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# CANADIAN MACHINERY

## AND MANUFACTURING NEWS

*A weekly newspaper devoted to the machinery and manufacturing interests.*

Vol. XIX. TORONTO, JANUARY 3, 1918 No. 1

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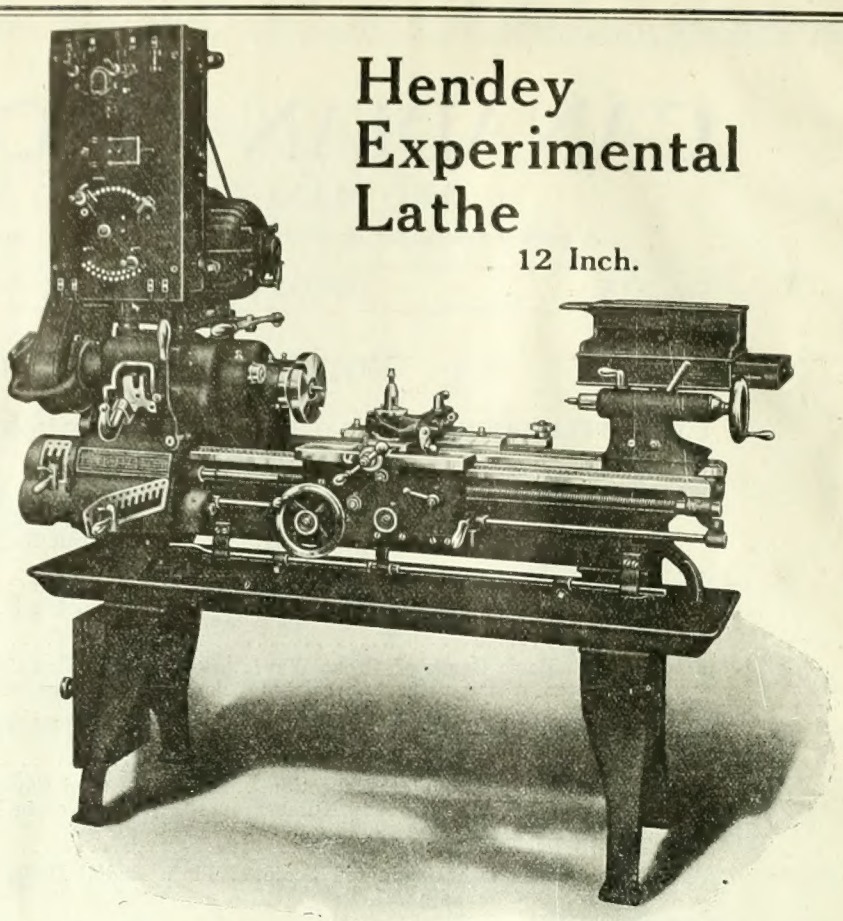

## Hendey Experimental Lathe

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# Some Applications of Air-operated Machine Tool Equipment

Staff Article

*The tendency to use specialized equipment when the output is sufficient to justify the expense is now thoroughly established amongst progressive manufacturers, and the resume of various applications of compressed air to increase production and save labor forming the accompanying article should serve a helpful purpose refreshing the minds of many readers.*

MANUFACTURING efficiency is almost entirely a question of maximum and accurate production on a speedy and economical basis, to achieve which it is essential that every facility be provided. This does not imply that the most modern equipment should be obtained for the specific purpose—although this is advisable where initial machinery is installed—but in cases where plants are already equipped with suitable tools it is very important that they be so equipped and utilized that their effectiveness is constantly maintained. While labor saving devices are not always a fundamental consideration in the manipulation of machine shop equipment, they are nevertheless a very important factor in the operation of a plant where considerable physical effort is required on the part of the workmen during the course of a day's work. Apart from the actual duties of a machine tool, production is governed by the ability of the operator to keep pace with the physical requirements of his work. In the making of munitions during the past three years, the outstanding feature has been the physical nature of much of the incidental work in connection with the manufacture of the shells this condition being especially pronounced during the incipient stages of the industry. Early methods of routing the shells for individual machine operations involved excessive handling of the shells in and out of the various machines.

### Early Neglect of Chucking

With the increasing demand for more shells plant executives were called upon to devise means to enhance their previous efforts in regard to production. The special or single purpose machine tool has without doubt been the chief factor in the solution of the stupendous problem of munition manufacture; and the remarkable success of this type of equipment was the primary incentive to the ingenuity of plant engineers and mechanics in devising special attachments for the accomplishment of a specific purpose. Equal in importance to the development of the single purpose tool has been the advancement of chucking, both externally and internally, for the various sizes of shells. In the early days of munition activity, the importance of chucking was not given the same consideration as other detail operations, but it was soon recognized that this feature was of the greatest importance. Those firms that took up the work at a later date were fortunate in that they were relieved to a considerable extent of the experimental work experienced by the pioneers of the industry.

### Progress of Air Devices

The adaptation of compressed air for the operation of chucking fixtures of every description has probably made greater progress than any other single detail in connection with munition manufacture. The uniform nature and quantity of the product practically eliminated the use of the ordinary independent or universal chuck, these being replaced by suitable collet chucks. At first these were usually operated by hand control, but this method was to a great extent superseded by pneumatic appliances; its

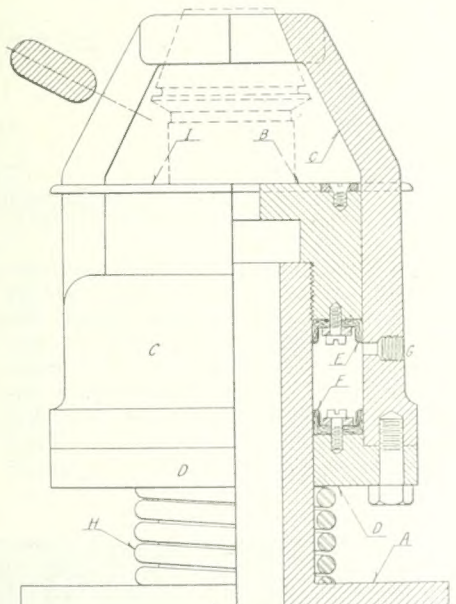



FIG. 1. AIR-OPERATED JIG FOR DRILLING AND REAMING SMALL HOLES IN DETONATING FUSES.

application for this purpose proved more rapid and reliable, and also relieved the workman of the tedious duty of operating the draw-rod by means of the hand wheel or heavy wrench at each insertion or removal of the shell. Where compressed air is not available the initial cost of installing an air compressor is, of course, a question that demands serious consideration.

In general, the expansive force of compressed air is used against a freely moving piston connected to a draw-rod for operating the gripping jaws of the collet chuck or expanding arbor. For lathe work the more common types of air control have the air cylinder secured to the rear of the spindle, the inlet being provided with gland connection to prevent the escape of air while the parts are in motion. This is an important detail on those machines where the work is revolved. When the pneumatic principle of chucking is adopted on machines where the tools are in motion, the necessity of one of these air connections is eliminated; this is the case on those fixtures used on drilling machines, jigs, etc.

### Rapidity and Accuracy

In the operation of jigs and fixtures rapidity of action is second only to the accuracy of the device in which the work is held. As in all other classes of machine shop work, the handling of the material and the time required to set the tools or attachments are the essential factors upon which efficiency is based; and it is therefore imperative that, apart from the actual machining of the piece, the period between operations—or the handling of the work—should be reduced to the lowest possible minimum. Where pieces are to be placed in jigs or fixtures for subsequent machining, it is very important that the clamping arrangement be of such a character that the pieces can be inserted and removed from position with minimum effort and loss of time. Various methods are adopted for holding work in fixtures during machining operations, the general practice being by the use of wing nuts or suitable cam clamps. While the effort required on the part of the operator is seldom such that actual fatigue results from work of this nature, it is often advisable to give due consideration to the conservation of the workman's energy even in those details that are invariably classed as insignificant.

The adaptation of compressed air to jig work is worthy of more attention from those who are called upon to perform work that requires rapid handling for economic production; particularly where large quantities are to be manufactured and the actual machining is light compared to the entire cycle of handling and tooling of the piece. The sketch shown in Fig. 1 illustrates a jig that has proven very satisfactory for holding detonating fuse bodies while certain of the drilling and reaming operations are being accomplished. The plant where this device is used employs quite a staff of female workers and it is characteristic of the management to adopt ways and means wherever possible to facilitate production without demanding excessive physical effort from those who are called upon to operate the equipment. The jig consists of a stand

A, that can be permanently fixed upon the drill table, or moved about as desired. To the upper end of the pillar of A is screwed the piece B that forms the piston of the device, which owing to the construction, is a stationary member, the cylinder or outer portion C moving vertically up and down with the action of the compressed air. The piece D forms the head of the cylinder, the U leathers E and F forming the necessary air-tight joints; G is the pipe connection for the air supply. A heavy coil spring

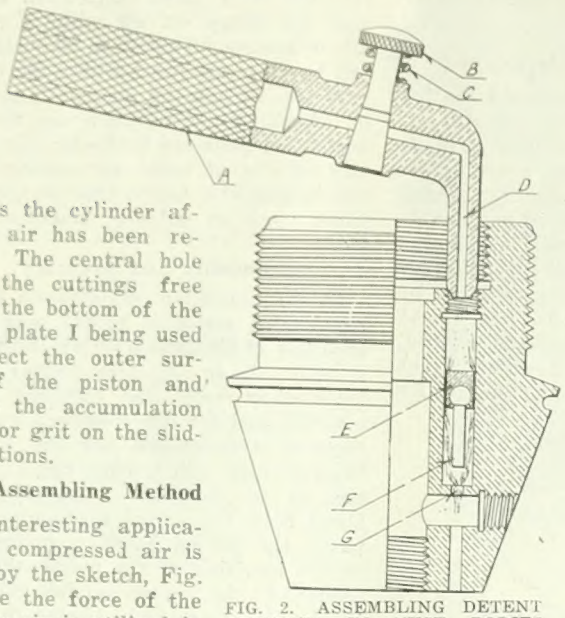



FIG. 2. ASSEMBLING DETENT SPINDLES IN FUSE BODIES WITH COMPRESSED AIR.

H raises the cylinder after the air has been released. The central hole allows the cuttings free exit to the bottom of the jig, the plate I being used to protect the outer surface of the piston and prevent the accumulation of dirt or grit on the sliding portions.

### Novel Assembling Method

An interesting application of compressed air is shown by the sketch, Fig. 2, where the force of the escaping air is utilized in the assembling of detonating fuses. Before adopting this method considerable difficulty was experienced in getting the detent spindle to enter the small hole; the air, however, solved the problem. After the detent has been dropped in place, the nozzle of the hose connection A, is placed in the detent hole as shown, so that when the button B is pressed down, a current of air is forced through the passage D and then through the larger hole in the fuse. As the air rushes on the pieces E and F are held in a central position by the vortex of rushing air, so that the point of the pin F is drawn into the small hole G without interference. An insignificant volume of air is sufficient for the desired purpose.

In the construction of the shrapnel shells it is necessary to machine the brass socket after the same has been firmly screwed to position, following the filling of the interior with bullets and resin. Owing to the fact that the copper band has been previously pressed on and turned, its larger diameter offers an inconvenience to the ordinary method of chucking. To overcome this, the chucking fixture shown in Fig. 3 was designed; in the general run of pneumatic chucks the stroke is comparatively short, but due to the special method adopted of placing the shell in position, the stroke of the device here shown was about 5 in., the control rod being in compression instead of in tension. After the sockets are screwed in and the tube soldered, the shells are placed in the chuck from the side and as the ram of the air piston is forced forward, the shell is held firmly in position while the brass socket is finish turned. The shell jig is secured to the driven plate of the lathe and has two rigid arms extending out to a circular portion that revolves in a separate steady head. The entire machining of the socket is performed by the movement of the handle at the right, the outer edge being finished when lever is pushed in one direction and the inner portion machined when lever is moved in the opposite direction.

### A Vertical Chuck

An interesting illustration of a pneumatic operated device is shown in Fig. 4. The entire fixture is of special design and worthy of particular attention; its purpose is to hold the shell firmly

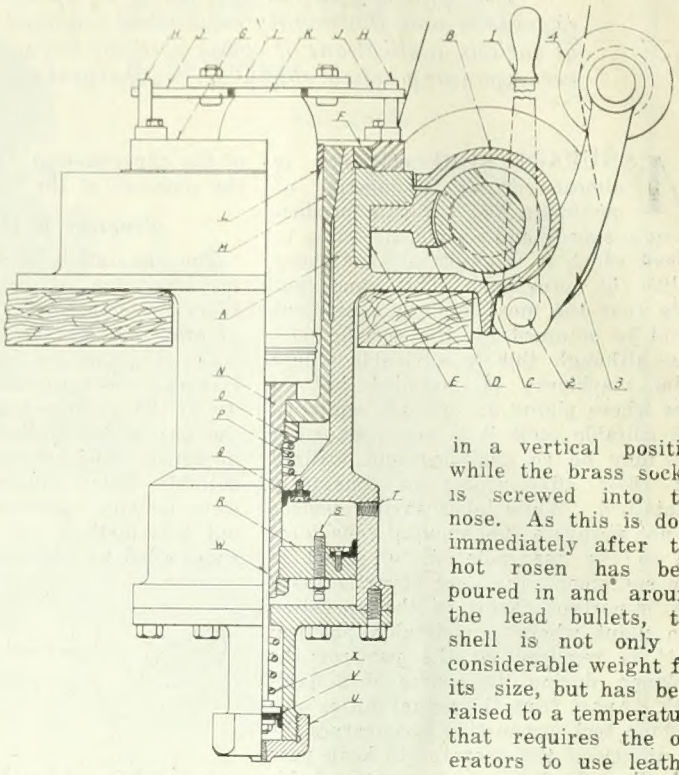



FIG. 4 SOCKET-SCREWING MACHINE WITH TWO-CYLINDER PNEUMATIC GEAR.

in a vertical position while the brass socket is screwed into the nose. As this is done immediately after the hot rosen has been poured in and around the lead bullets, the shell is not only of considerable weight for its size, but has been raised to a temperature that requires the operators to use leather gloves while they are being handled. For this reason it is very important that every facility be provided to perform the various operations in the shortest possible time. The body A, which is bolted firmly to the bench, is of special design, the upper portion constructed to contain the collet chuck and the revolving mechanism, while the lower portion contains the two cylinders, the larger one for the chuck control, and the smaller one at

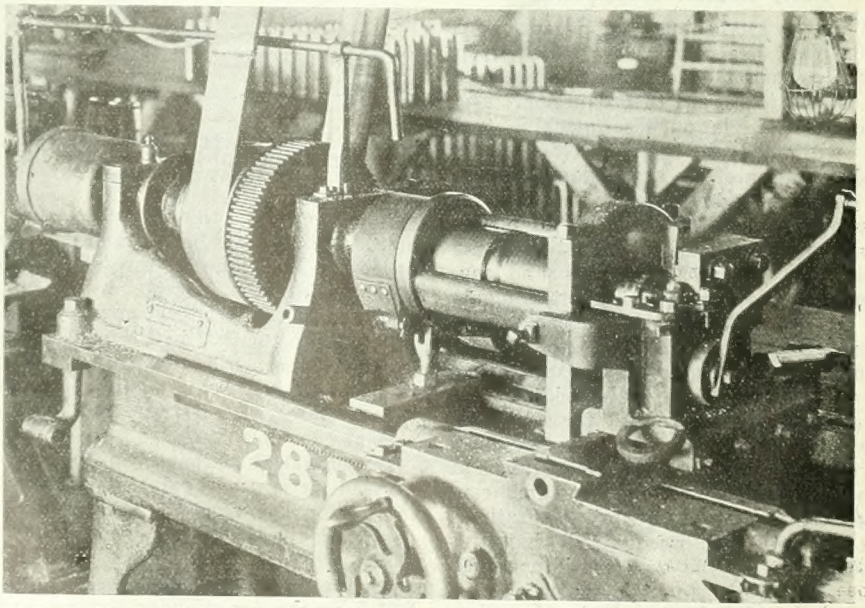


FIG. 3. AIR-OPERATED CHUCK FOR HOLDING SHRAPNEL SHELLS WHILE FINISHING BRASS SOCKETS.

the bottom for ejecting the shell after the socket has been screwed into position. To one side of the upper portion of the body an enclosed section B is provided to carry the worm shaft and worm C, the latter engaging with the worm gear D which is secured to the

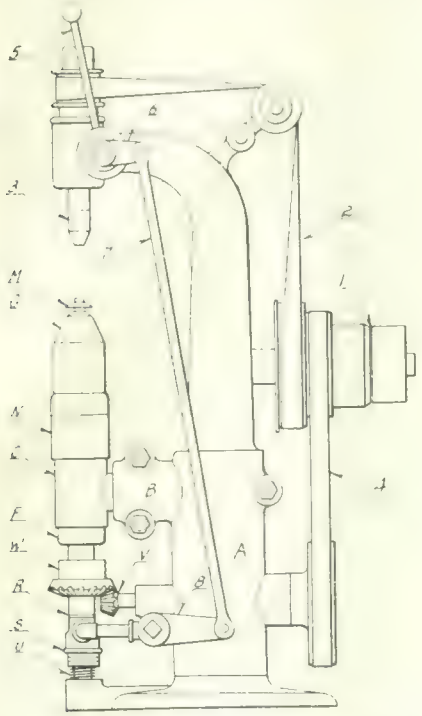


FIG. 5. DETAILS OF GRAZE PELLET DRILLING ATTACHMENT.

large ring E and held in position by retainer F. Fastened to the flange of the ring E is another steel ring G that carries the driving dogs H, of which there may be two or three as desired. To a small ring I is secured the levers J, the inner end of which are serrated to grip the brass socket when driving the same. As the copper band is of a larger diameter than the body of the shell, it is necessary to slip a thin split ring L over the shell before the same is dropped into the collet chuck M. To the lower portion of the collet is attached the draw rod N secured by the nut O, the spring P releasing the grip on the shell when the air pressure has been removed. Through the piston R is an adjustable bolt S for controlling the travel of the collet when releasing or tightening the chuck. The air inlet is shown at T. To facilitate the removal of the shell from its position in the chuck an additional cylinder is located below the larger one, so that when the chuck is released the piston V is forced upwards and the rod W that passes through the draw rod N, pushes the shell out of the chuck, so that it is easily grasped by the operator, the spring X lowering the rod when the air has been released.

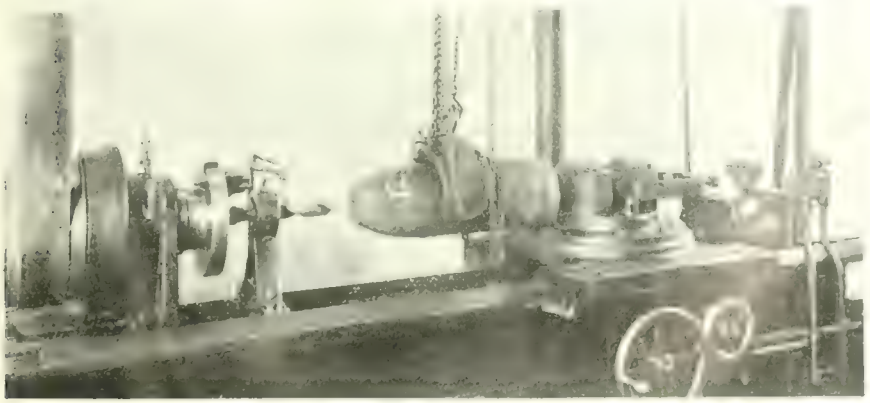


FIG. 7. DRILLING NOSE OF LARGE SHELL WITH BRASS [illegible] INLET IMPROVISED AS AIR FEED DEVICE.

### Insuring Concentricity of Drilling

In the manufacture of certain details in connection with the making of fuses, accuracy is an essential. In order to drill the small hole in the center of the pellet plug of the detonating fuse and assure of its being concentric with the outer portion the small but interesting drilling machine shown in Fig. 5 was designed and has given entire satisfaction. The machine is so constructed that the drill spindle is made to revolve at a speed of about 1,200 per min., while the lower portion that carries the work revolves at a speed of about 300 revolutions per min. in the opposite direction, so that the actual speed of the drill in relation to the work is practically 1,500 revolutions per min. This virtually insures a drilled hole central and concentric with the outer circumference. A notable feature in connection with the operation of this attachment is the joint control of the drilling and the chucking of the work with the one motion of the lever. After the pellet plug is placed loosely in the chuck the downward movement of the lever 5, which actuates the drill spindle 3, also operates the air valve on the lower end of the connecting rod 7, which is so adjusted that the initial movement of the sensitive lever opens the valve and allows air to enter the operating cylinder, the reverse motion of the lever raising the drill and releasing the chuck.

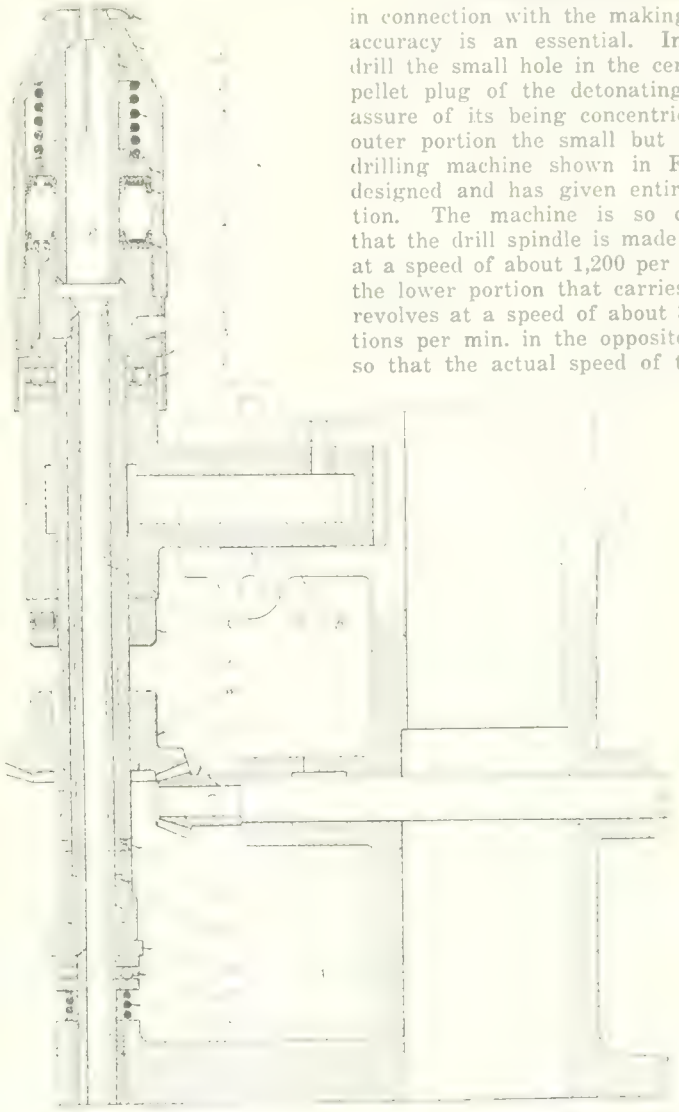


FIG. 6. SECTIONAL ELEVATION OF CHUCKING AND REVOLVING DEVICE IN FIG. 5.

A [illegible] arrangement and operating mechanism is shown in Fig. 6. The frame or stand A is bolted to the bench, the upper ex-

least possible friction, vertical motion justable collar F. The shell G of the chuck is threaded to the upper section outer cylinder and the smaller portion the air is released the collet is lowered by the reaction of the coil spring L. A small cup shaped piece of sheet steel is fastened to the top of the collet to prevent the dirt or cuttings from entering into and destroying the sliding portions. A similar cylindrical shield is attached to the side of the main spindle to protect the ball bearing E. The air enters by way of the inlet shown in the assembled sketch and passes into the space O, up between the outer and inner spindles and through the small opening P and thence into the cylinder chamber. A fibre washer is used between the stationary connection and the main spindle to seal the air in its passage through the enclosed space. The lower portion is made air tight by means of the gland S; the spindle and gland being additionally supported by the ball bearing T, which is kept in contact with the gland by the action of the coil spring U. The driving bevel pinion V which is secured to the horizontal shaft, engages with the bevel gear W keyed to the vertical spindle D. The central spindle is hollow to allow the free exit of cuttings from the drilled hole.

An application of compressed air for feeding purposes is shown in Fig. 7 adapted to the drilling of the nose on the larger shells. The fixture that supports the shell is of specially heavy construction to avoid any sag when the shell is placed upon the supporting arms so that the bore of the shell will be maintained in a central alignment with the lathe spindle. The turret is locked in a fixed position when drilling, but can be swung to one side to remove or replace a shell. For feeding the work to the drill an air-brake cylinder mounted on a special bracket between the ways of the lathe bed at the left. One of the advantages of this device is the steady and elastic feed obtained with a central supply of compressed air. Considerable skill is required in the movement of the saddle. The feed control is obtained by means of a motorman's brake valve.

## CAMPAIGN FOR FOREIGN BUSINESS IN STEEL IN U. S.

A VIGOROUS campaign for foreign business in steel products is being prosecuted by large export companies in the United States. Representatives of these concerns have been sent to Central and South America. Apparently a precious time to seek foreign business be-

against iron and steel exports by the railroad committee representing the United States Government in an effort to relieve the severe freight congestion at Atlantic terminals and southern ports that has been growing steadily worse for several months. It is estimated that 1,350,000 tons of iron and steel products designed for export are now being held awaiting ships.

The export companies, however, declare that they are not canvassing foreign markets for business requiring early shipments from this country, but that their intention is to cultivate the foreign field with expectation of securing a large volume of business after the war. Incidentally, some business may be secured for shipment within six months if Government licenses should be procurable.

## McGILL UNIVERSITY GIVES VALUABLE AID TO NATION

ON few activities of our national life has war made itself felt so much as on our universities. While the number of students in all classes has suffered an honorable decrease, it is in the engineering and allied technical fields that the most immediately results are found.

McGill University, Montreal, has participated very actively and the work of the students is directed as far as possible toward work of national and military importance. Compulsory military training is now the rule, and every male student who is a British subject is obliged to drill at regular intervals. In addition there is a class for the training of officers, which, although requiring some extra time, is a very important way in which the university can serve the country, the beneficial influence of a university training on an officer's ability being acknowledged in view of the fact that they can acquire the necessary knowledge in a much shorter time than the average person.

All of the McGill laboratories have really been at the disposal of the government for experimental purposes and excellent service has been rendered especially by the physics and chemistry departments. Members of both staffs have devoted a great deal of time to munitions research work as well as the overcoming of the submarine menace, while the difficulties experienced in the industrial world by the cutting off of German trade have received more than ordinary attention from the chemical department with a view to providing for future needs.

The shops under the mechanical department have been placed at the disposal of wounded soldiers for the learning of trades. The Campus has been turned over to the military authorities for drilling purposes and is lighted at the expense of the university when such drills are held. The library has been utilized as far as possible in the distribution of circulating libraries to soldiers' camps and barracks. The physical training course has been featured by the assistance rendered to wounded soldiers in directing massage treatment.

Considerable interest attaches to the work of university men on the several commissions established by the government, and it is interesting to note that two McGill men are on the commission on Scientific and Industrial Research, one of them being the chairman.

### Women's Work

Every organization connected with McGill has done important work in the way of providing comforts for the soldiers and equipment for the men over and above what is given by the government. The largest of these, formed at the beginning of the war, is known as the McGill Women's Union, and is composed of the wives of professors and others more or less intimately connected with the work of the university. The members knit socks, make bandages and many other articles required in the field and hospital and have done really wonderful work.

The honor roll of McGill to date is:

| | |
|---|---|
| Enlistment of students and graduates | 2,200 |
| Honors won | 300 |
| Prisoners | 20 |
| Wounded | 340 |
| Killed | 240 |

## MANUFACTURERS' ASSOCIATION URGE COAL ECONOMY

A CALL to their members to realize the extreme urgency for taking effective measures to reduce coal consumption has been made by the executive committee of the Canadian Manufacturers' Association. In a recent letter Secretary G. M. Murray says: In the light of representations made to your executive committee by the Fuel Controller for Canada, Mr. C. A. Magrath, we feel justified in saying that unless those portions of Canada that are dependent upon the United States for their coal supply voluntarily effect an immediate and substantial saving in their coal consumption, they will be compelled to do so by measures of the most stringent character.

It is idle to take shelter behind the defence that the prices demanded for coal afford all the incentive to economy that is necessary. Notwithstanding the high cost of coal, there is still more or less of it being wasted, in one way or another. The situation is so critical that now even pounds count, and it is a solemn obligation, resting upon every user, to do everything in his power to reduce his consumption.

Unless, as the result of voluntary and united effort in this direction, Canada's requirements are brought down to an irreducible minimum, it is practically certain that a system of priority treatment will have to be set up, if indeed the consumption of coal by non-essential industries is not absolutely prohibited. That is naturally something we all desire to avoid, whatever the cost, but from the present outlook we will only be able to avoid it by doing of our own accord, everything it is humanly possible for us to do, in the way of saving our consumption.

We beg of you, therefore, to take this matter up at once in a practical way.

If natural gas or electrical energy derived from water power is available, please consider seriously the conversion of your plant to its use as a means of relieving the coal situation. If wood or waste can be utilized as a substitute for coal, no matter to how limited an extent, please see that it is used. If anything can be accomplished by co-operating with other manufacturers in your locality and consolidating in one plant work that is now being done in two, please bear in mind that you will be serving the cause of your country by putting up with the inconvenience thereby involved.

The Canadian Manufacturers' Association is now endeavoring to secure technical men whose services will be freely available to manufacturers desiring to co-operate in this all-important movement.

## PREPARATION OF FERRO-URANIUM

BY using pure uranium dioxide, a low-ash coke or charcoal, and a pure iron as raw material, with fluorspar as slag-former in a tilting direct-arc type of furnace fitted with water-cooled magnesite hearth and sides, it should be possible to produce commercially, without a second refining operation, ferro-uranium of any desired content, say 40 to 70 per cent., the carbon content would average less than 2.0 per cent., silicon less than 0.75 per cent., and vanadium less than 0.5 per cent., while aluminum, sulphur, phosphorus and manganese can be kept so low as to be negligible.

The foregoing represents the conclusions arrived at by H. W. Gillett and E. L. Mack from a laboratory study of the preparation of ferro-uranium made by them for the United States Bureau of Mines, published as Technical Paper No. 177.

### Low Power Consumption

The power consumption should be decidedly less than 3 kw. hours per lb. of alloy, and the loss of uranium in the reducing process less than 15 per cent. If experiments show that uranium steels high in uranium are not valuable, but that the presence of the element in small quantities is useful, and if the amount required is so low that the carbon introduced by a high-carbon alloy would be harmless, the furnace might have an uncooled carbon hearth and the alloys would contain 4 to 5 per cent. of carbon.

If uranium is found useful only as a deoxidizer or scavenger of oxygen and nitrogen, aluminum would not be harmful and might be advantageous, and the slag-former might be wholly or in part alumina. As regards the usefulness of uranium in steel, the evidence is somewhat inconclusive and even contradictory. One authority states it has not been shown to add any important properties to steel not obtainable by the use of cheaper elements, and another that some of the large American steel companies that have tried to utilize it have met with little or no success.

### Substitute For Tungsten

There have been various rumors that Germany is using uranium steel liners in big guns, but on the other hand it is known that the stock of uranium compounds obtained from pitchblendes and stored by the Austrian radium works was exhausted early in the war. Experiments made by the Standard Chemical Company in America are said to indicate that a small percentage of uranium may be substituted for a very large percentage of tungsten in high-speed steel without injuring the cutting properties, and that uranium is also useful in carbon steel and cast iron.

A high-speed steel showing excellent cutting qualities contained 0.78 per cent. carbon, no manganese, 0.16 silicon, 0.02 phosphorus, 8.15 tungsten, 3.62 chromium, 1.81 vanadium, and 1.02 uranium. According to other reports, uranium steel with 5 per cent. of tungsten and 3 to 4 per cent. of chromium made a good tool and did good work for, say, two grindings, but after that did not hold its efficiency and had to be re-hardened, while a 40-point carbon steel with 0.3 per cent. of uranium was disappointing, being red-short at ordinary forging heat and altogether uninteresting for practical purposes.

## BEFORE AND AFTER

By N. G. Near.

THE accompanying photographs show how modern equipment is doing away with the dust nuisance in industrial establishments. Fig. 1 shows how ashes were once loaded into a car by means of a clap-trap belt and bucket arrangement. It was often unendurable for the men to work in the vicinity of this loading machine under certain conditions—when the wind was just right and when it was real hot. This view was taken while the steel structure shown in Fig. 2 was being erected. The bottom of this steel structure is visible in Fig. 1.

FIG. 1. BEFORE

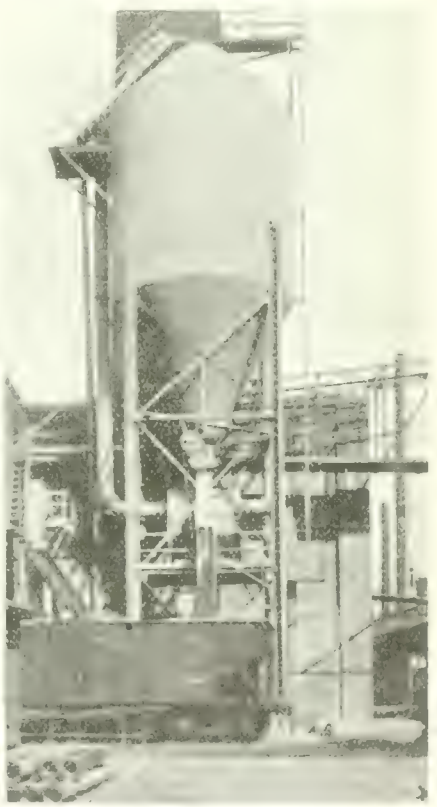


FIG. 2. AFTER

Fig. 2 shows how the ashes are loaded now. There is not a bit of dust, because the ashes are well wetted down by simply turning the valve of a pipe line. The ashes are sucked into the tank in the same way that a vacuum cleaner works, and we all know how dustless vacuum cleaners are. The advance in efficiency is sufficiently obvious to render further comment needless.

## FACTS ABOUT RADIUM

RADIUM is a metal, and has a white metallic lustre; it has been isolated only once or twice, and few people have seen it. Radium is ordinarily obtained in the form of salts, and is usually so sold and used. These salts are all white or nearly white substances, whose appearance is no more remarkable than that of common salt or baking powder.

Radium is found in nature in quantities so exceedingly small that it is never visible even when the material is examined with a powerful microscope. Ordinarily radium ore carries only a small fraction of a grain of radium per ton of material, and radium will never be found in large masses because it is formed by the decay of uranium, a process that is wonderfully slow, and radium itself decays and changes to other elements so rapidly that it is impossible for it to accumulate naturally in visible masses. Radium and radium minerals are not generally luminescent. Tubes containing radium glow from impurities present which the radiations from the radium cause to give light.

Minerals that carry radium are fairly easy to determine, for they affect photographic films in the same way as ordinary light, and they can also be identified by their effect upon an electroscope.—Mining American.

# EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

## THERE WAS EFFICIENCY IN THOSE DAYS TOO

By D. A. Hamilton

FIFTEEN or twenty years ago [illegible] would have [illegible] "efficiency" as the same [illegible] to the ratio of work done by to work delivered to a machine. More recent years have put this definition in the background and substituted one that applies rather to motion study—the cutting out of useless moves, the doing of operations in the shortest and best manner possible and it is in this sense that the word has become the most overworked and abused one in our trade. To believe all we are told, we would think that before the day of the efficiency expert our work was done in the slowest and most extravagant manner; some of it was, and some of it may be to-day, and again some of it was turned out in a way to be proud of though at that time it went unheralded and unsung.

The shop that Robert Laing ran was a good example of efficiency as practiced to-day although at that time the success was attributed to Laing's being a "good man." The shop employed twenty to thirty men and did a manufacturing business. Laing was around the shop most of his time, when he wasn't he was working [illegible] board—"so much easier to change a few lines," he would say "than to change a jig." And while at the board, you could often see him with his watch before him, making shadow motions—the motions the drill press hand would have to make in the actual use of the jig under consideration. There were very few of his jigs that did not work out as expected and none of them [illegible] two motions where one would do.

And after the set-up man had gotten a machine ready for an operator, if the job was a new one, Laing would run off a few pieces himself to see if everything was arranged for the operator to really produce. Sometimes a spring could be used to advantage between vise jaws and save a movement with every load. Perhaps he found the parts were so placed on the table beside the machine that the work was all done left handed, perhaps a seat for the operator could be arranged. If [illegible] a "magazine" fixture built that could be loaded while the machine was running. [illegible] presented themselves on drill press work. Pumps and flooding were unknown then but oil or soda water was used and the [illegible] mined by trial—squirt can, wick feed, or [illegible]

parts were so held that when clamps were released, the floor slid back and the drilled piece dropped out and into a box or a [illegible] a chute with a perforated slide that cleaned the work of chips before it landed in the box.

One thing that was carefully watched was to have waiting time eliminated. The men were instructed to inform the foreman a half hour before they were through with a job so that another could be made ready for them. Tools like drills and taps that were used on manufacturing work were always supplied in duplicate or better; then a dull drill or a broken tap would not hold up the production on a job. An endeavor was made to always have a sharp tool ready to replace a dull one. To keep the stream of work flowing, operators were forbidden to "handle" work themselves but had the services of a helper whose sole business was to fetch and carry.

A source of loss in many shops is from men waiting for the floor sweeper. Mr. Laing made a point of having benches and floors cleaned at noon and night when it could be done without interfering with workmen. Unless given permission, operators were not allowed to make any but minor adjustments; these were attended to by the set up man, who also sharpened drills and cutters.

The shop was successful and its success was laid partly to Mr. Laing's being a good man and attending to details but these little things were taken as a matter of course and nothing was ever written about it. Scores of other shops were in the same class. And if a shop to-day followed the plan of these twenty years ago, it would be called "efficient" and its fame would go down with that of the expert who "put in the system."

## DOES A PISTON STOP AT REVERSAL?

By N. G. Near

THE writer has read R. Hamilton's arguments in the Dec. 6 CANADIAN MACHINERY under the above heading with much interest and notes the very clever way in which he endeavors to prove that a piston does not stop at reversal.

A line has no thickness, true enough. It therefore requires no time at all for a crank pin to pass through a line. Therefore, Mr. Hamilton argues the cross head does not stop. That being the case, then, it can be proved that a piston has no "maximum velocity" either. Draw your cross head velocity curve and it will be found that at one "point" the ordinate is longest. The height of that ordinate represents the maximum velocity [illegible] in most of our text books and the writer has always accepted it as being true and must continue to do so. According to Mr. Hamilton's way of looking at it, though, this solitary maximum being represented by a "point" and a point having no magnitude it takes no time at all for the crank pin to pass through that point and therefore the maximum velocity does not exist (theoretically).

I am attempting, you see, to answer Mr. Hamilton's arguments with his own "thunder" and could probably go all the way around the whole path of the crank pin and prove that our understanding of kinematics is all wrong because of the smallness of a point.

To the question, "How long does a piston stop?" there can probably be only one answer—zero seconds. It doesn't stop a hundredth of a second, a thousandth, a millionth, a billionth, or even a decillionth for such stops are all of longer duration than zero. A stop, as is generally understood, means zero velocity and we surely have a "point" in our velocity diagram where the velocity is zero in the same way that we have a "point" where the velocity may be 10 feet per second regardless of whether the cross head is accelerating or decelerating.

Mathematically, let us assume a case where the length of the connecting rod is infinite and the velocity of the crank pin is C feet per second. The velocity of the piston may then be given as $v=C \sin A$ where A is the angle between the crank arm and the line through the shaft and piston. Now, where A is equal to zero the v becomes zero and for that infinitesimally short time the piston STOPS because its velocity is zero. Where the connecting rod is of finite length a similar solution will give the velocity at this "point" as being zero.

True, this may seem like some "pretty fine figuring" and Mr. Hamilton has a strong line of arguments built up on the fact that "zero is nothing" and that if a piston stops zero seconds it doesn't stop at all, which sounds logical because of the play on the words. But everything points to a dead stop via the velocity diagrams and mathematical formulae.

Anything possessing weight must stop before it can be made to reverse "in its tracks" as the expression goes. Even a baseball comes to a dead stop when struck by a bat before it can move in an exactly opposite direction. The bat, when swinging toward the ball, moves at a fairly constant velocity and is little disturbed when it meets the ball because of its greater mass. The whole bat does not stop because its direction is not reversed although some of the fibres in the bat may stop. But the ball DOES stop. The elasticity of the ball permits it to withstand the shock.

Perhaps all "points" in the ball do not stop at once but nevertheless every atom has its own deceleration and acceleration to perform and if the atoms do not function thusly our philosophy is all wrong

## IRON ORE THE BASIC CAUSE OF GREAT WAR

INDISPUTABLE facts which have not suffered even a suggestion of contradiction have been repeatedly stated by various writers regarding the ulterior motive of Germany in precipitating the present conflict. The industrial development of that nation is punctuated by a series of incidents whose continuity and gradually increasing deliberateness leave no room for doubt in the mind of an impartial observer that the war was "planned" in every sense of the word.

Speaking before the National Association of Manufacturers in the States recently, Rev. Newell Dwight Hillis gave a brief resume of known historical facts which throw an interesting light on past events and indicate the future effects on various nations according to the outcome. He said:

"If I understand this war right, it is, essentially, a war for hematite iron ore. It is the greatest war in history, because it is a war for the greatest thing in industrial history, namely steel; without hematite iron and good coking coal you cannot make steel.

"In 1866 Germany was an agricultural people. She had no manufacturing life. All that has its counterpart in your wonderful manufacturing systems in this country did not exist in Germany at that time. First, she captured that coking coal province from Austria. Then she captured Alsace and Lorraine. That was in 1870. But the important thing was this: Germany held a conference of twenty leading men of Germany in Berlin, presided over by Bismarck. In 1866 England led Germany in five things; first in pig iron, second in steel, third in woolen goods, fourth in cotton goods, fifth in the building of ships. In these things Germany was hopelessly behind. Then it was that Bismarck developed his scheme for a world empire that later hypnotized the Kaiser. In 1909 the Kaiser called his ministers together to consider a report presented by the mining engineers of Germany. That report was on the danger which threatened Germany by reason of the exhaustion of her iron supplies. The majority report of the mining engineers said that by 1925, one-half of the factories of Germany would have to shut down for the lack of iron. The minority report gave her thirty years. From this we can understand how desperate Germany was. Then came the discovery of the great iron mines down in Morocco. Fourteen days after the discovery of those mines, Germany had her biggest dreadnought in the harbor of Agadir. Diplomats know it as the Agadir incident. We know how Belgium, Spain, and Portugal united their forces; and how Germany then determined to mobilize her troops the following Monday. Then it was that the business men brought pressure to bear. The Bank of England, the Bank of France, the Rothschild banks, called their loans on the German people, a billion three hundred million dollars. Once more Germany was at bay. She ceased to plan for the mobilization of her troops.

"Some years ago, one of our authors called attention to the discovery of the new iron veins running across Northern France, and containing a great blanket body of hematite ore. It was the most marvelous event in the manufacturing life of Europe during the last one hundred years. The engineers of the French government made borings, and on tracing that ore deposit westward they found it disappearing on the frontier lines of Belgium. When Germany's troops started west in August, 1914, it was to grab that iron ore. Germany went into Belgium to get command of the iron mines of Belgium. A few miles away lay the newly discovered iron mines in northern France. The Prussians fought unto death for the iron mines controlled by that little pass at Verdun. It is said that Germany lost six hundred thousand men in that battle. Why did she make that desperate struggle? For this reason: The little pass of Verdun opens into the great basin of the Brie. From the hour Germany got in there in August, 1914, she began to load every day two or three freight trains with fine hematite ore, and the struggle at Verdun was to control that treasure. For that hematite iron ore Germany is going to fight unto death. The war in South Africa was a gold and diamond war. The war in Mexico to-day is a land war. The war between Russia and Japan was a forest war. This war to-day between Germany and France and Belgium is a war to control the iron mines of Belgium and France, and the coking coal, looking forward to the control of Europe for the next two or three centuries. William Morton Fullerton, in his wonderful book, "Problems of Power," calls attention to the fact that there is enough high grade iron ore now bored in northern France to take care of all the people of Europe for the next three to five hundred years. Germany is going to fight unto death for that iron ore. It is a struggle for steel. Ours is a civilization based upon steel. Steel means locomotives and looms, presses, Pullman palace cars; means enormous wealth for the country through tools and conveniences. As these iron mines go in this war, therefore, so civilization in Europe will go."

## STORING COAL GAS UNDER PRESSURE

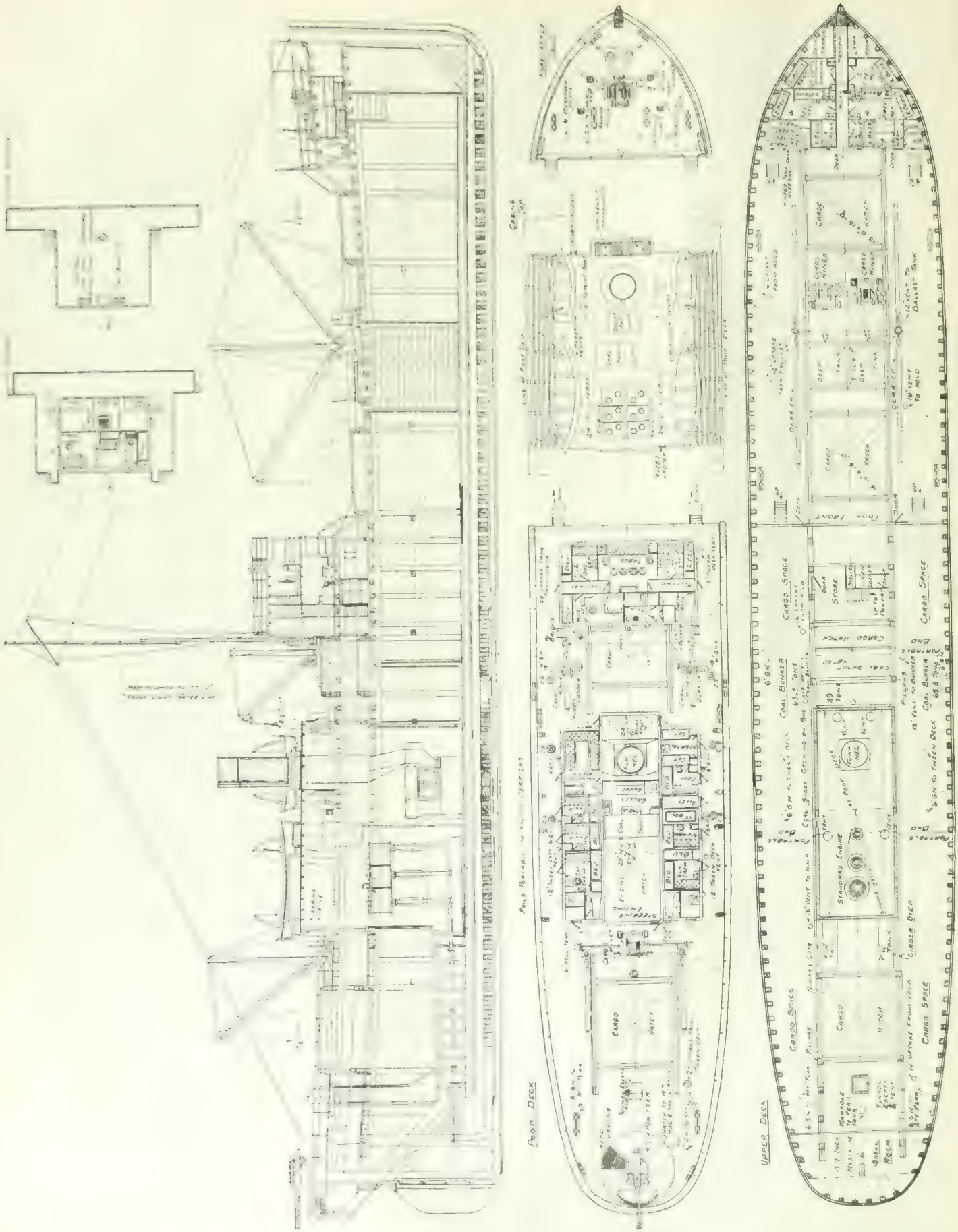
THE rapid development of coal gas as a fuel for motor cars in Britain has been limited by the problem of storage, and much attention is being given to this subject by numerous investigators throughout the country. Fragility and bulkiness are the two principal drawbacks to the extended use of low-pressure containers, consequently attention is being given to the question of compressing it at high presure in cylinders. Coal gas is being regularly compressed to a pressure of 120 atmospheres (about 1,800 lb. per sq. in.), and this must be regarded as the maximum pressure at which the gas can be easily dealt with, though on the continent pressures of over 3,000 lb. per sq. in. are quite common. The great objections to steel cylinders are their dead weight; the care and supervision required in looking after them when stored under high pressures and the liability of the metal to fatigue through constant vibration, necessitating frequent annealing; and the depreciation of the gas by compression, the calorific power being reduced about 10 per cent. by compression to 1,800 lb. per sq. in. Authorities on the subject do not hold out any great hope of steel cylinders ever being adopted universally for compressed gas on motor-vehicles, the opinion of leading experimenters being that the solution of the problem will be found in cylinders made of other metals than steel, or of composite rubber material.

## HUNDRED-POINT MEN

THE need of the hour is emphasized by George A. Simpson, sales manager of the Steel Co. of Canada, who in an able article published on page 19 of this issue presents lucidly, emphatically and conclusively the demands which future business conditions will make upon the industrial personnel of the nation. To derive the fullest benefit from experience, to be able to satisfactorily meet all demands, familiar or unexpected, to sense the future and separate certainty from uncertainty—these and others will be the least of the qualifications imposed on us by the conditions set forth in Mr. Simpson's article.

## GERMANS APPRECIATED SCIENTIFIC EDUCATION

IN the course of a recent discussion on the training of engineers, the eminent English scientist, Prof. W. E. Dalby, said that ten years ago when he went to Charlottenburg in Germany to make some investigations into the training of engineers, there were over 10,000 students of engineering over 18 years of age, who, before they started on their engineering courses, were as well educated as if they had taken an English university degree. In Great Britain he could only find about 900 men to set against the 10,000 of which Germany could boast, and the position of Germany in this respect had probably improved during the intervening years. His own view was that, whatever might be said in regard to the numbers of trained men in British engineering, there was very little wrong with the quality, and he did not hesitate to say there was no country in the world where better engineering training could be given than in British modern university centres. The fundamental need was for the schools to build up a strong pedestal of engineering scientific knowledge, on which could afterwards be constructed an edifice of any specialized knowledge which was desired. To start specialized training in the first place was clearly a mistake.




STANDARD WOOD STEAMSHIPS BUILDING IN CANADA—PROFILE, MAIN DECK, AND ACCOMMODATION PLANS.

# General Specification of Standard Wood Steamships

*By courtesy of the Shipping Department of the Imperial Munitions Board, Ottawa, we are able to place before our readers a comprehensive resumé of the hull and equipment features of the standard wood steam freighters now under construction at various locations on our ocean coasts and inland waterway shores. The text matter in conjunction with the illustrations cannot fail to create the impression that eminently seaworthy and useful craft will be the outcome of this emergency enterprise aside from the non-permanency of the industry.*

WOOD steamship construction on behalf of the Imperial Munitions Board, Ottawa is at the moment being prosecuted with considerable vigor in Eastern and Western Canada. Twenty-seven of the particular type vessel are building in British Columbia and nineteen others are distributed among shipyards between Toronto and the Atlantic seaboard. Leading dimensions of these standardized craft are as follows:

**Hull Dimensions.**

| | |
|---|---|
| Length B.P. | 250 ft. |
| Length O.A. | 259 ft. |
| Breadth, extreme | 43 ft. 6 in. |
| Breadth, moulded | 42 ft. 6 in. |
| Depth, moulded | 25 ft. |
| Depth over keel | 26 ft. 11 in. |
| Draft for displacement | 22 ft. |
| Draft over keel | 21 ft. |
| Approximate deadweight on 20 ft. maximum draft | 2,300 tons |
| Approximate deadweight on 22 ft. maximum draft | 2,800 tons |

**General Description.**

Vessel will be of the single deck cargo type, built principally of Douglas fir, with hold beams, wood deck houses and rails. To have elliptical stern with long poop deck aft, and raised fo'c'sle forward. To have five hatches. One deep ballast tank with longitudinal divisions. To have six watertight wooden bulkheads, one bunker bulkhead, which is a non-watertight bulkhead, one screen bulkhead, and one watertight door between engine room and tunnel.

Accommodation for the officers will be in deck houses erected on the poop deck. A bridge and bridge house will be erected at the forward end of the poop.

Six cargo winches, one of which is to be a warping winch, to be fitted as shown on deck plans. Windlass on the fo'c'sle head suited to handle anchors and full scope of chain, also arranged for warping as usual.

Fore peak to be fitted for fresh water, with filling pipes, suctions, etc. After peak to be fitted in the same manner. Culinary water will be distributed from separate steel tanks of about four hundred gallons capacity each, placed as directed.

The vessel is to be driven by single screw, with engines abaft, amidships, as shown in the drawings. Builders of hull will have no responsibility in connection with the installation of machinery, except in the putting in of foundations for the main engines and auxiliaries, for deck gear, and in the piercing of hull for sea cocks, valves, etc., as directed by the Board's representative, and also in the fastening of deck machinery, deck fittings and windlass.

**Classification.**

[illegible] necessary for a cargo steamer.

**Materials.**

All lumber used in the construction to be British Columbia fir, generally known as Douglas fir, unless otherwise specified. All material to be to the satisfaction of the Board's inspector.

Long lengths are to be used in the keels, keelsons, planking and ceiling, and to be clear of shakes, loose knots and other faults, and, as far as possible free from sap. All decking to be edge grain.

[illegible] drift bolts of galvanized iron and black iron, as hereinafter specified.

**Conditions.**

It is distinctly [illegible] to supply the Board with [illegible] a workmanlike manner, satisfactory for ocean service and fitted [illegible] handling of freight. The work in all departments shall be done under the supervision and subject to the approval of the Board's inspector, and facilities must be afforded him for inspecting material and workmanship during the whole progress of building.

**Drawings and Plans.**

The [illegible] tion with the construction of the vessel will be [illegible] the progress of the work, and if the contractor [illegible] will at once see that he is provided with the necessary details.

**Water-testing of Compartments.**

[illegible] tested with a head of water to [illegible] presentative of the British Board of Trade.

**Keel.**

Keel to be sided 24 in., moulded 20 in. To be in four lengths. Scarphs to be 12 ft. long, and to be copper painted before fastening. The nibs of the scarph to be 4 in. deep. A [illegible] with 1 in. galvanized button head screw bolts, having the heads sunk below the flush for cementing before shoe is fitted. The ends of the scarphs to be spiked.

**Shoe.**

Shoe to be 3 in. fir in approximately 24 ft. lengths, and to be fastened with 8 in. by 7-16 in. galvanized spikes, spaced 15 in. centres, staggered. Heads of spikes to be set in, say ½ in., and cemented.

**Stem.**

Stem to side 18 in. and mould 18 in. The cut water at stem to be reduced to 5 in., and gradually to widen out to conform to the curve of the forefoot as it widens out to meet the keel. The rabbet of stem to be 3½ in. deep. Forefoot connecting stem to the keel to be a wide timber, moulded to the form of stem. The stem as it widens out.

The forefoot to be scarphed to stem and keel, as shown on the stem drawing which will be [illegible]

**Apron.**

Apron to side 24 in. and mould 28. To extend down until it dies on the forefoot. The apron to be connected to the stem with 1½ in. galvanized drift bolts, spaced 12 in. centres, staggered. Forefoot to be connected to stem and keel with at least four 1¼ in. galvanized screw bolts, the heads and nuts sunk below the flush to be cemented on the outside and the recess [illegible]

Balance of the forefoot to be fastened into the [illegible]

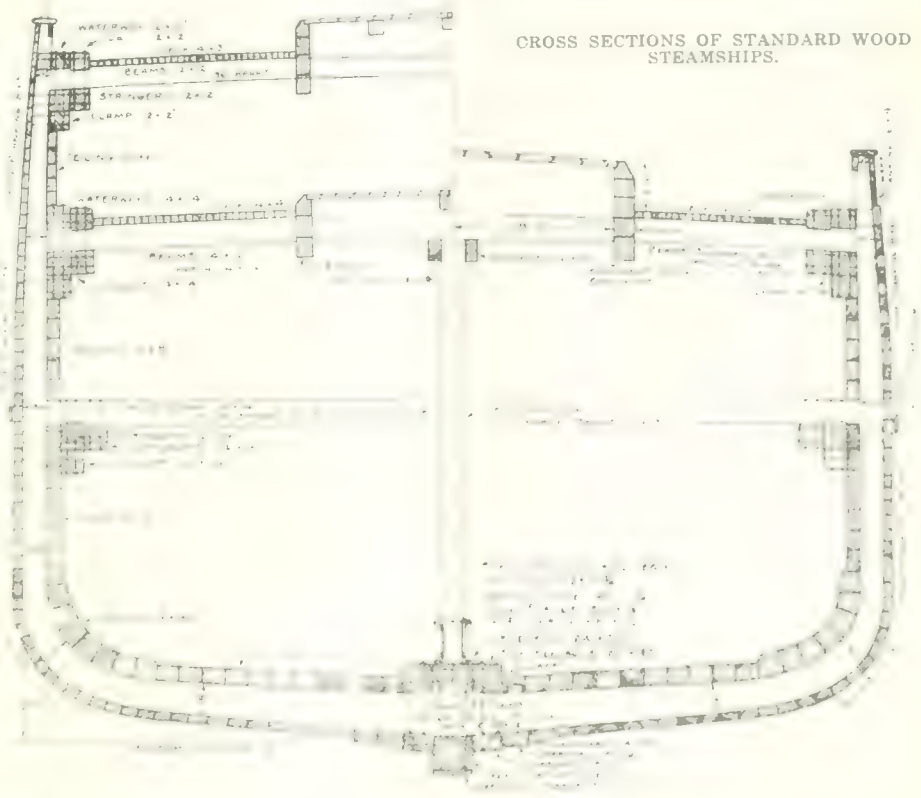
**Propeller Post.**

Propeller post to be moulded 30 in., and generally sided 24 in. In the way of shaft tube, to be swelled out to 32 in., and tapering from the under side of the boss to 17 in. at top of keel, which will be tapered off to suit, finishing at 12 in. at rudder post. Propeller post tenoned into keel and skid log. Copper paint to be applied in mortises before fastening.

**Knee.**

The knee fastening keel to propeller post to be a natural crook, and both arms to be not less than 7 ft., and fitted the full seven feet along keel, the other arm to be fitted to suit height of shaft logs. Rabbett to be 3½ in. deep, and to conform to the table of rabbet measurements, which will be furnished. The keel, propeller post and knee to be fastened to each other with 1¼ in. galvanized screw bolts and drift bolts as approved.

CROSS SECTIONS OF STANDARD WOOD STEAMSHIPS.




and deadwood, as per detail drawing which will be furnished.

**Stem Band.**

An iron stem band to extend from the top of stem to beyond the keel scarph connecting the

**Deadwood Forward and Aft.**

The deadwood forward and aft to be generally [illegible]

**Rudder Post.**

Rudder post to be 24 in. x 24 in., and gradu-

**Skid Log**

**knees in Arch Between Propeller Post and Rudder Post.**

**Plates in Way of Well.**

**To be carried up the post a distance of approxi-**

**Frames.**

**of the top of thick ceiling, 13 in. in way of hold**

**Double frames to be efficiently fastened to one another with fir treenails. In way of the well**

**bulwark stanchion, and care must be taken to**

**ends of the top timbers to be left alone, say**

**be let over the frame for efficient caulking. The**

**servative, also futtock ends.**

**Swash Chocks.**

**The spaces from the lowest salt chocks up to be entirely filled with salt.**

**chain to be freely pulled back and forth. Frames to be spaced 3 in. centres, and to be securely held in place by a sufficient number of carefully disposed ribbands, to hold the frames in place during construction. Frames to be fastened to keel with two 1⅛ in. black drift bolts in each frame.**

**Cant Frames.**

**The heels of cant frames to be closely fitted to the deadwood, and to be securely fastened to**

**Framing at Stern**

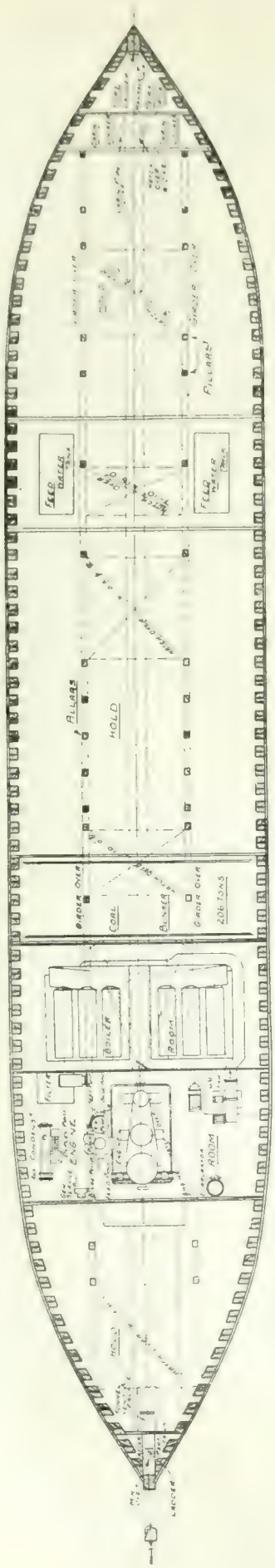
**Keelsons**

**A steel rider keelson is to be fitted on top of the wood keelsons, as shown in cross section. The steel keelson, centre and sister keelsons, frames and keel, have to be fastened with through screw bolts of 1¼ in. galvanized and black iron, as per drawing of fastenings which will be furnished. In addition, the wood keelsons are to be edge bolted with one 1¼ in. screw bolt in each space between frames, as per drawing which will be furnished. Plate washers will be fitted**

**rests on wood. Plate washers will be fitted both under heads and under nuts of edge bolts, as per drawing. The steel keelson will extend from the fore peak bulkhead to the after peak**

**supplied by owners and erected by contractors.**

**Shaft Logs**




STANDARD WOOD STEAMSHIPS BUILDING IN CANADA—SECTIONAL PLAN UNDER MAIN DECK.

**suit shafting, heights of which will be given later. The two sections of shaft logs to be bolted to one another with 1⅛ in. black screw bolts. At the forward end of shaft logs, two hardwood logs, 12 in. x 18 in., are to be fitted running from side to side of vessel, and to be let in over end of shaft log 8 in. To be securely fastened to hull and shaft logs with 1⅛ in. drift bolts. The bolting in the way of propeller post, shaft logs and hardwood cross timbers to be so disposed that in the final boring out of the tube, there will be no iron interfering. The size of tube will be furnished the contractors.**

**Ceiling**

Bottom ceiling to be 12 in. x 10 in., in long lengths, having a limber strake fitted adjacent to the sister keelsons, as shown on midship section. Ceiling to be neatly fitted on edges, so as to lay close, particularly at back. In the way of the deep water tank, the liber strake is to be solid. Ceiling to be edge and face bolted with 1⅛ in. black drift bolts. There are to be four bolts in every plank in every frame, to be driven from the outside and clinched. These bolts to be well headed over clinch rings to prevent drawing. The edge bolts to be 1⅛ in. black drift bolts, spaced about 4 ft. 6 in. centres, and to be long enough to go half way into the next plank but one below.

**Limber Chains**

In the way of the limber strake, chains are to be fitted in lengths which will be indicated on drawings, to be ½ in. chain, short link, galvanized.

**Thick Ceiling in Way of Bilge**

Ceiling in way of bilge to be 14 in. x 14 in., and to be similarly fastened as above.

**Ceiling Above Bilge Ceiling**

Ceiling directly above bilge ceiling to be 12 in. x 10 in., extending to above the hold beam stringers. To be similarly fitted and similarly bolted.

The remainder of ceiling to the under side of maindeck stringers to be 12 in. x 8 in., similarly fitted and fastened.

**Ceiling in 'Tween Decks**

To be 10 in. x 6 in., and to be similarly fitted and similarly fastened.

**Hold Beam Stringers and Clamps**

To be 16 in. x 14 in. and 14 in. x 14 in. To be fastened with 1⅛ in. galvanized screw bolts, four in each frame, through both stringer and clamps, and to be edge bolted with 1¼ in. galvanized screw bolts, through hold beams, four in each end of each beam, and the top and bottom chord to be through edge bolted to one another with 1¼ in. galvanized screw bolts, spaced about 2 ft centres.

**Maindeck Stringer and Clamps**

To be 14 in. x 14 in., similarly fastened to the hold beam clamps, with 1⅛ in. galvanized screw bolts.

**Waterways on Maindeck**

To be 14 in. x 14 in., the inboard waterway to be jogged to the beam as shown on drawings, and to be fastened with two 1⅛ in. galvanized screw bolts, in each frame, and to be through fastened with two 1⅛ in. galvanized screw bolts through frames and outside planking.

Maindeck waterways, stringers and clamps to be edge bolted with one 1¼ in. drift bolt, through waterway, beam, clamps and into ceiling below, and one 1¼ in. screw bolt through waterway, beam and upper and lower chords of clamps, and the inner waterway and inner clamp to be edge bolted with two 1¼ in. bolts.

**Upper Deck Stringer and Clamps**

Upper deck stringer and clamps to be 12 in. x 12 in. To be similarly fastened to maindeck clamps and stringers with 1⅛ in. galvanized screw bolts. To the edge bolted through deck beams and upper and lower clamps with one 1¼ in. drift bolt in each beam at each end, extending into ceiling below, and to have one 1¼ in. galvanized screw bolt in each end of each beam through beam and inner member of clamps.

**Air Spaces**

A 3 in. air course to be fitted for one-fifth of the entire length of the vessel each end, between keelson and hold beam clamps, as shown on midship section. A 3 in. air course the full length of the vessel to be fitted under hold beam clamps as shown on midship section. Between maindeck beams and upper deck beams, chocks 5 in. deep are to be fitted as shown on midship section, leaving air spaces as indicated.

**Outside Planking**

First garboard to be 18 in. x 10 in., with 5 ft. scraphs. Second garboard to be 16 in. x 9 in., and third garboard to be 14 in. x 8 in. Bottom planking to be 12 in. x 6 in., bilge planking to be 10 in x 6 in., side planking to be 8 in. x 6in. up to the guard. Top side planking to be 8 in. x 5 in. Garboard strakes to be fastened with four ⅞ in. galvanized bolts, spaced about 3 in. centres. Bolts to be 32 in. and 20 in. long. The bottom and bilge planking to be fastened with three treenails and a galvanized spike in each frame, and galvanized butt bolts.

The 8 in. x 6 in. and 8 in. x 5 in. planking to be fastened double and single.

Treenails to be driven through and wedged with 1½ in. oak wedges. All short treenails up to 12 in. in length to have a wedge inserted in point before driving. All holes striking iron less than 8 in. in frame to be plugged and another hole bored. All holes above waterline to be plugged. All holes below waterline to be plugged and cemented.

**Guard**

Guard to be 16 in. x 9 in., fitted as shown on midship section, and to be securely fastened to frames with ⅞ in. drift bolts. A hardwood rubbing strake 3 in. x 6 in. to be fitted on face of guard, and securely spiked. Heads of spikes to be driven in and holes plugged.

**Covering Board at Upper Deck**

Covering board to be 5 in. x 18 in., grooved on under side to receive the projecting heads of frames. Covering board to be securely fastened to chocks, frames and outside planking. Covering board to be rounded on outer edge as shown on midship section.

**Rail in Way of Bulwarks**

Rail in way of bulwarks to be 6 in. x 20 in. To be grooved on the under side to receive the heads of stanchions. To be rounded both on the inner and outer edges as shown on midship section. A 3 in. x 9 in. fore and aft plate to be fitted under the rail, and to be well fastened to stanchions and rail with spikes.

**Beams**

Hold beams to be 14 in. x 14 in., spaced as shown on inboard profile. To be secured to clamps and stringers with screw bolts as already described.

**Main Deck Beams**

To be 14 in. x 14 in., at amidships, running to 10 in. x 14 in. at ends, 5 in. worked and 4 in. sprung, spacing 36 in. Detail of beam ends will be furnished. Beams to have a camber of 9 in. amidships. Beams in way of hatches to be 14 in. x 15 in. from forward to the after end of engine room casing. Aft of the engine room casing, main deck beams will be 12 in. x 14 in., and hatch beams 14 in. x 14 in.

Upper deck beams to be 12 in.x 12 in., 36 in. centres, and beams in way of hatches to be the same width as the corresponding hatch beams below, by 12 in. deep.

**Main Deck Hatch Coamings**

Main deck hatch coamings to be 12 in. x 14 in. and to be notched into beams in way of hatches a distance of 2¾ in., as indicated on midship section and details.

Carlins in way of hatches to be notched into coamings 2¾ in. as indicated on drawings.

Four 2 in. rods with plate washers and turnbuckles to be fitted in hatchway at each side, as indicated on drawings.

**Upper Deck Hatch Coamings**

Upper deck hatch coamings to be 12 in. x 12 in., notched into deck beams in a similar manner to main deck. Carlins in way of upper deck hatches to be notched into coaming in similar manner to main deck beams. Upper deck beams and carlins to continue to outside of frame as shown on midship section, the heads of frames being notched out for this purpose.

**Lodging Knees**

Carlins to be secured to hatch coamings by lodging knees 8 in. deep, fitted as shown on drawings. To be thoroughly bolted to both carlins and hatch coamings with 1⅛ in. drift bolts, clinched.

**Continuous Stringer Under Main Deck Beams**

A continuous fore and aft stringer to run under deck beams below hatch coamings. To be 12 in. x 14 in.; to be scarphed with 5 ft. scarphs. Scarphs to be fastened with 1 in. black screw bolts and stringer to be securely bolted to beams with 1⅛ in. drift bolts, two bolts in every beam.

**Side Keelsons**

Two side keelsons 12 in. x 16 in. to be fitted to ceiling directly under the continuous stringer and to be continuous. To be scarphed, and secured with 1 in. screw bolts.

**Continuous Stringer Under Upper Deck**

Continuous stringer under upper deck to be 10 in. x 12 in., and scarphed and fastened to deck beams in similar manner as main deck stringer.

**Pillars**

Quarter pillars 12 in. x 12 in. to be fitted between the slide keelson and the continuous stringer under main deck beams. Pillars to be as shown on inboard profile. The heels and heads of pillars to have hardwood bearing strips fitted. Hardwood to be 5 in. thick at heel and 3 in. thick at head. Pillars to be secured to side keelson at heel with plate straps ½ in. x 12 in., 3 ft. 6 in. long, securely bolted to one another and to pillars. Heads of pillars to be fastened with an 8 in. knee each side of pillar. Knee to be securely fastened to pillars and to stringer with 1⅛ in. black drift bolts.

**Upper Deck Pillars**

To be 4 in. x 5 in., extending from top of continuous coaming in main deck to underside of stringer on upper deck. Pillars to be fastened as shown on inboard profile.

**Continuous Coaming on Main Deck**

To be constructed of three courses of 12 in. x 12 in., in way of hatches, and two courses between hatches as indicated on midship section. Lower member to rest on top of beams and hatch coamings, and all to be securely bolted to beams and to one another with 1⅛ in. black drift bolts. Top member of coaming in way of hatches to be notched out for hatch cover, as indicated on midship section.

**Cross Coamings on Main Deck**

Cross coamings in way of hatches to be laid on top of desk, and to be 12 in. thick at bottom; the upper courses are narrowed to form landing for fore and after. See detail.

**Upper Deck Hatch Coamings**

To be similarly constructed to main deck coamings and similarly fastened. To be in two courses of 10 in. x 12 in. Upper courses to be notched for hatch covers in a similar manner to main deck hatches. These coamings only run two beam spaces beyond the hatch opening. Cross coamings to be similarly fitted on top of deck to those on main deck.

**Hatchways**

All hatchways to be lined with ⅛ in. steel plate with a 2 in. half-round chafing iron at bottom. The 2 in. half-round chafing iron in a fore and aft direction will not register with the one running athwartships, as the continuous stringer under the deck beams running fore and aft make the whole coaming at side deeper than at ends. In order to keep a line from fouling, the half-rounds on the fore and afters are carried beyond the ends of hatches at both ends, for a distance of 2 ft., as will be indicated on drawings.

**Hatch Shifting Beams**

Shifting beams 18 in. x 14 in. to be fitted in hatchway as shown on drawings. A ½ in. x 7 in. stirrup plate is to be fitted at ends of shifting bases and the ends of shifting beam will rest in angle sockets. There will be bearing plates ½ in. thick fitted on top of shifting beam to receive the fore and afters.

**Hatch Fore and Afters**

Hatch fore and afters to be one 18 in. x 16 in. notched out at top for covers, and two 14 in. x 14 in., tapered to suit the rake of covers. These fore and afters will have ½ in. x 7 stirrup plates fitted on the ends, and they will rest on bearing plates fitted on the cross coaming. The ends of the fore and afters will rest in single sockets. See detail.

**Wood Hatch Covers**

To be 3 in. thick and constructed out of two pieces 5½ in. x 13 in., through bolted to one another with three ⅝ in. bars clinched in the usual manner. These bars are to be driven as indicated in detail, so that the bars may form the means of breaking away the hatches as well as the means of lifting the covers off.

**Hatch Cleats and Battens**

Hatches to be fitted with cleats spaced 2 ft. centres, and to be fitted with bottoms at least ⅞ in. thick, and the usual wedges, as shown in detail.

**Deep Tank Hatches**

Deep tank hatches are to fitted with one course of 12 in. x 12 in., and 8 in. x 5 in. channel bars on top of the 12 in. x 12., with ⅝ in. steel watertight covers as will be shown in detailed drawings.

**Bulkheads**

There will be four ordinary watertight bulkheads, one forward of bunker, one at the after end of engine room, one at the after end of bunker and at the collision bulkhead. These are to be constructed of two thicknesses of 3 in. lumber, laid diagonally and fitted between the two diagonal courses with canvas, painted with marine glue, to approval. The boundary timbers will be 7 in. x 7 in., fitted on both sides of the bulkhead and the vertical stiffeners will be of timber 3 in. x 5 in. spaced 18 in. centres. These bulkheads are to be made watertight, and the details of construction will be furnished. There will be a bulkhead at the after end of bunker which will be similarly constructed, but having no canvas between the courses. This bulkhead will be fitted with the necessary openings for access to coal. The vertical stiffeners instead of being spaced 18 in. apart will be 30 in. apart. In addition to the above, there will be constructed two special bulkheads fitted as a deep tank. These will be constructed of two thicknesses of 4 in. lumber, laid diagonally with canvas between, arranged to approval. The boundaries will be 7 in. x 7 in. fitted on both sides of the bulkhead, and the wood stiffeners will be [illegible] in. spaced 18 in. centres. These bulkheads will be furnished. In the deep tank, a fore and aft centre line bulkhead will be constructed of 8 in. lumber, fitted with lightening holes. The construction of these bulkheads will be detailed. Fore and aft bulkhead will be fastened with drift bolts, and the other bulkheads will be fastened with spikes, to approval. Screen bulkheads to be fitted as and where directed.

**Decking**

Main deck planking will be 5 in. x 5 in., finishing [illegible] edge grain fir. The upper deck will be 4 in. x 4 in. [illegible] straight edge grain fir. The main deck to be fastened with 7/16 in. x 8 in. galvanized spikes, two in each strake in each beam. The upper deck to be fastened with ⅜ in. x 7 in. spikes, two in each strake in each beam. These spikes to be reeled and plugged, with plugs set in [illegible] and 40 ft., averaging 30 ft., and should be cut as soon as possible for air drying before being laid. The edges of decking to be bevelled for caulking, care being taken that the bevels leave the vertical grain up. Decks to be payed with marine glue.

**Pointers**

Two sets of pointers forward, and two sets aft to be located in suitable positions to give strength. To be 12 in. x 18 in. in order to mould to a suitable size. To be connected at heels with a natural crook. Pointers to be fastened with 1⅛ in. drift bolts. Six bolts to be in every frame, clinched, and all bolts to be driven before outside planking is put on. Pointers should span four frames.

**Breast Hooks**

To be natural knees fitted forward 12 in. thick, to approval. Arms to be long enough to provide efficient fastening through frame. Throats of hooks to be well fastened into stem with 1½ in. bolts and face of arms to have ten 1¼ in. bolts, and bolts to be clinched.

**Knees**

Knees will be fitted at head of hold pillars. [illegible] other arm 3 ft. long. Similar sizes knees will be fitted as lodging knees in the way of all openings, and similar knees both hanging and lodging, will be fitted in way of continuous stringer under deck. Hanging knees will be fitted under the fo'c'sle deck beams at ends. These knees to be 10 in. knees, length of one arm 3 ft. and the other arm 4 ft. The knees will be fastened with 1⅛ in. drift bolts, clinched. Hold beam lodging knees to be fitted as directed, length of one arm 3 ft. and the other arm 4 ft. Knees to be 6 in. at ends, and 18 in. at throat. Knees to be 12 in.

**Knightheads**

Knightheads to be fitted in way of stem and stern for a distance of approximately 6 ft. 6 in., as indicated on drawing.

**Horn Timbers**

Horn timbers to extend from deadwood to after end of vessel. To be two in number 12 in. x 12 in. To be securely fastened to skid log, rudder post and frames, all to approval. Filling-in pieces to be fitted between horn timbers and skid log. Fastening to be 1⅛ in. drift bolts.

**Construction in Way of Engine and Boiler Room**

Spaces between floors in way of engine and part of boiler room will be filled in solid from long floor to long floor timber and the lower edge of these filling pieces should be bevelled off to allow water to run to limbers, and in addition thereto, fore and aft timber will be fitted to the height of the top of steel rider keelson, extending from after bunker bulkhead to bulkhead at after end of engine room. The fastening of this timber is to be governed in large measure by the holding down bolts necessary for the engine bed, so as to clear holding down bolts. Fastening to be 1⅛ in. black drift bolts. Floor in engine room to be sheathed with 5 lb. lead and boiler floor with bricks.

The fore and aft timbers in the engine and boiler room are aranged to form engine and thrust seating, details of which will be furnished.

**Decking Over Shaft Tunnel**

[illegible]

**Deck Beams Over Tunnel**

To be 6 in. x 6 in., spaced 3 ft., supported with 6 in. x 6 in. pillars, one pillar on every beam and four rows of pillars to be fitted if possible.

Seatings for tunnel bearings to be fitted in tunnel as directed.

**Bulkhead at Forward End of Poop**

[illegible] indicated on drawing. There will be an opening [illegible]

**Bulkhead in After End of Fo'c'sle**

This bulkhead to be built of solid 5 in. lumber. There will be openings in this bulkhead for access to the fo'c'sle. Details of these will [illegible]

**Casing Around Engine and Boiler**

[illegible] 'tween decks will be built of solid 4 in. lumber. [illegible]

**Chain Locker**

A chain locker to be fitted as shown on drawings aft of the collision bulkhead. To be of such size as will safely stow the chain. Eye plates for securing the ends of cable to be fitted in chain locker.

**Small Hatches**

Small hatches to be fitted to give access to the fore peak bulkhead, chain locker and after peak bulkhead.

Ladders

Watertight Door

Ferrous Parts

Construction of Fo'c'sle Head

Ventilators

ventilation, an air space will be left in the way of the bunkers in the strake of ceiling one below the bottom of this air space. The floors in the way of bunker will be leveled to the top of the wood side keelsons under heels of pillars, and covered with sheet iron.

**Hawse Pipes**

Hawse pipes to be fitted for stockless anchors as per drawing which will be furnished. To have chafing ring on deck and cover plate.

**Chain Stopper**

A chain stopper will be fitted in a suitable location for the cable.

**Devil's Claw**

A devil's claw will be fitted for the anchor cable. Detail will be furnished.

**Rudder**

A steel rudder to be fitted with steel lock

SHIPYARD PLANT OF THE FOUNDATION CO AT VICTORIA, B.C.

**Caulking**

All outside planking to be caulked with best hand-picked oakum. Caulking to be in the proportion of one strand of oakum to each inch thickness of plank. Caulking must be well horsed and carefully done. Outside plank seams up to 10 ft. waterline to be cemented. Balance of outside seams to be puttied. Decks to be caulked with the best hand-picked oakum, in the proportion of one strand of oakum to each inch thickness of plan. To be well horsed, seams to be payed with marine glue to approval. Ceiling in way of deep ballast tank to be caulked so as to be watertight. All watertight bulkheads to be caulked where necessary, to ensure watertightness. The whole of the caulking throughout the entire vessel must be first-class in every respect, and each strand must be well hardened up before the next strand is laid.

**Fastenings**

Vessel to be efficiently fastened in every respect, and the fastening to conform generally to the sizes stated in the various items hereinbefore mentioned.

as indicated on drawings, and in way of deep tank, swan-neck ventilators to be fitted as indicated on drawings.

**Hawser Pipes, Fair-leads and Bollards**

Hawser pipes, fair-leads and bollards to be fitted as indicated on drawings, and to be securely fastened.

**Ports**

Port lights to be fitted in fo'c'sle as directed. These lights to have 10 in. clear glass.

**Accommodation Ladder**

Accommodation ladder with all fittings, tackle and gear necessary for shipping ladder on either side of vessel. Ladder to be made of wood. All fittings to be galvanized. Suitable platforms with necessary fittings to be provided for landings. Ladder can be made in two sections if required.

**Beds For Windlass, Winches and Steering Engine**

Beds for windlass, winches and steering engine to be laid as directed, and to approval. Any extra stiffening required in way of these to be fitted as directed.

having steel gudgeons and pintles. Gudgeons to be lined with lignum-vitae, all as per drawing which will be furnished.

**Machinery Spaces**

Machinery spaces are to be lined with ⅛ in. wrought iron, properly secured, in the way of all parts of woodwork exposed to risk of fire. In general terms, the stokehold will require to be completely sheathed and such parts of the engine room as will be indicated by the Board's Inspector.

**Scuppers**

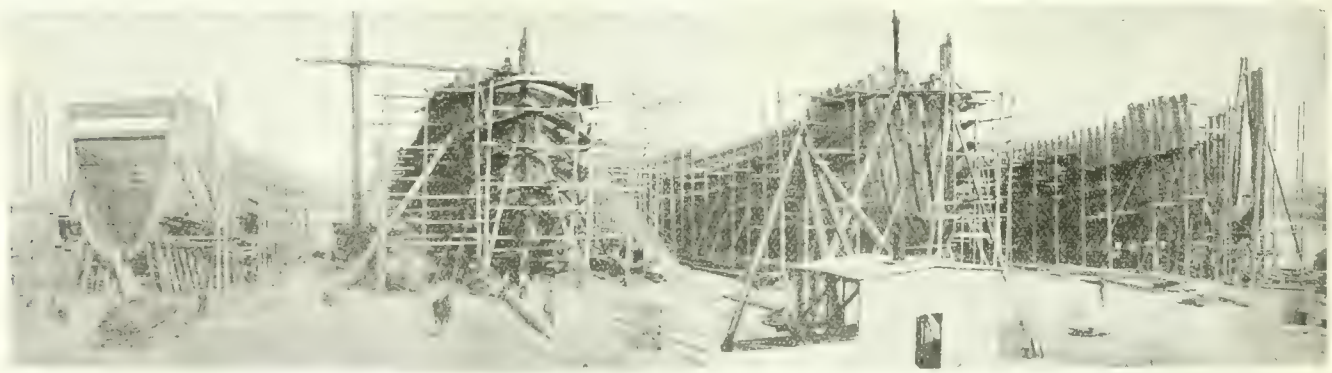
Scuppers to be led through waterway as indicated on drawings. Of lead pipe 4 in. in diameter. To be flanged both outside and inside and securely fastened with galvanized clout nails.

**Accommodation For Crew**

Accommodation for crew to be fitted in fo'c'sle as indicated on drawings. To be plainly but substantially built, and to have suitable lockers fitted. Berths to be open iron berths of suitable pattern.

**Chain Pipes**

Chain pipes to be led through fo'c'sle in proper



[illegible] CONSTRUCTION AT THE YARD OF THE FOUNDATION CO., VICTORIA B.C.

**Masts**

Two pole masts or derrick posts as arranged to be fitted of a suitable diameter, to carry sets of derricks capable of handling five tons. If masts are fitted, all mast irons, irons for derrick heels, rigging, rigging screws, chain plates, forestays and backstays to be fitted to approval, and as indicated on drawings. Masts to be

All mast irons and other blacksmith work will

contractor.

in solid 5 ft. each side of the mast, and pieces being let into the adjacent beams. These filling-

**Beds For Auxiliary Machinery, Etc.**

To be installed and fitted as and where directed.

**Bunker Spaces**

Bunker spaces to be lined with 1¼ in. ceiling [illegible] This ceiling to be covered with ⅛ in. black iron sheets, to protect same. All spaces intenuded for use as bunkers to be so fitted with air spaces and sheeting. Ventilation of bunkers to be very closely considered and carried out to approval. Sides of bunker below hold beam clamps will have air space shown on midship section immediately below the clamp as a means of ventilation. The 3 in. air space will not be worked around the hold beam clamps, but will cease directly under the clamp. Air space above the clamp will

location to suit windlass. To be of sufficient diameter to allow chain to stow freely. Drawings of this will be furnished.

**Plumbing the Fo'c'sle**

Plumbing in fo'c'sle will be plain but substantial, and great care must be taken with this particular work.

**Coaming on Top of Covering Board Around Upper Deck**

A coaming 4 in. x 6 in. to be fitted on top of covering board as shown on midship section, to receive stanchions.

**Joiner Work**

Accommodation for officers, and officers' dining room and pantry, to be erected as shown on plan. Officers' and engineer' rooms to be fitted in good cargo boat style. Rooms to be fitted

with spring berths, hardwood front, upholstered settee, desk, drawers and folding lavatory. Floor laid with linoleum and carpet runner

Dining saloon to be panelled in hardwood and fitted with tables, swivel chairs, sideboards, etc., as usual in vessels of this class. Pantry to be fitted up with hot press and all necessary shelving. Details of the construction of this house will be furnished.

In the way of engine room casing, galley, crew's messroom, storerooms, ice house, officers' bath and W.C., engineers' bath and W.C., petty officers' bath and W.C., wireless room, room for cook and boy, and room for petty officers, will be fitted. Galley will be lined with galvanized iron, fitted on [illegible], leaving an air space all round. Galley to be fitted with stove shelving and all necessary fittings. Galley funnel to be fitted as directed.

**Crew's Messroom**

Crew's messroom to be fitted in plain manner, with [illegible] and all necessary shelving.

**Storerooms**

Storeroom to be fitted aft on main deck. To be [illegible]. Storeroom on upper deck to be fitted with drawers and [illegible].

**Ice Box**

Ice box to be fitted and properly insulated. Shelves to be constructed with galvanized iron, and all [illegible].

**Baths and W. C.**

To be provided for officers and engineers, with water supply, etc., to approval. Plumbing must be efficiently and carefully done.

**Wireless Room**

Wireless room to be fitted with berth, drawers, etc., similar to officers' rooms.

**Petty Officers' Rooms**

To be fitted with [illegible], etc., plainly but substantially built. Rooms for gun crew to be fitted aft on main deck as indicated on drawings. To be fitted with [illegible] drawers, settees and folding lavatories as directed.

**Port Lights**

Port lights [illegible] to be brass throughout, showing 14 in. clear glass, and lights in the way of engine room casing to be of iron body with brass frame, showing 12 in. clear glass.

**Engine Room Casing in Way of Rooms**

To be built as indicated on drawings, detail of which will be furnished. Bulkheads between rooms will be double tongue and groove, laid diagonally, as will be shown in detail.

Back beams and carlins over accommodation will be [illegible] in. x 3 in., spaced not over 21 in. centres, and arranged so that deck beam, outside stud, stud in engine casing, and coaming will all register in way of bulkheads, so that bulkhead can be securely fastened and set as a brace.

**Stanchions**

4 in. turned stanchions to be fitted around poop and fo'c'sle decks, spaced generally 4 ft. centres. Short stanchions running to rail to have hole bored through centre to allow a 5/8 in. rod to pass through. Long stanchions running to the deck will have through rods fitted where directed alongside stanchions. Short stanchion rods are bolted through rail, coiling and covering board. Long stanchions rods bolted through plates, rail, ceiling and covering board. Plate at head of stanchions to be 4 in. x 6 in. The ends of carlins and deck beams to be dovetailed into place as will be shown on details.

**Rail**

A suitable rail to be fitted having fore and aft runners between rail and deck as shown in drawings.

**Decking Over Accommodation**

To be 1½ in. T. & G. 3¼ in. face, planed smooth- V-jointed on the under side, and to be covered with felting and canvas. Canvas to be No. 2, having drilling bedded in white lead under the joints of canvas. Joints of adjacent strips of canvas to be closely butted over drilling and to be nailed with double pointed galvanized tacks, spaced about ¾ in. apart. Canvas to be thoroughly stretched before being nailed. This work must be carefully done in order to ensure a tight deck.

Immediately canvas is laid, it should receive a coat of paint, and should receive in all four coats of paint. Covering board for canvas to be [illegible] in. [illegible] and [illegible] Waterway in way of covering board to be laid in [illegible].

**Skylights**

Skylights for engine room to be built of teakwood [illegible] with approved opening gear.

**Ventilators**

Ventilators [illegible] ventilators, [illegible] and [illegible].

**Bunker Rings**

Bunker rings to be fitted [illegible], as shown on drawing, and to detail.

**Coal Chutes**

Coal chutes to be fitted in engine room casing as directed, with suitable doors for coaling 'tween decks. Detail will be supplied. The [illegible] boiler casing fitted [illegible] on drawings.

**Fidley Top**

To be constructed as directed. To be fitted with angles and gratings, according to drawings which will be furnished.

**Stokehold Ventilators**

Stokehold ventilators of ample diameter to be fitted as directed and to have approved turning [illegible].

**Engine Room Ventilators**

Ventilators [illegible] to be fitted [illegible] as directed [illegible].

**Bridge, Pilot House and Captain's Room**

A [illegible] modation, with pilot house, captain's room and sitting room, and chart room erected thereon. The whole of this work to be built to detail, which will be furnished.

**Rail Around Bridge**

A [illegible]

In the erection of the pilot house and officers' rooms below, care must be taken that no iron fastening of any kind is used, within a radius of 12 ft. of the compass.

**Davits**

Davits to be fitted suitable for the boats they have to carry. Steps, cranes and all gear necessary for the correct fitting of the davits to the [illegible] blocks and life lines required by the Board of Steamship Inspection and the Board of Trade. There will be [illegible] boats, one on each side of the vessel, and one set of davits on one side for an approved working boat. Davits will be furnished by the Board.

**Boats**

Two Class A life boats to the British Board of Trade requirements to be fitted, one on each side of the vessel, of dimensions required by regulations. Each boat to be capable of taking the whole of the crew of the vessel. A service [illegible] vessel, and built to satisfy Class X requirements of the Board of Trade. Boats to be supported in davits to the requirements of the Classification Society, fitted with all necessary gear and rigging for handling same. Boats to be furnished by the Board.

**Boat Chocks**

Suitable [illegible] as directed and to detail.

**Anchors and Cable**

Vessel to be fitted with anchors and cables to the requirements of the Classification rules. Anchors to be of the stockless self-tripping class, of approved manufacture, and of weight required by rules. Cable to be of stud link type, to classification requirements, and to stow in [illegible] peak, which locker is to be fitted with drain to bilges. All to be furnished by the Board.

**Steering Engine**

Steering engine of approved make to be arranged directly over the rudder, with all necessary pulleys, chains, quadrants, etc., as required, to give the desired leads, and to be fittted with suitable hand gear. Control rods to be laid from the steering engine to the steering wheel on bridge, all as per drawings which will be furnished.

A house to be built over the steering engine, [illegible] seating on deck. Details of this house construction will be furnished.

**Ladders, Etc.**

All deck ladders to be built of hardwood, fitted with cast iron treads, and toeplates, and secured by galvanized iron fastenings. Ladder rails to be galvanized iron pipe. Ladders to be fitted as and where directed, in accordance with general arrangement plan. Accommodation ladder, wooden hold ladders and Jacob's ladder, etc., to be supplied as hereinbefore mentioned.

**Deck Storerooms**

To be fitted with all necessary shelves, hooks, and cleats for tackle, etc.

**Lamp Room**

[illegible]

**Side Light Screens**

[illegible]

**Carving**

Vessel's name, and Port of Registry to be carved on the stern, and vessel's name to be carved on the bow. Same to be also painted on boats, life buoys, bells, etc. The [illegible] carving [illegible].

**Ship's Bell**

A [illegible] where directed.

**Binnacles**

[illegible]

**Aerials**

Aerials for wireless and lead to wireless room [illegible].

**Heating**

[illegible] fitted in accommodations with approved radiators [illegible].

**Electric Light**

A [illegible] capacity driven by a turbine to be installed, with all fittings complete. To be laid out in suitable circuits. To have switchboard with double pole switches, ammeter, voltmeter and short circuit indicator. Sockets to conform to British standard thread and to be of the bayonet [illegible].

**Pumping**

A [illegible]

**Scuppers**

[illegible] accommodation and boat decks, all to approval.

**Compasses**

Stands for compass and steering wheel in pilot house, to be fitted as and where directed. Standard compass to be installed as and where directed.

**Fire Service**

A fire service to be fitted as arranged, and all fittings necessary for steam heating, pumping arrangements and fire service, to be installed as and where directed. A wash desk service to be fitted to the fire service as directed.

**Tanks**

Two fresh water tanks to be installed on boat deck as directed, of about four hundred gallons capacity each, with suction to the galley only. Additional fresh water tanks to be fitted in the wings of tunnel, having all necessary seating, etc., fitted as and where directed. These tanks to connect to pumps for boiler feed. Deck fittings for filling pipes, etc., to be fitted as and where directed.

**Painting**

Outside planking below load waterline to be painted two coats of copper paint. All above load waterline to have three coats of lead, and finished navy gray. All interior work to have three coats of lead paint. Interior accommodation to be finished with colors approved by the Board, varnished or polished as found necessary. All deck work, fittings, etc., to be finished navy gray. Inside of decks, clamps, etc., to be oiled and all projecting ends of fastenings and visible iron work, including steel keelson, to be painted red oxide paint.

**General**

It is to be understood that while in this specification, reference is made to winches, windlasses, hawser pipes, fair-leads, bollards, hawse pipes, steam heating, pumping and fire service, etc., the contractor will only do the necessary work to allow of their being installed, such as making beds, boring holes for holding down bolts, etc. The workmanship must be first-class of its kind, and all work must receive the approval of the Board's representative. All lumber exposed both inside and outside to be dressed, except the sides of the sister keelsons.

This specification does not include any equipment, ship or engine supplies, deck or engine fittings, but it is to be understood that storerooms are to be fitted for supplies on deck and in engine room, as directed, and that all fittings supplied by the Board will be installed as directed.

## RECLAIMING SCRAP METAL

A NEW method for the reclamation of [illegible] Thomas, Mich. By this method all scrap including broken and obsolete parts of locomotive and car equipment, nuts, bolts and old chains, are forged into commercial steel again. The scrap is piled on wooden boards, 14 inches square, in piles of from 300 to 350 pounds. It is then charged into a crude oil furnace, where it is brought to a welding heat, after which it is taken from the furnace with a crane and grab tongs and placed under a 7,000-pound steam hammer and forged into slabs 15x2½ inches and 3 feet long.

The saving created by the introduction of this method is considerable, and [illegible] times, when metal is difficult to obtain at any price.

The work is under the direction of Paul H. Cain, the foreman of the forge shop, who came to St. Thomas from the Beech Grove shops of the Big Four Rail-

## PURPOSE AND METHODS OF INSPECTION*

IN considering why inspection is necessary a consideration of the various classes of men employed in production will be helpful. Apart from laborers, there are in average engineering works a majority of workers, male and female, who, although graded as mechanics, are practically repetition workers. It is not necessary for them to have the training and knowledge of the higher grade engineer, and the more progress is made with the introduction of automatic machines and a general system of repetition work the more will it be possible to use less highly skilled labor. Again, the engineer puts forward a design and the drawing office works it out in detail. The drawings should be reproduced as shop drawings, showing the various processes for each part, and clearly laying down the limits which are to be worked to and the material from which the parts are to be made.

The producer—i.e., the mechanic, cannot be expected to have the knowledge required to determine whether the material is in accordance with the specification, and if the material be slightly above or below the limits of the specification it is impossible for him to determine whether it is safe to employ it. The designer, however, may justly be entitled to expect that a finished article is in accordance with his wishes, else he can hardly be held responsible for its correct functioning. Some department must, therefore, exist to take this responsibility, and an inspection branch is essential for the purpose.

### The Production Aspect

From the machine shop point of view the workman desires output because it gives him more money; the foreman desires it because therein lies his chance of promotion; the production manager may thus be said to be the enemy of the designer. The directors and shareholders of a company must, therefore, protect themselves from bad workmanship; the reputation of the firm must be upheld, and the finished article must be as good as possible, having due regard to prime cost. Inspection alone will ensure this.

Again, inspection of a finished part is essential before assembly of all the parts into the whole. A well-organized shop with a proper system of inspection results in a saving of time and money in erection. In many cases where the viewing of the output of the machine shop is slack, or is lacking, erection becomes practically hand-fitting, interchangeability is entirely lost, and spare parts are impossible to fit. An organization is, therefore, required on the lines of a small [illegible] to deal with all goods in the receiving or inward store (nothing being allowed to go forward to the machine shop unless it bears the stamp of that inspection branch), and a complete [illegible] in the machine shop and in a view room between the machine shop and what may be called the erection or main store.

### Interests of the Purchaser

The average purchaser is content to take a firm's guarantee that the goods supplied are in accordance with the order. He usually protects himself by seeing that the goods are externally correct, and that they function reasonably in accordance with his requirements. Government departments go a good deal further. They are responsible for public funds and have to ensure that value is obtained for the money expended. In many cases the requirements may be of a special naval or military nature of which the contractor has little or no knowledge. Inspection from this point of view may be divided into two main classes—final inspection and detailed process inspection. The former is possible in many cases—for example, in the purchase of a lathe. Detail inspection is essential where the nature of the material is of vital importance in the functioning of the whole, as when the factor of safety is low.

Detailed inspection during manufacture should not be necessary when a firm has a good view room of its own. In this case material must be inspected on or before entering the works. Steel should be inspected where it is made, at the steel works or the rolling mills. Any faulty material is then at once thrown out, and the steelmaker has the opportunity of tracing the trouble to its source. Freight to and from the steelmakers' and contractors' works is saved; in fact, a double journey is obviated, as faulty material will probably be returned to the maker by the contractor.

The next place where the inspection department picks up the thread is where the parts have left the machine shop. Here the amount of inspection necessary depends entirely upon the firm. In the case of a good maker who is erecting, say, 80 per cent. of his products into finished machines and sending away the remainder as spares, it would probably be necessary for the Government inspector to inspect only the spares, the machines themselves being inspected after erection. A running test, if one is required, is carried out under the supervision of an inspector, and at its conclusion a careful examination is made to see that no parts are unduly worn or fail in their action.

### Women Inspectors

Women are quick to learn elementary details; thus they can be taught to use micrometers intelligently, and easily manage the "go" and "not go" gauge. But with such a training they cannot be given discretionary powers to any extent. The most economical way to employ them is to place an inspector with discretionary powers over a gang; all doubtful cases are submitted to him and he carefully scrutinizes the rejections to ascertain that they are necessary. Where the amount of work is large and numbers of girls are employed, the rejections should be gone over by a specially appointed inspector, as many of the parts rejected by women viewers can be made use of for production purposes, either by alteration or by selective assembly.

Of women employed on routine work inspection some show greater aptitude and intelligence than others, and these certainly make excellent inspectors. With one or two exceptions, however, they do not, as experience shows, approach the man who has done his five years in the shops and been through a technical college training. It can hardly be expected that this should be otherwise; yet it would not be surprising if at no distant date women were found competing in engineering.

### Rejections

It is very necessary to arrange a proper system for dealing with rejections. When Government inspection is in force the following procedure should be adopted:—The junior Government inspector rejects. This is confirmed by a senior member of the staff, who then labels the part to show the cause of rejection, and who should also express an opinion as to whether the part can be returned to the shop for rectification. The part should then be passed back to the firm's viewers, who if they are in agreement with the Government inspector will take action accordingly; if they are not in agreement the part should be put on a "pending table" and a higher authority called in for consultation. In a large inspecting organization this is arranged for by the appointment of district and travelling officers. The main object of instituting such a procedure is that the reason for rejections may be known at the earliest possible moment to the producer, so that the cause may be removed.

## DEFECTIVE COAL CAUSES INCREASED LOSS

IN discussing the general need of fuel conservation in the boiler rooms, Van. H. Manning, Director of the Bureau of Mines, Department of the Interior, recently issued the following statement:—

There is one phase of the present coal situation which may put an entirely different light on the supposed increased production of coal of the present year. In round numbers, there was produced 600,000,000 tons of fuel last year. Statement has been made that 50,000,000 more tons will be mined this year. The preparation of this increased quantity of coal has not been as good as in times past. Analyses of samples show in many cases a greatly increased quantity of ash. Repeated cases are brought to the attention of the Bureau of Mines where coal which would run from 6 to 8 per cent. ash in normal times is running from 12 to 18 per cent. of ash in these abnormal times.

Complaint about the preparation of coal is very general and it is not at all improbable that 5 per cent. more ash is included in this year's coal than in previous years. If such a figure is true, it means that 32,500,000 tons of the estimated output of 650,000,000 tons is nothing but increased ash. If we can imagine

over 600,000 car loads of ash being added to the present burden of transportation, the evident effect on car supply and transportation troubles would be seen.

If this were the end of the matter, it would not be so bad, but there is another factor well known to engineers which is apt to be overlooked by the non-technical user. The extensive experiments carried on by the Government at the St. Louis Exposition showed that with the coals used there was a decrease of about 1½ per cent. in efficiency for each 1 per cent. addition to the ash content of the coal—that is to say, the inclusion of more ash with the coal decreases the value of the fuel not only the amount equal to the useless ash, but it makes the remaining good coal less effective to the extent of 1½ per cent. for each 1 per cent. of ash. The inclusion of 5 per cent. more ash in the fuel, therefore, means a reduction in efficiency of the remaining good coal of about 7½ per cent., which, added to the 5 per cent. useless ash, makes a total reduction in effectiveness of 12½ per cent.

According to this point of view, although 650,000,000 tons may be produced in 1917, its effectiveness as compared with previous years is probably about ⅞ of this, and equivalent to a production or normally prepared coal of about 570,000,000 tons. We have then, instead of an increased production as compared with last year, an actual decrease of effective coal of about 30,000,000 tons. If this is added to the estimated increased needs, due to our accelerated activities, of 100,000,000 tons, we have a deficiency of the equivalent of 130,000,000 tons, instead of 50,000,000 tons to make up by good engineering and true fuel conservation in the boiler room.

## HOW TO EXTRACT ANY ROOT OF ANY NUMBER

By N. G. Near.

VARIOUS ways have been published showing how to extract the fifth root, cube root, fourth root, etc., but here is a graphical method for extracting any root.

Lay off a logarithmic line AC, as long as you wish—up into the billions if desired.

Then lay a scale alongside, like BC, so that the zero of the scale coincides with the "one" of the logarithmic scale. BC may be placed at any convenient angle with AB. The instrument is now ready.

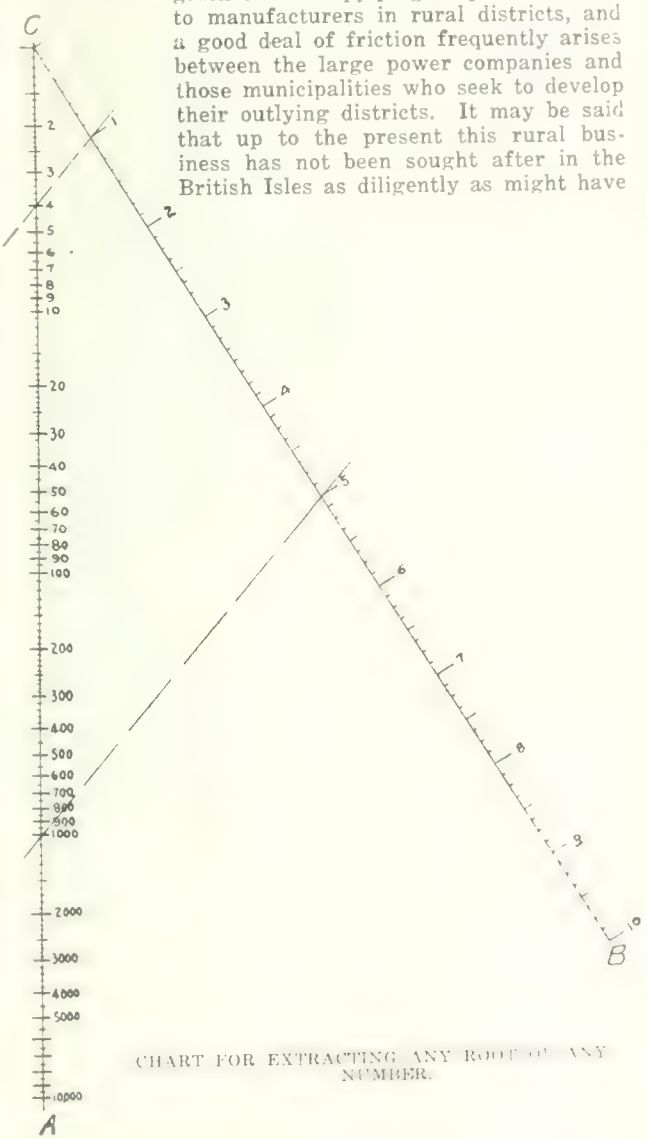



CHART FOR EXTRACTING ANY ROOT OF ANY NUMBER.

For example, what is the fifth root of 1024?

Join the 1024 and the 5 as indicated by the dotted line. Then draw a parallel line through the "1" as shown. The answer is 4. Proceed similarly for any root.

The reason why this "works" will be plain to anybody who understands the principles of logarithms, so I deem further explanation to be unnecessary.

## ELECTRIC POWER IN BULK

By L. E.

EVERY year more and more attention is given to the supplying of power in bulk to manufacturers in rural districts, and a good deal of friction frequently arises between the large power companies and those municipalities who seek to develop their outlying districts. It may be said that up to the present this rural business has not been sought after in the British Isles as diligently as might have been the case. It is perhaps due to the fact that the possibilities of its development have not been estimated at full value, or possibly the parties interested have devoted more attention to the business which is nearer home and which is more immediately remunerative.

The cost of transmission is always a serious item when the sale of power in bulk is being considered. One company has increased the distances between supports gradually until they now have solid copper conductors operating with perfect satisfaction in spans of 250 feet. How much further they can extend is now a matter for experiment, but above 250 feet it would seem that local atmospheric conditions would have an important bearing on the subject.

### Composite Conductors

Possibly copper-clad steel or other combination of metals may render it possible to increase that distance and so enable distribution to be carried out at a less cost per mile. Steel or reinforced concrete posts which are now being used in some localities may eventually do much to solve the support problem, for the simple reason that the maintenance of poles is a considerable item where the poles form a large proportion of the invested capital. Insulated copper is, of course, out of the question for rural work, as its increased weight shortens the spans, thereby raising the cost of supports, and the insulation neither adds any factor of safety nor decreases the cost of the supporting insulators.

There is some divergence of opinion as to the voltage which is best adapted for rural district supply and also as to the scheme of transformer connections which it is best to adopt as a standard. In the majority of cases 110 volts can be used for single, and 220 volts for polyphase work, as this perhaps offers the most flexibility of any scheme of secondary voltages. On the primary side may be used delta connected three wire 6,600 volts, and 2,200 volt systems.

### A Desirable Circuit

There is of course much to be said in favor of 4,000 volt or 11,000 volt, star connected, earthed neutral primary circuit for rural work, as according to A. S. Hall, who has had a great deal of experience, it has the advantage of fewer earths being necessary, thereby lowering earthing cost, and a further advantage of enabling the circuit to be cut out entirely by an automatic switch in case any of the three wires should be earthed, whereas the delta connected three wire primary will sometimes operate with one wire down. An increase of voltage is possible, with a resultant lower copper cost, and a single wire can be run to handle singe phase distribution transformers using earth return. Further, if any earth fault should develop it will be on the high-voltage side, which is the voltage being earthed against, and by earthing the secondary also the consumer is rendered doubly safe.

A plan which is sometimes followed, and which has saved considerable first cost, has been the banking of transformers in multiple, on both primary and secondary sides. This is not good practice in town work, but the objections are not so apparent in rural distribution and there is a decided saving in both transformer and copper on account of being able to use larger transformer units, and so take full advantage of the diversity factor of grouped consumers.

# PROGRESS IN NEW EQUIPMENT

There is Here Provided in Compact Form a Monthly Compendium of Shipbuilding and Marine Engineering Auxiliary Product Achievement

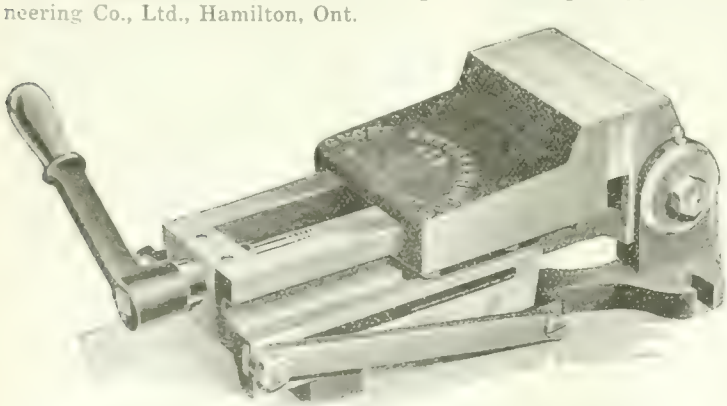
## TILTING VISE WITH GRADUATED SCALE

THE illustration shows a vise with tilting adjustment which allows it to be quickly fixed to any position from horizontal to vertical. This feature makes it applicable to a wide range of work and facilitates its use on the drill press, milling machine, shaper or bench.

It is built in two sections—the base for clamping to the work table, and the vise proper which is hinged to the base. The elevating arms are pivoted to the base at one end, while the other ends are fastened to a tee-headed bolt, working in slots on both sides of the vise. Tightening up the lock nuts on the bolts secures the vise rigidly in any position to which it is adjusted.

The jaws are 2 in. high and 6 in. wide and have a 6-in. opening. The stationary jaw is formed integral with the hinge while the movable jaw is traveled along the machined steel ways by a steel screw with buttress threads. The handle which turns the screw also serves to tighten up the lock nuts.

A machined indicator plate is secured to the hinge support and has its bevelled rim graduated in degrees. The pointer, fastened to the stationary jaw, moves over this scale and accurately indicates any angle of tilt up to 90 deg. The device is manufactured by the Globe Engineering Co., Ltd., Hamilton, Ont.



GRADUATED TILTING VISE.

## HIGH-PRECISION BALL BEARINGS

THE tendency toward higher speeds and heavier loads arising from intensified [illegible] is due to war conditions has caused [illegible]ased interest to be taken in ball-bearings capable of sustained high-speed service. The accompanying engravings, Figs. 1 and 2, show the Norma ball bearing, an open type of ball bearing made to exceptional standards of precision and instantly separable, without the use of any tools, into its several constituent [illegible] and balls. In practice, the inner and outer races are separately, independently and readily mounted—the cage with balls slipped over the inner race—and the outer race with its housing placed in position. In the manufacture of the bearing, precision measurement has been

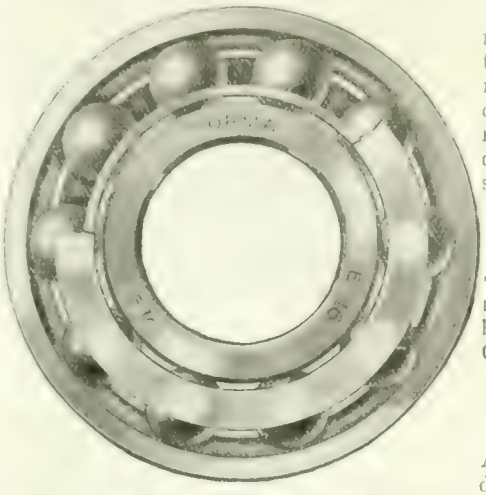


FIG. 1. VIEW OF BEARING WITH CAGE PARTIALLY REMOVED TO SHOW ARRANGEMENT OF BALLS.

carried to a high degree, the Hirth minimeter which is used on all dimensions being capable of measuring to 1-10,000th of an inch.

The open type, separable construction

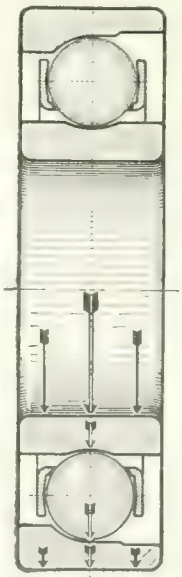


FIG. 2. CROSS SECTION SHOWING OPEN-TYPE CONSTRUCTION. ARROWS INDICATE LOAD LINES IN RADIAL LOADING.

of these bearings permits rigid mounting of both races, with its resultant contribution to speed-ability. It also facilitates assembling a machine in true alignment, thereby obviating cramped, misaligned bearings and consequent excessive wear, while the almost instant accessibility of every part of the bearing invites that frequent inspection and easy cleaning which is so essential to a maintenance of perfect operating conditions. The metals used in these bearings are made to rigid specifications and parts are specially treated to make the most of the inherent qualities of the metal.

The speed limits of these bearings are not definitely known, for the reason that tests to destruction have never been made. They are, however, used in machines where a speed of 35,000 revs. per min. is reached without any evidence of distress or failure; constant operation at speeds of 3,000 to 6,000 revs. per min. is maintained in many machines.

The suitability of this bearing for high speeds has led to its extended use in magneto and lighting generators for motor vehicles, aeroplanes, etc. These bearings are the product of the Norma Company of America, New York City.

## PLAIN RADIAL DRILL

A PLAIN radial drill with speed box drive as shown in the accompanying engraving is now being built by the Morris Machine Tool Co., Cincinnati, in 4 ft. and 4½ ft. sizes. The drill can also be arranged for cone pulley, constant speed motor in connection with speed box or variable speed motor drive.

The arm slides up and down on a column by power with safety stops in extreme positions and the column swings around a stump that runs through to the top of the column. At the top of the stump a combination annular and thrust ball bearing is mounted, which carries the entire weight of the column and arm. At the bottom of the column there is a plain bearing on the stump. This construction permits the arm to swing with ease. The stump is securely mounted on a heavy base which is deep and well ribbed. Around the edge of the base is a lubricating channel which drains to a reservoir. The base is so arranged that oil pump and piping can be attached at any time.

The lever at the bottom of the stump, standing in a vertical position, controls the friction clutches on the pulley shaft in the speed box. This lever, which is convenient to the operator, when in neutral position, stops every gear on the machine, and in connection with the double back gear lever on the head, the operator can secure six spindle speeds instantly. With the speed box, eighteen spindle speeds are available and on the cone pulley drive there are fifteen spindle speeds. The double back gear is mounted on back of the head and is fully enclosed.

Back gear clutches and clash gears are made of nickel steel heat treated and hardened. Tapping attachment mitre gears are also mounted on back of the head and are enclosed in an oil tight case and run in oil. Frictions are of the

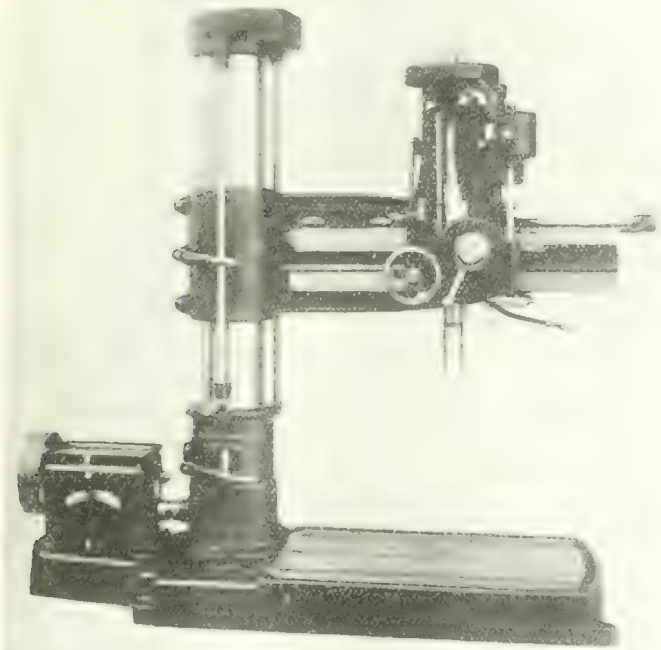
expanding ring type capable of pulling the maximum capacity of the drill and controlled from the front of the machine. Friction rings are adjustable.

The head is heavily constructed with long bearings for the spindle. It travels on the arm on wide bearings by means of a hand wheel through reduction gears to a rack and pinion.

Spindle is equipped with a ball thrust bearing. Bearings throughout are of bronze with felt wipers. A recess around the bearing acts as an oil reservoir. Through feed gear box mounted on the head, six feeds are obtainable. A direct reading depth gauge is provided, arranged to throw the feed out. A safety feed throw out is arranged at the end of the spindle travel.

All gears are of steel except the spindle gear which is semi-steel, made of one-third scrap steel mixture. Speed box is fully enclosed and gears run in heavy oil. A tool tray is mounted on top of the box. A speed plate is furnished, giving the operator all spindle speeds at certain positions of the lever.

Principal specifications of the 4 ft. drill are as follow: drills to center of 8 ft. 6 in.; maximum distance between spindle and base 60 in.; minimum distance between spindle and base 10 in.; maximum distance between spindle and table 39 in.; spindle traverse, 16 in.; spindle diameter above sleeve 1 15/16 in.; spindle—Morse Taper No. 5; spindle speeds—Cone Drive 19 to 350; spindle speeds—Speed Box Drive 20 to 350; working surface on base 36 in. x 51 in.; working surface on table 18 in. x 24 in.; weight crated—about 7,500 lbs.



PLAIN RADIAL DRILL WITH SPEED BOX DRIVE GIVING EIGHTEEN SPEEDS.

## NEW CENTRIFUGAL PUMPING PLANT AT TORONTO RIVERDALE STATION

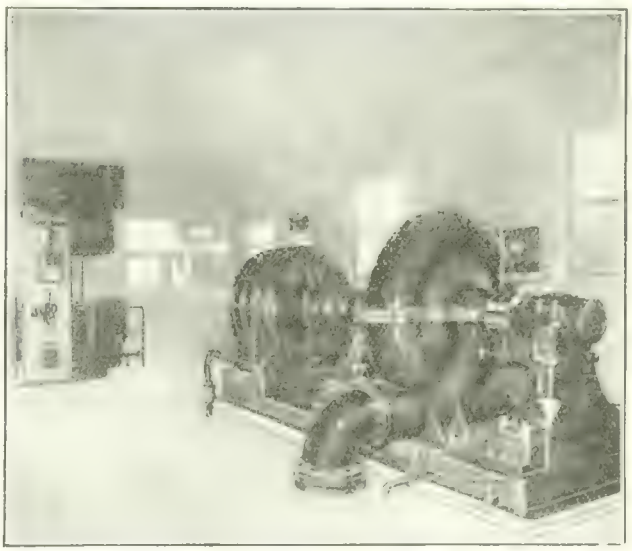
THE motor driven centrifugal pumping plant recently completed at the Riverdale Station of the Corporation of Toronto is of interest to municipal and other engineers, owing to the great flexibility of speed and capacity of the unit. It was designed to deliver five million imperial gallons in twenty-four hours against a head of 170 ft. and running at a speed of 720 revs. per min., but owing to probable variation in pressure and capacity the city required the unit to deliver either three million gallons or one million gallons against a lower head varying from 130 ft. down to 70 ft.

Under such conditions, it is usual to build a multi-stage pump but the contractors, Canadian Allis-Chalmers, Limited, designed and built a single-stage pump which has fulfilled all the guarantees required by the city. The usual practice also is to supply constant speed induction motors for centrifugal pumps; however, as the speed to fill the above requirements must vary from 720 revs. per min. down to 350 revs. per min., the Canadian General Electric Co. built a special 250 horse-power variable speed motor which also fulfills all the requirements.

The pump, which is single-stage with split casing, consists of a cast iron spiral casing with discharge and suction inlet cast on to the lower body. The casing is split on a horizontal centre line, so as to facilitate inspection without dismantling pipe or any other part of the unit. A set of removable diffusion guide vanes has been provided so as to guide the water from the impeller to the casing in the most effective manner. The impeller is made of cast bronze, and polished so as to eliminate unnecessary friction.

Special neck rings have been provided so as to decrease the water leakage from the pressure side to the suction side. The impeller is of double suction type and the head of 170 ft. is generated in a single stage. Proper stuffing boxes are arranged on each side of the extending shaft, and bronze sleeves are provided to eliminate rust and prevent undue wearing. The shaft itself is of hammered steel and of ample stiffness to prevent any vibration.

Separate outboard pedestal bearings are provided in order to carry the shaft, and one of these bearings is arranged with forged collars which act as a thrust bearing to take any unbalanced thrust which might occur occasionally. All bearings are arranged for water cooling, and are of the self-aligning ring oiling type. Separate sub-bases are provided to facilitate dismantling and direction. Both bearings are tied up to the main pump casing by means of stay bolts, so as to make the whole unit as rigid as possible. A flexible pin type coupling is arranged for connecting up this pump with the motor.



CENTRIFUGAL PUMP WITH CAPACITY OF [illegible] IMPERIAL GALLONS IN 24 HOURS.

The whole unit is set upon a heavy cast iron base-plate which is grouted in to the foundation, and has proven to be exceedingly quiet during operation. An efficiency of well over 70 per cent. has been shown operating under various conditions.

The Eagle and Globe Steel Co. [illegible] treal, has been absorbed by the Arthur Balfour & Co., and in future all Canadian business will be carried on under the name of Arthur Balfour & Co. Apart from the change of name no alterations will be made in the Canadian offices, W. A. Bradbury continuing as general Canadian agent.

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## WHAT BRINGETH THE YEAR?

ON very few occasions in the memory of those living has the beginning of a new year been so fraught with possibilities, beneficial or dire, probable or improbable, as the beginning of 1918. Week after week, month after month, year after year the war has been influencing our lives to an extent not yet comprehended by all of us though more or less fully comprehended by some.

Many, very many, have been bereaved, too many have suffered and died, others have toiled beyond preconceived measure and the end is not yet.

Even as the year is born we are witnesses of the most impressive contrast ever afforded in the history of nations in our ken. The most threatening combination of militaristic powers ever centred in the grasp of a few ambitious madmen is making desperate efforts to call it quits and assume the role of peace-loving brethren of mankind, while the most peaceable of the world's leading nations is just as desperately straining every nerve and fibre to prevent the perpetration of the most gigantic fraud on civilization ever attempted.

Despite the delirious camouflage being indulged in by the Huns, the United States makes ready for the final bout with undeviating aim and an intensity of purpose, the effects of which are reflected in the foe's desire for peace.

**"Achievement of the purposes for which the Allies are fighting is essential to the future freedom and peace of mankind."**

This score of words forms part of a letter sent by Premier Lloyd George to the special National Labor Conference held at Westminster, Dec. 28, which had been convened to consider a memorandum on war aims. The conference was attended by 750 delegates and went on record by a virtually unanimous vote that Labor, in continuing the war, is actuated by a determination to make the world safe for democracy hereafter.

In reaching such a decision, Labor has demonstrated that it has risen to the occasion like other essential components of civilization. During the few years immediately preceding the war the claim was made that war would never be possible on a decisive scale as the workingmen of the various countries would never rise in arms against each other, or in any way allow their services to be utilized in carrying on hostilities. Had such a scheme been feasible and strictly adhered to, and the calculated results obtained, the war would not only have been short-lived or never started, but the progress of the world toward democracy would have been immeasurably advanced.

The manner in which developments actually took place is now history. When the time for a decision came, the Huns unmasked themselves, their previous regard for the brotherhood of man was seen to have been but a feint to lull vital sections of the Allies' forces into a reluctant attitude which might have had very serious, albeit not deliberate, influences on the course of hostilities, and allied Labor was left with the alternative of admitting the failure of its previous ideals or being guilty of culpable slacking.

The results of the Conference, while definitely negativing any suggestion of guilt, are of special significance in view of conditions in Russia. Untrammeled liberty is more dangerous to a nation's welfare than untrammeled power. Reports from reliable sources indicate the gradual merging into chaos of many elements whose former efficiency elicited unbounded admiration from those who had opportunities to judge.

Freedom unbounded, uncontrolled, aimless and selfish—such a state induces national disintegration at an appalling rate. Freedom—unbounded but controlled, realization of its worth stimulating every effort for its defence, unselfish sacrifice a feature of its devotees—such an ideal is the inspiration of the great marshalling of finance, commercé and industry which we, as neighbors of the United States, are privileged to witness at close range. It is not what the name itself is, as what it stands for that counts to-day. Freedom, like the rose, by any other name would be just as sweet.

**"The ideals for which we are fighting to-day are precisely those for which the British Empire entered the war."**

In assuming the burdens of the coming year, burdens which will grow heavier and yield less recompense, we must keep graven on our mind this further statement by Britain's premier. The longer we have fought for them the more will we value our ideals when they are finally won. And, in this, the critical and possibly final year of the struggle, let it be ours to so act that of none of us can it be said "he eased off his hold."

"The last man and the last dollar" is an extreme figure of speech, but it can become an unwelcome reality through unscrupulous manufacturers advancing unfounded exemption claims and extracting undue profits for their personal gain—in which case the effects on the efforts of the country are exactly opposite to those originally intended by the speaker of these words.

With the official declaration of British Labor referred to, the reputation of Labor as a stable element of the Empire remains unsullied; with the advent of government control of railroads in the States the singleness of purpose of the Republic is made still more manifest; for Canada, a continuance of past efforts will more than maintain the good name of the Dominion as a tower of strength in time of stress.

The future will soon be with us. Let us see that it finds us ready for all that it may bring.

# WANTED—
# HUNDRED POINT MEN

By
GEORGE A. SIMPSON

ALL over this great Continent, geographically known as the United States of America and Canada, there are to-day many prosperous industries which were, a few short years ago, facing serious financial embarrassment and failure. ¶ These industries in many instances had been grossly mismanaged, while in others, lack of capital and kindred ills contributed to their condition; but it matters not now what was the cause; it is Results and not explanations we are interested in, as results count and the facts are, these conditions did exist. ¶ Then came the War, and as if by magic all was changed; from Adversity to Prosperity was a short shift and even Industries that were wavering on the ragged edge of failure took on a new lease of life and assumed a prosperous air. The stupendous demand for products of every description was, and is, such that extension of plant and increased production became the order of the day and under these unprecedented conditions, business to-day is pushing the man who, under normal conditions, could not push business. ¶ The whole structure---Agricultural, Industrial, Commercial and Economic---has been undergoing the most drastic change the World has ever known. But how about the man? And how about business, with its increased facilities for production and its corresponding overhead expense, when this demand ceases and Competition sets in? ¶ 'Tis said the leopard changeth not his spots, and this, in a measure, applies to business management. The test of fitness will come when the Commercial War begins and a new order of things exists, to which we must adjust ourselves. A tremendous momentum has been started and maintained on business we did not seek, and the Wheels of Industry have been greased with prices exceeding our wildest dreams. We have been floated into position, on a tidal wave of business, far and above the jagged rocks of competition, which await us when the tide recedes. What then?--- is a question worthy of sincere consideration NOW. ¶ To successfully cope with the new conditions and maintain our progress will create a demand for Hundred Point Men. Men who are well balanced--- men who are not one-sided in their development, whose energies do not seep into narrow channels, while the main streams of ability are allowed to run dry--- men who are broad, who do not take half views of things--- men whose education has been received in the school of hard knocks, whose capital is Knowledge acquired through experience, who mix common sense with theory and do not permit the technical to distort their practical viewpoint of everyday life--- men who have studied men and mastered conditions, whose love of humanity knows no bounds, who despise pretence and worship a good name--- men who can decide and whose decisions are intelligent and just, who see education and development, discipline and character in their occupation--- men who can co-operate more successfully than they can compete--- men who can honorably and persistently produce results--- such men as these are the Executives of the future--- HUNDRED POINT MEN

# Iron and Steel Price Revision Postponed

*United States Government Decides to Continue Prevailing Schedule—Severe Weather and Fuel Shortage Affects Transportation and Production Markets are Quiet Generally*

BUSINESS continues quiet which is the usual state of affairs at this time of the year. Most firms are busy stock-taking and are out of the market in the meantime. The severe weather has revealed a shortage of coal in many districts and the outlook is serious in some parts. It is not unlikely that a number of factories will have to either close down or restrict operations. The cold weather is also interfering with operations at the steel mills. Railways are also suffering on this account and the movement of freight is being interfered with, curtailing deliveries of fuel. There is no improvement in the coke situation and more furnaces have been banked in the United States which is curtailing the production of pig-iron and steel. The outlook in this respect is becoming serious. There will be no revision in prices of iron and steel in the States, it having been decided to extend the prevailing schedule. This relieves the steel market of an element of uncertainty. The iron and steel market has been quiet all the week with consumers for the most part holding off. The shortage of steel for ordinary commercial purposes continues and there is no relief in sight. Prices of non-ferrous metals are unchanged and demand has been light. The markets generally are featureless and seasonably quiet. The scrap metal market is also dull.

MONTREAL, Que., Dec. 29, 1917. —The opening of the New Year finds us on the verge of another industrial epoch, as exemplified in the recent action of both the American and Canadian Governments with respect to their attitude towards the railroads of the respective countries. The former have virtually taken over the entire control of every transportation company with a view to the more rapid movement of freight to and from its destination. The actual operation of the various companies will, however, remain under their present officials. Almost as if the movement had been pre-arranged, the Canadian Government has also taken steps to relieve the pressure that exists as shown by the granting of increased rates on the various railroads throughout the Dominion. While no stated date has been set for the inauguration of the new schedule it is anticipated that it will go into effect very early in the New Year.

### Pig Iron

The generally acute situation has been further emphasized during the past week owing to the increased difficulty of obtaining delivery of all classes of raw materials. Furnaces have been struggling to maintain operations but in many instances curtailment has been necessary in order to conserve the supplies on hand. This falling off in output, though slight, has had a serious effect on metal-working industries generally. Better conditions, however, are in sight, as the recent attitude of the Governments respecting railroad operation seems to indicate. Quotations for Canadian pig ore nominally $50 per ton, but [illegible] is available.

### Steel

[illegible] production of iron and steel of every description has been somewhat curtailed owing to the holiday season and the general disorganization contingent to the Federal Elections. These disturbing elements, [illegible] activity either in manufacture or transportation. Recent developments in the railway situation promise relief, but it is a little early to predict what will result from this most recent step. The shortage of coal has become very acute and it has been found necessary to close many factories and public buildings in order to conserve the available supply. The new regulations governing railroad operation will, it is hoped, enable officials to give a much better service in respect to the delivery of coal and other essential materials for manufacturing and general industrial purposes.

Canadian conditions are much the same as last week, the excitement of the elections and the festive season not yet being entirely dispelled. With the opening of the New Year it is expected that impetus will be given to industrial activities, as further appropriations from the recent loan are looked for, and the congestion of the past few weeks may be relieved by the new developments regarding railroad operation. Increased requests for shipment has been a result of the pending advance in rates, so as to take advantage of the old rates while they are still in force. Local steel prices are unchanged on a strong but quiet market.

### Metals

The metal situation is much the same and conditions are still dependent on developments at the American capital. Little interest is shown by buyers as they are reluctant to purchase heavily under the uncertain conditions. Copper is quiet but firm at fixed prices. Tin is easier following the drop on the London market. Spelter is firmer but uncertain. Visible lead is apparently scarce and a stronger tone is evident. Antimony and aluminum are quiet and unchanged.

**Copper.**—Consumers are being well taken care of at present and the supply appears to be sufficient to meet all the requirements for essential manufacture. Local dealers report a quiet but steady market with quotations unchanged at 23 and 32 cents per lb.

**Tin.**—Trade conditions appear to have shaken off some of tension that has characterized this market for the past several weeks, but the acute situation is still more or less pronounced. New regulations imposed by the British Government and the recent decline on the London market have been reflected in the easier tone of the New York market. Lack of further detailed information regarding the recent action of the British authorities has, however, placed the American trade on its guard respecting buying of future supplies, and until the permit question is cleared up the market here will continue to be more or less unsettled. Spot tin is still practically impossible. No quotations are given in New York, while dealers here are asking 77 cents, a decline of one cent on the week.

**Spelter.**—The situation in spelter has developed a little firmer tone but is still very irregular. The market is rather disturbed over the report that production has been curtailed, this being partly through the desire of the smelters but largely from the inability to secure delivery of coal for operating purposes. The strength of the market is shown in the slight advance quoted on the New York market and the expectation that further business will be placed for Government requirements. The position of spelter on the local market is firmer but prices are maintained at the previous quotation of 10½ cents per lb.

**Lead.**—The difficulty that has been experienced in the delivery of coal and other materials has resulted in the curtailment of production and in consequence the tone of the lead market has become stronger. The American Government is endeavoring to maintain a stable market and it is very unlikely that conditions in the coming year will duplicate those of the past twelve months. The market here is developing a little more activity. Prices are firm but unchanged, dealers asking 9½ cents per lb.

**Antimony.**—Uncertainty is the dominating feature in the present market owing to the doubt that appears to exist as to the actual war requirements of the American Government. This has had the tendency to maintain the market in

a firm position but a certain feeling of nervousness is everywhere apparent. The situation here is unchanged with prices holding steady at 18 cents per lb.

**Aluminum.**—The market is quiet and unchanged with quotations firm at 60 cents per lb.

### Machine Tools and Supplies

In common with all other activities the machine tool industry has felt the effect that has followed the recent elections and the present holiday season, both these factors tending to disorganize the ordinary trend of industrial life. No developments of importance have taken place to create renewed interest in this particular line of manufacture, but it is expected that a little impetus will follow the turn of the New Year when the resumption of business again falls into its usual groove. Very little activity is reported in connection with munitions machinery, although the inquiries for general equipment continue to be of fair volume. General supplies are still in fair demand owing to the steady activity in industrial circles. Prices on all commodities are well maintained.

### Scrap

The old metal market has suffered more or less during the past week from the cold weather that has prevailed, this preventing the free movement of material on the different railroads. Business this week has been quiet but prices have been well maintained, the quotations here being practically the same as last week.

## Toronto

TORONTO, Ont., Dec. 31.—The close of another year finds the industrial situation in Canada on the whole very satisfactory. Orders are plentiful, but supplies of raw materials are high in price and scarce in some cases. This latter feature is tending to restrict production and the volume of trade is not as heavy as it would otherwise be. The scarcity of skilled labor has also handicapped manufacturers and it is likely that the situation in this respect will become worse owing to the selective draft. The severe weather has revealed a serious shortage of coal in many parts of this province causing considerable suffering and curtailing manufacturing operations. The severe cold has also practically cut off supplies of natural gas in some parts, principally in Western Ontario.

### Steel

Quiet conditions prevail in the steel market, which is usual at this time of the year and there is practically no change in the situation from last week. The demand for steel for commercial purposes continues light on account of the general slowing down of manufacturing activity due largely to the difficulty that is being experienced in obtaining steel, particularly from the United States. The outlook for consumers of steel for commercial purposes is not very bright for the coming year and it is likely that the output of a number of finished products will be considerably curtailed. Manufacturing operations cannot help but be restricted owing to shortage of raw materials on account of the heavy and increasing demand for steel for war equipment. Plants engaged upon government work are in a class by themselves and are not suffering the same inconveniences that other plants are subject to. So many plants, however, of one kind or another are engaged upon government work that the apparent quietness in the market does not affect the situation to the same extent as in normal times. In other words, although the outside market is dull there is a continuance of activity among industries engaged upon the production of munitions and other war supplies. The mills are busy and have more orders on hand than they can readily take care of, a large proportion of the business being government work in one form or another. The severe weather will interfere with mill operations and restrict the output to some extent while it will also hinder the transportation of raw materials affecting principally those mills whose source of supply is in the United States.

The situation in regard to prices has been cleared up by an anouncement that the present schedule will be extended for a certain period, probably three months. The War Industries Board, Washington, has recommended an indefinite extension of the price schedule fixed last September. It is expected that President Wilson will in the near future issue a proclamation extending the present schedule. Further recommendations have been made regarding fixed prices on a number of miscellaneous iron and steel products. The new list covers steel castings, railroad fastenings and track supplies, including spikes, angle bars, tie plates, etc., cut nails, and forging ingots. Some of these prices are as follows. Forging ingots at $73 per ton, splice bars and tie-plates at 3.25c per pound, rail 3.90c, iron spikes at 4.50c, track bolts at 4.90c and cut nails at $4 per keg, also fixing schedule on steel castings and cast iron pipe. Some of the above products had been gradually adjusting themselves to the new market basis, so that the formal announcement means no abrupt change.

**CANADIAN GOVERNMENT PURCHASING COMMISSION**

**The following gentlemen constitute the War Purchasing Commission appointed by the Canadian Government: Hormidas Laporte, Montreal, chairman; George F. Galt, Winnipeg; William P. Gundy, Toronto. Thomas Hillier is secretary, and the Commission headquarters are at Ottawa.**

### Pig Iron

There is no improvement in the pig iron market, in fact the situation has become more acute owing to the severe weather interfering with the movement of freight. In the United States the shortage of coke and fuel has become more acute and has further handicapped the production of pig iron and likewise steel. Now that the American Government has taken over all the railways there will doubtless be some improvement in the transportation situation, although it will take some little time before relief measures can become really effective. More furnaces have been banked and production has thus declined. There is no iron for nearby delivery and all reserve stocks have been exhausted. Fuel Administrator Garfield announced a few days ago that there would be no general revision of coke prices for the year 1918.

### Scrap

The scrap market is stagnant and featureless. The fixing of prices in the United States of heavy melting scrap will make the market more settled here.

### Machine Tools

The market has been quiet all the week on account of the holiday season, but a revival of activity will likely develop after the new year.

### Supplies

The market is seasonably quiet this week with prices generally holding firm. Cut nails, however, have declined 15c per 100 lbs., which makes the base price $5.65 per 100 lbs. An advance in lubricating oils is looked for principally on account of the increase in cost of tins and containers.

### Metals

There is very little of importance to note in the metal markets this week and there have been no price changes. The situation remains the same as last week with business dull, which is usual at this season of the year. The copper market is quiet with very little interest being shown by consumers. The tin situation is unchanged and continues acute on account of the scarcity of metal. Spelter is firmer due to large purchases by the United States Government. Lead is quiet and demand light, although prices are firm. Antimony and aluminum are both quiet at unchanged prices.

Copper.— routine affair and quite devoid of excitement. This is due to the fact that consumers are assured as to supply and of a uniform price. Spot copper, however, can only be had in small lots as distributed by jobbers. Lake and electrolytic are quoted at 32c and castings at 31c per pound.

Tin.— and the acute shortage continues. Shipments are arriving from time to time, but are already sold into consumption long before arrival. Inquiry continues heavy, but in the absence of offerings trading is light and prices nominal. Local prices 80c per pound.

Spelter.—The U. S. Government recently purchased a considerable quantity of grade C spelter, which has stiffened the market, although local prices continue unchanged at 10½c per pound.

Lead.— of the quiet market and absence of demand. There is enough lead produced and in process of production to provide for all natural requirements and leave a sufficient surplus for private consumption

so that exceptional prices should not prevail. Local quotations 8½c per pound.

**Antimony.**—There is no change in the situation. The demand is quiet and price steady at 18c per pound.

**Aluminum.**—The market is quiet and quotations unchanged at 62c per pound.

## Washington

WASHINGTON, D.C., Dec. 28. The United States made its second great step in the war game at noon to-day, when all railroads passed under Government control. With conscription as its first great war move, the United States has now taken the second step in taking over the activities of the railroads. The importance of this action in respect to the progress of the United States' war programme is great. William G. McAdoo, Secretary of the Treasury, as predicted by your correspondent last week, is the railroad dictator. McAdoo has already taken long steps to bring about a remedy to the railroad congestion which has been hampering the United States for many months. All traffic and facilities of railroads are to be pooled, according to orders issued by McAdoo. This will allow one railroad to use the terminal facilities and equipment of another, and will mean that the thousands of miles of railroads in the United States will act as a unit.

With this step taken by President Wilson, there now appears on the horizon a solution for many of the problems which have been the subject of worry on the part of United States officials. The first of these is the transportation of troops.

**Better Freight Movement Anticipated**

Perhaps an even greater effect which will be brought about will be the fast movement of freight. For many weeks now freight of all sorts has been congested on railroads in the United States in a hopeless tie-up. McAdoo is to-day using his wide powers to move all of this material. Munition factories and other war material making plants which have been tied up for lack of material may now go ahead at top speed.

Canadian manufacturers will benefit largely from this action, because those supplies which Canadian manufacturers depend upon the United States for have been caught in the great freight jam. These supplies will now move with rapidity.

Railroad stocks have advanced from ten to twenty points on all markets following the action of President Wilson. This move has been a great boon to all holders of railroad securities throughout the nation and has given the stock market greater impetus than any single act since the outbreak of the war. More than a million and a half shares of stocks were sold on the New York exchange following the announcement.

**Government Control to Solve Coal Shortage**

In the Government control of the railroads [illegible] for the coal shortage in the United States. Fuel Administrator Dr. Harry A. Garfield told the Senate Investigating Committee that the coal supply of the United States has been reduced by 20,000,000 of tons because of the car shortage. W. B. Colver, Federal Trade Commissioner, declared that the entire shortage of 50,000,000 tons in the United States was caused by a lack of transportation facilities. The sub-committee of the Senate investigating the coal shortage is satisfied that the railroad control will relieve the coal shortage, and has, therefore, directed its attention to the prices of coal. In this respect again Canadian manufacturers will profit. Movement of coal to Canadian points promises to be more steady, and if Senators are able to put through legislation which they now have in mind there will be a downward revision of coal prices.

**Government Control of Coal Mines**

Government control of coal mines is expected to be the next step of the United States Government. Already Fuel Administrator Garfield has warned coal operators that all of their contracts must be made subject to requisition of the United States Government and no contracts may be made for a period longer than one year. Dr. Garfield has served notice that he will ultimately take over the control of all mines. "It is not a question of when, but how soon," he has said.

**The Shipbuilding Situation**

The United States Shipping Board, goaded on by Congressional investigation, is now speeding up to a considerable degree. Henry Ford, automobile manufacturer, has been sent to the Southern States to lay the foundations for plans for a series of great shipyards to be constructed at once. Congressional investigation of the Shipping Board has developed the fact that the delay in shipbuilding has been partly due to transportation difficulties, and this obstacle will also be removed by the Government control of the railroads. The wooden ship programme has been a flat failure, according to the statement of Admiral Bowles, naval constructor, and it has hindered the American shipbuilding programme. Hence it now seems to be doomed to oblivion.

American industry has taken a great spurt in the past few days under the promise of Government regulation of railroads and war work in the United States is now speeding on with greater determination than ever before.

## New York

NEW YORK, Dec. 28.—Shipbuilders, war munition manufacturers and the United States Government are still actively in the market for machine tools. It is estimated that contracts placed in the past week and the new contracts pending will call for the early expenditure of $3,000,000. The fact that the Ordnance Department of the Army is still trying to place large contracts for guns is taken as an indication that further large orders for machine tools will come before the manufacturers early next year.

The Foundation Co. has come into the market for machinery to be installed at plate and angle shops at its local ship plant, through the Liberty Steel Products Co.; the list of tools is a large one. The Southern Shipbuilding Co. is about to enter the market for equipment for its new plant at Charlestown, South Carolina, and the Chickasaw Shipbuilding Co., the Southern shipbuilding subsidiary of the United States Steel Corporation, is preparing a list of tools for its Mobile, Ala. plant. The Kettler-Elliott Co. of Chicago, controlling the new Pensacola Shipbuilding Co., has placed a contract for 30,000 tons of steel plates and shapes with the American Bridge Co. required for the construction of ten 9,400 ton cargo boats for the Emergency Fleet Corp. Ten shipways are to be constructed at Pensacola, mainly of wood. The buildings also are to be largely of wood. Shop equipment will probably be placed in the New York market. The steel for the ships will not be required until early in June.

A large munition plant is to be built at Cincinnati, soon after the first of the year, by the co-operation of a number of prominent manufacturers of machinery who will be in a position to equip their own plant. The General Motors Corp., which recently received a contract for 5,000 Liberty motors has distributed the work among the Cadillac, Buick, the Northway, and the Chevrolet works. The Detroit Shell Co., recently organized with a capital of $2,000,000, has already received a $30,000,000 contract for projectiles and it is understood that an additional contract up to $100,000,000 will be placed with this concern. The equipment of the new plant will require the purchase of a very large number of tools.

The recent contract for howitzer gun mounts placed with the Standard Steel Car Co. calls for the expenditure of $60,000,000 by the Government and a large list of tools required for this work is now before Eastern machinery manufacturers. The Harroun Motor Co., Detroit, has received a large contract for 6-inch shells. The S. A. Woods Machine Co. of Boston has purchased 40 lathes and other machine tools to be used in the manufacture of trench mortar bombs. The American Steam Gauge & Valve Co., Boston, and the International Arms & Fuze Co., Bloomfield, N.J., have taken Government contracts for detonators. The Amesbury Brass & Foundry Co., and the Howard & Bullough American Machine Co. Ltd. have also received Government orders for war munitions including guns and shell mounts.

The taking over of the railroads by the United States Government will probably expedite the placing of contracts for cars and motive power for domestic roads. Although the car builders booked orders in 1917 for nearly 120,000 cars, less than 52,000 were for home roads, these being the smallest contracts placed for cars in twenty years while the needs of transportation companies were never so great. The United States Government, however, ordered 22,775 cars for the railroad in France con-

structed for the use of the United States expeditionary forces. Contracts were also placed for 61,775 cars for foreign countries, exclusive of the 30,000 for Russia, which contract has been suspended. The building of these cars has called for 1,200,000 tons of steel, but the car manufacturers state that they are receiving only 40 per cent. to 50 per cent. of their steel requirements. The locomotive builders received orders during the year for 5,672 engines the building of which call for 1,135,000 tons of steel.

## Pittsburgh

PITTSBURGH, Pa., Dec. 29.—Unless the unexpected occurs, there will be no revision in iron and steel prices at this time or in the near future. After a conference with the Federal Trade Commission, the War Industries Board has recommended to the President that no change be made at this time, and a proclamation to that effect will probably be issued, perhaps formally continuing present prices until April 1.

Undoubtedly there is room for a reduction in prices with regard to the great bulk of the production, but some manufacturers, peculiarly positioned as to raw materials or otherwise, might be unable to produce at a profit in the event of a great reduction. Apart from this fact, the working of the set price system depends upon the voluntary cooperation of manufacturers, and this might not be so easy to secure if the manufacturers felt they were unjustly treated. As a practical matter the lapse of time sees the working out of old contracts at higher than the set prices, and without their being replaced to the full extent by fresh sales. Thus, apart from Government orders the producers will find themselves from month to month with less commercial business on books and reductions in the set prices might occur later in a smoother manner, while there is the possibility of traffic conditions on the railroads so improving as to permit full production of pig iron and steel, and in that event there would be a much better supply of material. Finally, there is the possibility of the Pomerene Bill being passed by Congress to furnish legal authority for the fixing of iron and steel prices. Thus, the fact that it seems quite undesirable to undertake to reduce iron and steel prices at this time does not mean that there will not be reductions later on, possibly only a few months hence.

### Railroad Pool

The iron and steel industry is well pleased at the decision reached by President Wilson to take over the operation of the railroads, as announced in the proclamation of December 26. It is felt that this arrangement has no drawbacks and many advantages. While the General Operating Committee, conducting the pool of railroad facilities ordered a month ago by the Railroads' War Board, has accomplished some good, it has been constantly hampered by the anti-pooling laws, and these, of course, are to be sus-

## Enlarged Canadian Trade Intelligence Service

Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.

CHILE—Valparaiso, British Consul General.

COLOMBIA—Bogota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT—Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General..

INDIA—Calcutta, Director-General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General, Petrograd, British Consul General, Vladivostock, British Consul General, Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA—Caracas, British Vice-Consul.

BRAZIL—Para, British Consul. Rio de Janeiro, British Consul General.

## Canadian Commercial Intelligence Service

**The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.**

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 16, Buenos Aires, Canadian Commercial Commission.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address, Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Canadian Commission.

CHINA—J. W. Ross, 1 Nanking Road, Shanghai, Canadian Commission.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. M. Cornell, H. M. Consular Office.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgoiza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, 73 Basinghall Street, London, E.C.2, England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Anne's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Cantracom.

CANADIAN COMMERCIAL AGENTS.

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—[illegible] address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

CANADIAN HIGH COMMISSIONER'S OFFICE.

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

the roads will doubtless result in the rescinding of the priority orders, the Government [illegible] a traffic manager to direct the movement of Government material. While the priority orders are blind, the traffic manager will be an individual with a brain. The steel trade also has its own interest in the Governmental taking over of the railroads, in that it doubtless means eventually the placing of orders for cars and locomotives to be financed by the Government.

### Traffic Conditions

Supplies of coke for the blast furnaces and of coal for the steel mills have not improved in the past week. The merchant furnaces tributary to the Connellsville coke region are producing pig iron at about 80 per cent. of capacity, while the steel interests are operating their blast furnaces at an average of 70 to 75 per cent. of capacity. The Carnegie Steel Company shows the lowest rate of operation of any of the large interests, and as it has coke production of its own, the circumstance suggests that the restriction is due to an insufficiency of transportation. Operations at steel works are cut down by the shortage of pig iron, as there have been no reserve stocks of pig iron for months. In some cases there is additional restriction by reason of insufficient coal supplies. Thus the Republic Iron & Steel Company has its blast furnace operations only slightly restricted, while its entire Bessemer steel making and rolling department has been down for nearly three weeks on account of there not being enough coal. The open-hearth department is kept in operation, as that is where the Government orders are.

### More Set Prices

The American Iron and Steel Institute has issued a long statement, setting additional prices, the most important of which are: Angle splice bars, 3.25c; single shoulder tie plates, 3.25c; standard railroad spikes, 3.90c, these base prices being subject to the usual trade extras. A long list of prices and extras is given for steel castings.

While manufacturers nearly all assert that the system of set prices is working very well, and some buyers have the [illegible] that there is no complaint. There is considerable complaint in some quarters, but referring to the manufactures of steel more than to the ordinary rolled products of the mills. It is asserted that some of the manufacturers are openly quoting prices higher than those set, and that some have even tried to impose upon the [illegible] maintain that the set prices are minimum prices, not maximum. There is complaint, too, that producers have not adjusted contracts to the set prices when [illegible]

### Pig Iron

With production of the merchant furnaces in Western Pennsylvania and the valleys and along the lake front curtailed by about 20 per cent. the make is naturally not sufficient to meet requirements of existing contracts, and there is no iron offered for sale in the open market, as has been more or less the case for weeks past. There is very little inquiry from foundries, as they are receiving moderate shipments and the operations of many of them are curtailed, particularly those making sanitary ware. It is asserted in some quarters that the steel works, by reason of their own production being curtailed, would buy large tonnages of Bessemer and basic iron if the iron were obtainable, but one should not be so sure about this, as the works may feel that in time they will be able to fill their orders with their own pig iron at correspondingly lower cost, and they cannot be certain of replacing the orders in full with other orders at high prices.

The finished steel market has continued practically stagnant. There is scarcely any inquiry from ordinary commercial buyers, while offerings are correspondingly limited. The condition is not necessarily a criterion of the relation between supply and demand, because at this time of year buyers are never actively in the market, while on the other hand producers would have no incentive to offer material in this market. A few weeks later there may be a clearer line on actual market conditions, particularly if railroad conditions are so improved as to result in heavier production of pig iron and steel.

## U. S. REQUISITIONS ELECTRIC POWER

TO assure the adequate supply of electric power for establishments engaged in war work at Niagara Falls and Buffaolo, the United States Government last Friday requisitioned the electric power produced, imported and distributed by the Niagara Falls Power Co., the Hydraulic Power Co. of Niagara Falls, and the Cliff Electrical Distributing Co.

Canadian demands that approximately 100,000 horsepower of current imported from the Canadian side should be applied exclusively to war work were said to have been a determining factor in the Government's decision to requisition all power.

Operation of mills is not expected to be affected materially by the new order, as readjustment of the power supply had been effected previously by representatives of the War Industries Board conferring with the Buffalo manufacturers.

Approximately, 110 factories not working directly on war contracts will curtail their electric power requirements somewhat, will use power at times when munitions factories are making their smallest demand, and will substitute steam for electricity as much as possible.

## PLANS FOR REBUILDING HALIFAX

A REPORT has been submitted by Thomas Adams, town planning expert of the Conservation Commission, to the Board of Control at Halifax, N.S., regarding the reconstruction of the devastated area in that city. The report went into considerable details showing the magnitude of the problem with which Halifax is confronted. After some discussion the Board decided to request Premier Murray to call representatives of the City Council, the Board of Trade, the Provincial Government, the Federal Government, the Executive of the Relief Committee, the Town Planning Board and the naval and military authorities, with a view to having a permanent commission appointed to deal with all matters pertaining to the rebuilding of the destroyed portion of the city, and with all problems which are the outcome of the recent disaster.

## NEW OVERSEAS TRADE DEPARTMENT

SIR ARTHUR STEEL MAITLAND, who has been appointed head of the new Overseas Trade Department, outlined to representaticves of the press recently its organization and projected scope. Describing the new office as a joint department of the Board of Trade and the Foreign Office—a *mariage de convenance* is perhaps the aptest phrase—Sir Arthur went on to sketch its composition. It is to take in the following old departments: (1) The Department of Commercial Intelligence of the Board of Trade. (2) The War Trade Intelligence Department of the Foreign Office. (3) The Foreign Trade Department of the Foreign Office. (4) The Consular Service and the Consular Department of the Foreign Office. This last service will not be definitely handed over to the new department until it has obtained offices adjoining the Foreign Office, but in the meantime its affairs are placed under Sir Arthur Steel Maitland personally.

The new department is to have two main divisons: (1) An overseas division, separated geographically into sub-sections; (2) an United Kingdom division, sub-divided according to trade and industry.

Sir Arthur made it clear that the Department is not only to collect information, but to take action in trade matters. Its power of action is subject to two reservations. When a piece of business becomes predominantly political, it is to be handed over to the Foreign Office, and when special subjects, such as commercial treaties, arise, they are to be put in charge of the appropriate department of the Board of Trade.

An Advisory Committee is being formed representing finance, banking, merchants, manufacturers, Chambers of Commerce, and labor, and this committee Sir Arthur intends to treat as an active "Board of Directors," whose lively assistance would be asked in tackling new problems and formulating proposals.

**First Train Over Quebec Bridge.**—It is officially announced that the first passenger train to cross the Quebec Bridge will be the I. C. R. local train from Quebec to Montreal, leaving Quebec Jan. 6th.

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

### PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago | 37 50 |
| Standard low phos., Philadelphia | |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 36 00 |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | | 50 00 |
| Victoria | 50 00 | 50 00 |

### FINISHED IRON AND STEEL

| Per lb. to Large Buyers. | Cents |
|---|---|
| Iron bars, base Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in. base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 7 50 |
| Norway iron | 14 00 |
| Tire steel | 5 00 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 7 75 |
| Chequered floor plate, 3/16 in. | 13 20 |
| Chequered floor plate, ¼ in. | 13 00 |
| Staybolt iron | 8 50 |
| Bessemer rails, heavy, at mill | |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *2 85 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | 3 50 |

F.O.B., Toronto Warehouse

| | |
|---|---|
| Steel bars | 5 50 |
| Small shapes | 5 75 |

F.O.B. Chicago Warehouse

| | |
|---|---|
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 15 |

*Government prices.

### FREIGHT RATES

Pittsburgh to Following Points

| | Per 100 lbs. C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 35.1 | 45.5 |
| Halifax | 35.1 | 45.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

### METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $32 00 | $32 00 |
| Electro copper | 33 00 | 32 00 |
| Castings, copper | 32 00 | 31 00 |
| Tin | 77 00 | 80 00 |
| Spelter | 10 50 | 10 00 |
| Lead | 9 50 | 8 50 |
| Antimony | 18 00 | 18 00 |
| Aluminum | 60 00 | 62 00 |

Prices per 100 lbs.

### PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¼ to ½ | $13 00 | $12 00 |
| Heads | 13 30 | 12 30 |
| Tank plates, 3-16 in. | 13 10 | 12 10 |

### WROUGHT PIPE

Effective July 5, 1917.

Standard Buttweld

| Size | Black Per 100 feet | Galvanized Per 100 feet |
|---|---|---|
| ⅛ in. | 8 00 | 5 50 |
| ¼ and ⅜ in. | 12 | 7 16 |
| ½ in. | 6 46 | 8 03 |
| ¾ in. | 8 17 | 10 29 |
| 1 in. | 12 07 | 15 22 |
| 1¼ in. | 16 33 | 20 80 |
| 1½ in. | 19 73 | 24 60 |
| 2 in. | 26 27 | 33 12 |
| 2½ in. | 42 12 | 52 87 |
| 3 in. | 55 08 | 69 23 |
| 3½ in. | 69 92 | 86 94 |
| 4 in. | 82 84 | 103 00 |

Standard Lapweld

| | | |
|---|---|---|
| 2 in. | 24 25 | 30 41 |
| 2½ in. | 43 88 | 54 11 |
| 3 in. | 57 78 | 70 75 |
| 3½ ins. | 71 76 | 87 50 |
| 4 in. | 87 02 | 106 28 |
| 4½ in. | 96 32 | 121 25 |
| 5 in. | 112 50 | 141 34 |
| 6 in. | 145 90 | 183 36 |
| 7 in. | 190 40 | 238 00 |
| 8 L in. | 200 00 | 250 00 |
| 8 in. | 230 40 | 288 00 |
| 9 in. | 276 00 | 345 00 |
| 10 L in. | 256 00 | 320 00 |
| 10 in. | 320 60 | 412 00 |

Prices—Ontario, Quebec and Maritime Provinces

### WROUGHT NIPPLES

4" and under, 45%.

4½" and larger, 40%.

4" and under, running thread, 25%.

Standard couplings, 4" and under, 35%.

4½" and larger, 15%.

### OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 21 50 |
| Copper, heavy | 22 50 | 21 50 |
| Copper wire | 22 50 | 21 50 |
| No. 1 machine composition | 21 00 | 20 50 |
| New brass cuttings | 16 00 | 17 00 |
| No. 1 brass turnings | 14 00 | 15 75 |
| Light brass | 10 00 | 10 00 |
| Medium brass | 14 00 | 14 00 |
| Heavy brass | 15 00 | 16 00 |
| Heavy melting steel | 21 00 | 20 50 |
| Steel turnings | 12 60 | 8 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 23 00 | 18 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 20 50 |
| No. 1 machine cast iron | 25 00 | 25 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 15 00 | 9 00 |
| Car wheels, iron | 26 00 | 25 00 |
| Steel axles | 38 00 | 30 00 |
| Mach. shop turnings | 9 00 | 8 50 |
| Cast borings | 12 00 | 8 50 |
| Stove plate | 19 00 | 19 00 |
| Scrap zinc | 5 50 | 6 50 |
| Heavy lead | 5 50 | 7 00 |
| Tea lead | 5 00 | 5 75 |
| Aluminum | 25 00 | 25 00 |

### BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, ⅜" and less | 10 |
| Carriage bolts, 7-16 and up | net |
| Coach and lag screws | 25 |
| Stove bolts | 55 |
| Plate washers | List plus 20 |
| Elevator bolts | 5 |
| Shuttle bolts, 7-16 and over | net |
| Machine bolts, ⅜ and less | 10 |
| Blank bolts | net |
| Blank nuts | net |
| Machine screws, fl. and rd. hd., 1-in. and shorter | 25 |
| Machine screws, fl. and rd. hd., longer than 1-in. | 10 |
| Machine screws, fl. and rd. hd., nickel | add 25 |
| Machine screws, o. and fil. hd., nickel | add 25 |
| Nuts, square blank | add $1 50 |
| Nuts, square tapped | add 1 50 |
| Nuts, hex. blank | add 1 50 |
| Nuts, hex. tapped | add 2 00 |
| Copper rivets and burrs, list plus | 10 |
| Burrs only list plus | 50 |
| Iron rivets and burrs | 15 |
| Boiler rivets, base ¾-in. and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 37½ |
| Wood screws, O. & R., brass | 32½ |
| Woodscrews, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

### MILLED PRODUCTS

| | Per cent. |
|---|---|
| Set screws | |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil Head Cap Screws | net |
| Flat ⅜ But. Hd. Cap screws plus | net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. and semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and semi-fin. nuts over 1½ in., up to 2 in. plus | 10 |
| Studs | 10 |
| Taper pins | 40 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws, list plus | 20 |
| Collar screws, list plus | 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | 40 |
| Patch bolts | and 10, 10 |
| Cold pressed nuts to 1½ in. | add $1 |
| Cold pressed nuts over 1½ in. | add $7 00 |

### BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $47 50 |
| Open hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rod | 60 00 |

Government prices.

F.O.B. Pittsburgh.

### NAILS AND SPIKES

| | | |
|---|---|---|
| Wire nails | 8 00 | 8 75 |
| Cut nails | 5 70 | 5 65 |
| Miscellaneous wire nails | | 60 |
| Spikes, ¼ and 5-16 in. | 8 00 | 87 50 |
| Spikes, ¼ and 5-16 in. | 8 00 | |

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | 0 36 |
| Solder, commercial | 0 25 |
| Babbitt metal | 1 to 1 10 |
| Soldering coppers, lb. | 0 53 |
| Lead wool, per lb. | 0 15 |
| Putty, per lb. | 0 7 |
| White lead, pure, cwt. | 16 20 |
| Red dry lead, 100-lb. kegs, per | |
| Glue, English | 0 38 |
| Tarred slater's paper, roll | 0 95 |
| Gasoline, per gal., bulk | 0 31½ |
| Paraffine | |
| Pure turpentine, single bbls. | |
| Linseed oil, raw, single bbls. | 1 36 |
| Linseed oil, boiled, single bbls. | 1 39 |
| Plaster of Paris, per bbl. | 2 50 |
| Sandpaper, B. & A. | list plus 20 |
| Emery cloth | list plus 20 |
| Emery wheels | |
| Carborundum wheels | |
| Rosin "D," per lb. | 0 03 |
| Rosin "G," per lb. | 0 03½ |
| Borax crystal and granular | 0 15 |
| Wood alcohol, per gallon | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

### ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 41 |
| Plumbers' oakum, per lb. | 0 09 |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Packing, Metallic | 0 [illegible] |
| Packing, Metallic, Rod | 0 [illegible] |
| New Zealand Hemp | 0 33 |
| Transmission rope, Manila | 0 45 |
| Cotton Rope, ¼-in. and up | 0 47 |

### POLISHED DRILL ROD

Discount off list, Montreal and Toronto net

### CARBON DRILLS AND REAMERS

| | Per Cent. |
|---|---|
| S.S. drills, wire sizes up to 52 | 30 |
| S.S. drills, wire sizes, No. 53 to 80 | net |
| Standard drills to 1½ in. | 30 |
| Standard drills, over 1½ in. | 30 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 20 |
| Bit stock | 25 |
| Ratchet drills | 15 |
| S.S. drills for wood | 30 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 40 |
| Screwdrivers | 40 |
| Taper pin reamers | net |
| Drills and countersinks, list plus | 30 |
| Rose reamers | 30 |
| Centre reamers | 10 |
| Chucking reamers | net |
| Hand reamers | 10 |

### COLD ROLLED SHAFTING

At mill list plus 40%

At warehouse

Discounts off new list. Warehouse price at Montreal and Toronto

### IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 25% off list. Malleable bushings, 25 and 7½%; plugs, 20% off list. Net prices malleable fittings: Class B black, 24½c lb.; Class C black, 15¾c lb.; galvanized, Class B, 34c lb.; Class C, 24½c lb. F.O.B. Toronto.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | 39 50 | 38 50 |
| Sheets, black, No. 10 | 12 00 | 12 00 |
| Canada plates, dull, 52 sheets | 12 00 | 12 00 |
| Canada plates, bright | 12 50 | 12 50 |
| Apollo brand, 10¾ oz. galvanized | 12 25 | 12 00 |
| Queen's Head, 28 B.W.G. | 11 75 | 10 |
| Fleur-de-Lis, 28 B.W. | | 10 |
| Gorbal's Best, No. 28 | 12 00 | 10 |
| Colborne Crown, No. 28 | 11 25 | 10 00 |
| Premier, No. 28 U.S. | 13 75 | 9 |
| Premier, 10¾ oz. | 13 85 | 10 |
| Zinc sheets | 20 00 | 00 |

### PROOF COIL CHAIN.

| B | |
|---|---|
| ¼ in. | $12 35 |
| 5-16 in. | 11 85 |
| ⅜ in. | 11 50 |
| 7-16 in. | 10 90 |
| ½ in. | 11 20 |
| 9-16 in. | 11 20 |
| ⅝ in. | 11 00 |
| ¾ in. | 11 00 |
| Extra for B.B. Chain | 1 20 |
| Extra for B.B.B. Chain | 1 80 |

ELECTRIC WELD COIL CHAIN B.B.

| | |
|---|---|
| [illegible] | $2 50 |
| [illegible] | 2 70 |
| [illegible] | 3 45 |
| [illegible] | 3 40 |
| [illegible] | 4 [illegible] |
| [illegible] | 5 [illegible] |
| [illegible] | 6 [illegible] |
| [illegible] | 6 [illegible] |
| [illegible] | 7 [illegible] |
| [illegible] | 7 [illegible] |
| [illegible] | 8 [illegible] |

Prices per 100 lbs

FILES AND RASPS.

| | Per Cent. |
|---|---|
| [illegible] | 50 |
| [illegible] | 50 |
| [illegible] | 50 |
| [illegible] | 40 |
| [illegible] | 40 |
| [illegible] | 50 |
| [illegible] | 50 |
| [illegible] | 50 |
| [illegible] | 10 |
| [illegible] | 10 |

COAL AND COKE.

| | |
|---|---|
| [illegible] | ... |
| [illegible] | ... |
| [illegible] | ... |
| [illegible] | ... |

Net ton f.o.b. Toronto.

BOILER TUBES.

| | Seamless | Lap-welded |
|---|---|---|
| [illegible] | $26 00 | $ .... |
| [illegible] | 39 00 | .... |
| 1½ in. | 43 00 | 36 00 |
| [illegible] | 45 00 | 36 00 |
| [illegible] | 70 00 | 36 00 |
| [illegible] | 73 00 | 38 00 |
| [illegible] | 75 00 | 42 00 |
| [illegible] | 84 00 | 50 00 |
| 3¼ in. | .... | 58 00 |
| 3½ in. | 77 00 | 60 00 |
| 4 in. | 90 00 | 75 00 |

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | 50 |
| [illegible] | 16 |
| [illegible] | 19 |
| [illegible] | 26½ |
| [illegible] | 15 |
| Cylinder or Capitol | 15½ |
| Cylinder or Acme | 46½ |
| Standard cutting compound, per lb. | 0 06 |
| Lard oil, per gal. | 2 50 |
| Union thread cutting oil, antiseptic | 85 |
| Acme cutting oil, antiseptic | 35½ |
| Imperial quenching oil | 39½ |
| Petroleum fuel oil | 12½ |

BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30-5[illegible] |
| Standard | 10[illegible] |
| Car leather facing, No. 1 | 1 25 |
| Leather in sides | 1 75 |

TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Mayer Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

WASTE.

| White. | Cents per lb. |
|---|---|
| XXX Extra | 20 |
| Peerless | 20 |
| Grand | 19 |
| Superior | 19 |
| X L C R | 18 |
| Atlas | 18 |
| X Empire | 18 |
| Ideal | 17 |
| X press | 16 |

Colored.

| | |
|---|---|
| Lion | 14½ |
| Standard | 13 |
| No. 1 | 13 |
| Popular | 11¾ |
| Keen | 10½ |

WOOL PACKING.

| | |
|---|---|
| Arrow | 25 |
| Axle | 20 |
| Anvil | 15 |
| Anchor | 11 |

WASHED WIPERS.

| | |
|---|---|
| Select White | 12 |
| Mixed colored | 10 |
| Dark colored | 09 |

This list subject to trade discount for quantity.

RUBBER BELTING.

| | |
|---|---|
| Standard | 10[illegible] |
| Best grades | 15 |

ANODES.

| | |
|---|---|
| Nickel | 50 to 54 |
| Cobalt | 1.75 to 2.00 |
| Copper | .44 to .46 |
| Tin | 49 to 56 |
| Zinc | .23 to .25 |

Prices Per Lb.

COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | 55 00 | 48 00 |
| Copper wire, list plus 10. | | |
| Plain sheets, 14 oz., 14x60 in. | 55 00 | 48 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 60 00 | 54 25 |
| Copper sheet, planished, 16 oz. base | 64 00 | 49 00 |
| Braziers', in sheets, 6x4 base | 55 00 | 48 00 |

BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 43 |
| Brass sheets, 24 gauge and heavier, base | 0 48 |
| Brass tubing, seamless | 0 55 |
| Copper tubing, seamless | 0 60 |

PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 06 |
| Emery glue | 15 to 20 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 35 |

Prices Per Lb.

LEAD SHEETS.

| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $18 00 | $18 00 |
| Sheets, 3½ lbs. sq. ft. | 18 00 | 18 00 |
| Sheets, 4 to 6 lbs. sq. ft. | 17 50 | 17 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

| | |
|---|---|
| Acid, boracic | $ .15 |
| Acid, hydrochloric | .05 |
| Acid, hydrofluoric | .14½ |
| Acid, nitric | .10 |
| Acid, sulphuric | .05 |
| Ammonia, aqua | .08 |
| Ammonium carbonate | .15 |
| Ammonium, chloride | .11 |
| Ammonium hydrosulphuret | .40 |
| Ammonium sulphate | .07 |
| Arsenic, white | .12 |
| Copper, carbonate, anhy. | .35 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .70 |
| Iron perchloride | .20 |
| Lead acetate | .16 |
| Nickel ammonium sulphate | .12 |
| Nickel carbonate | .35 |
| Nickel sulphate | .15 |
| Potassium carbonate | .75 |
| Potassium sulphide (substitute) | .20 |
| Silver chloride (per oz.) | .65 |
| Silver nitrate (per oz.) | .55 |
| Sodium bisulphite | .10 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .41 |
| Sodium hydrate | .04 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | .14 |
| Tin chloride | .60 |
| Zinc chloride | .60 |
| Zinc sulphate | .09 |

Prices per lb. unless otherwise stated.

## METAL PRODUCTION IN CANADA IN 1917

THE Department of Mines estimates the production of metals from Canadian ores in 1917 as follows: Gold, 17,000,000 ounces; silver, 23,500,000 ounces; copper, 113,000,000 pounds; nickel, 84,800,000 pounds; lead, 56,700,000 pounds; zinc, 31,000,000. The production of pig iron was about 1,186,000 short tons, and steel ingots and direct steel castings 1,735,000 short tons. The production of coal was about 14,100,000 short tons. The production of gold, silver, copper and coal was less than in 1916. The production of nickel, lead, zinc, pig iron and steel was greater than during the previous year.

Higher prices received for silver, coal and other products considerably enhanced the total value of the mineral production. It is estimated to have been not less than $200,000,000, as compared with $177,201,534 in 1916.

## U. S. SHIPPING BOARD ESTIMATED OUTPUT

FIVE million deadweight tons is the United States Shipping Board's estimate of America's 1918 output of shipping based on builders' reports that show the Government's programme of 8,246,308 tons is 18.2 per cent. on its way to completion.

The forecast is a minimum estimate with one labor shift figured. Every effort will be made to put on two, and wherever possible three shifts in yards throughout the country. With the task of designing models, the problem, according to Shipping Board officials, is that of obtaining labor and materials.

The reports disclose that the wooden programme is 9 per cent. under way, the requisitioned steel ships 39 per cent., and the contract steel ships 4 per cent. on their way to completion.

## LUMBER TRADE PROSPERING IN BRITISH COLUMBIA

GENERALLY speaking, the lumber mills of the Province of British Columbia have had a good year, although increasing supply costs and the shortage of labor have given the lumbermen cause for worry. In 1916 the Government figure for the total lumber cut of the province was 1,280,000,000 feet. In 1917 lumbermen say they would not be surprised to see the total cut approach the billion and a half mark. The 1917 cut on the British Columbia coast alone is estimated at close to a billion feet.

The mills last year cut a lot of heavy timber for shipbuilding. Conditions on the prairies were also fairly good and a good deal of lumber was shipped there. Although the export trade was fair, the shortage of ships curtailed the total volume of business.

The increase in the price of labor and supplies, and all classes of mill machinery and accessories having gone up in price, have been responsible during the year for increased lumber prices. Millmen hold out no hope that conditions will be any better during this year, and higher lumber prices may be looked for in 1918.

Some spruce is being cut locally for aeroplane construction, but there is not so much spruce in this section of the province as is supposed. The bulk of the spruce supply of British Columbia lies in the north, and it will be the northern mills which will cut most of the spruce for aerial service. The Munitions Board is now working out a plan for securing large quantities of this spruce for shipment east.

**Submarine Boat Corporation Building Steel Ships.**—The keel of the first of the steel ships in the Submarine Boat Corporation's yard at Newark, N.J., was laid last Thursday by Edward M. Hurley, chairman of the Shipping Board. The programme calls for completion of 150 steel ships in Newark yards. The Newark Bay plant is one of the largest in the United States and was over 90 per cent. completed in 67 days. It will be possible, officials stated, to have 28 ships under construction at one time in the yards.

# ANNOUNCEMENT

Our Service Department, realizing the necessity for securing equipment for the manufacture of shells owing to the difficulties attendant on the importation of Machine Tools from the United States, have purchased the Drawings, Patterns and jigs of the famous

## "Montreal Shell Lathe"

**FOR BORING AND TURNING 6" AND SMALLER SHELLS**

This Lathe was designed and developed by the Montreal Foundry & Machine Co., and has attained an unexcelled reputation among Munition Manufacturers on 6" Shell Operations.

We have completed arrangements for the manufacture of this Tool with a well known Canadian Machine Tool Manufacturer and expect to be making deliveries in the near future.

Our SERVICE DEPARTMENT will be pleased to send you specifications, prices and deliveries.

## A. R. Williams Machinery Co., Ltd.

**64-66 FRONT STREET W., TORONTO**

# PRACTICALITY

AFTER fifteen years' study of the Miner's and Lumberman's wants, we know just what is and what is not required in tools for them.

Practicality has been the keynote of our organization. Experience has aided us in eliminating all unnecessary parts and in perfecting the design of our tools.

The use of best material and finest workmanship enable us to manufacture tools that are unexcelled.

We make a complete line.

Write us for prices.

**J. W. CUMMING & SON, LTD.**
NEW GLASGOW, - - CANADA
*Wood or Steel, let Cummings make it.*

# Cost Reducers for Shell Makers

SPECIAL PURPOSE SHELL TOOLS

Designed for use in our own Factory and found so satisfactory that other Shell Factories have asked for and been supplied with them:

Boring Lathes
Base Boring Lathes
Waving Lathes
Band Turning Lathes
Hydraulic Band Presses
Shell Grinding Machines
Shell Cleaning Machines
Undercutting Machines
Finish Tapping Machines
Inside Profiling Machines
Nicking Machines
Centering Machines

We can supply any of the above complete, ready for use, **at about half the cost of ordinary tools for the same purpose**, or we can furnish you with **a complete set of castings** ready for you to machine and set up.

We have sold these to many Shell Factories in Canada, and have had many testimonials regarding their good qualities and economy in use.

## Marsh & Henthorn, Limited

**Belleville - - Ontario**

# INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

## ENGINEERING

**Toronto, Ont.**—Plans have been drawn for the erection of a one storey addition for the Canadian Fairbanks Morse, Ltd., Bloor Street, to cost $4,000.

**Toronto, Ont.**—A $6,500 building permit has been issued for a one-storey brick foundry to W. H. Banfield & Sons, to be erected at 372 Pape Avenue.

**Toronto, Ont.**—The Spruce Falls Pulp & Paper Co. have acquired pulp limits in the Kapuskasing District, Northern Ontario, and will erect a pulp and paper mill.

**Toronto, Ont.**—The Holden Morgan Co., 579 Richmond Street, West, is having plans prepared for the erection of a building to cost $4,000 to manufacture munitions.

**St. John, N.B.**—Contracts for the electrical equipment for the Municipal General Hospital have been let, but tenders are being received on boilers, pumps, valves and fittings, etc.

**Winnipeg, Man.**—The Vulcan Iron Works, Ltd., will build an addition to its plant to cost $65,000. Tenders are being received by Woodman & Cubbidge, architects, 302 Lindsay Building.

**Toronto, Ont.**—Permission has been granted to the Cluff Ammunition Co. to construct a one-storey steel frame and corrugated iron cooling and shipping plant at 28 Atlantic Avenue to cost $10,000.

**Toronto, Ont.**—The Bond Engineering Works, formerly the Queen City Foundry, will build an addition to their plant on Cherry Street at a cost of $8,500. Contracts for the building have been let.

**Toronto, Ont.**—The Canada Type Foundry has been granted a permit by the City Architect's Department for the erection of an addition to their factory at 70-72 York Street. The cost of the addition is placed at $18,000.

**Regina, Sask.**—Damage to the amount of $30,000 was done at the Imperial Oil Co. plant last Thursday afternoon when the condenser box between stills seven and eight exploded. Fire resulted, burning a considerable quantity of oil. One workman was slightly injured. The company's fire department was able to cope with the flames.

**Toronto, Ont.**—The following permits have been issued to the British Forgings, Ltd., for additions and alterations to their plant at the corner of Liberty Avenue and Atlantic Avenue:—Storage buildings and addition to forge shop, one-storey frame and galvanized iron, to cost $15,000; one-storey frame and galvanized iron addition to forge shop at a cost of $[illegible]; one-storey frame and galvanized iron garage, $1,000; one-storey steel and galvanized iron addition to storehouse, also addition to office, to cost $1,000; pump house and office for munitions plant, $1,200; one-storey frame and galvanized iron building, to cost $2,500.

**Windsor, Ont.**—Representing the Canadian Steel Corporation, Mr. O. E. Fleming, K.C., at a meeting of the Border Utilities Commission, held last Thursday, made an announcement that official Governmental sanction had been received for a new water works system to serve the Town of Ojibway, where the Canadian Steel Corporation is engaged in the construction of a large steel plant. The plans for the water works system were submitted some time ago, Mr. Fleming stated. An intake pipe to be laid 250 feet out into the Detroit River will bring the water to the pumping and chlorination station for distribution.

**Toronto, Ont.**—The Ontario Government will develop big pulp and paper industry in the Kapuskasing district. Hon. G. Howard Ferguson has awarded to Messrs. Munday and Stewart, of 84 King Street east, who are understood to be representing American interests, the right to cut pulpwood and timber upon the Kapuskasing pulp and paper limit. The company to be formed will be required to erect at Kapuskasing a pulp mill costing with machinery and equipment not less than a million dollars; to operate it so that the daily output shall be not less than 100 tons of pulp, and to employ an average of 200 hands for ten months of the year. The company will also be required to erect a paper mill with a daily capacity of 75 tons a day whenever directed by the Government. The winning tender offered the government a flat rate of 75 cents per cord for all pulpwood and $15 a thousand for pine.

**Montreal, Que.**—F. G. Daniels, general manager of the Dominion Textile Co., announced recently that work on the new St. Lambert factory would be started during the coming summer. The destruction of the Halifax mill has made it necessary to hasten the South Shore plans, and while the operations during the coming summer will not be on an extensive scale it is proposed to erect a weave shed and the preparatory buildings during the summer. The agreement entered into with the town of St. Lambert provides for a commencement of construction work two years after peace has been declared. The new plant is to be built of reinforced steel and concrete, and will cost something like $3,000,000. Mr. Daniels explained that it would not be feasible to go ahead with any extensive building at the present time in view of the prevailing cost of material and machinery. He explained that restrictions placed on the manufacture and export of machinery from England made it practically impossible to carry on extensive construction just now.

## GENERAL

**Calgary, Alta.**—The Alberta Flour Mills will build a flour mill to cost $1,500,000.

**Montreal, Que.**—The Dominion Cement Co. contemplate building a plant to cost $100,000.

**Toronto, Ont.**—The W. G. Hunt Co. will build a factory on Dundas street to cost $10,000.

**Watford, Ont.**—The Andrews Wire Co. contemplate the erection of an extension to their factory.

**Deseronto, Ont.**—The Dominion Match Co. have started work on the construction of an addition to their factory here.

**Paris, Ont.**—The Alabastine Co., whose factory was gutted in a recent fire, contemplate rebuilding. Approximate cost, $35,000.

**Brockville, Ont.**—On Dec. 18 the Anvern cheese factory, located on the old Hough farm, at Fairfield, was burned to the ground. The cause of the fire is unknown. The place was owned by Samuel Walker. The loss will be covered by insurance.

**Winnipeg, Man.**—Entailing a loss estimated at $250,000, the large terminal elevator of the Northern Elevator Co., in St. Boniface, containing 80,000 bushels of grain, was completely destroyed by fire on Dec. 22. The fire originated under the dryer. Several workshops and storehouses in connection with the elevator were destroyed.

**Oshawa, Ont.**—Oshawa Town Council last Tuesday decided to submit a by-law to the citizens to give the Thornton Rubber Co., composed of Toronto business men, a fixed assessment of $5,000 per annum on the premises of the defunct Ontario Malleable Steel Range Co. for a period of ten years, with a cash bonus of the end of that time of $10,000, should the company carry out all its undertakings. The new industry will engage in the manufacture of waterproof textile goods.

## MUNICIPAL

**Belleville, Ont.**—The Town Council contemplate the installation of an electric pump.

**Renfrew, Ont.**—The Town Council contemplate the purchase of pumps for the waterworks.

**Brussels, Ont.**—The town is anticipating the installation of a new electric light plant shortly.

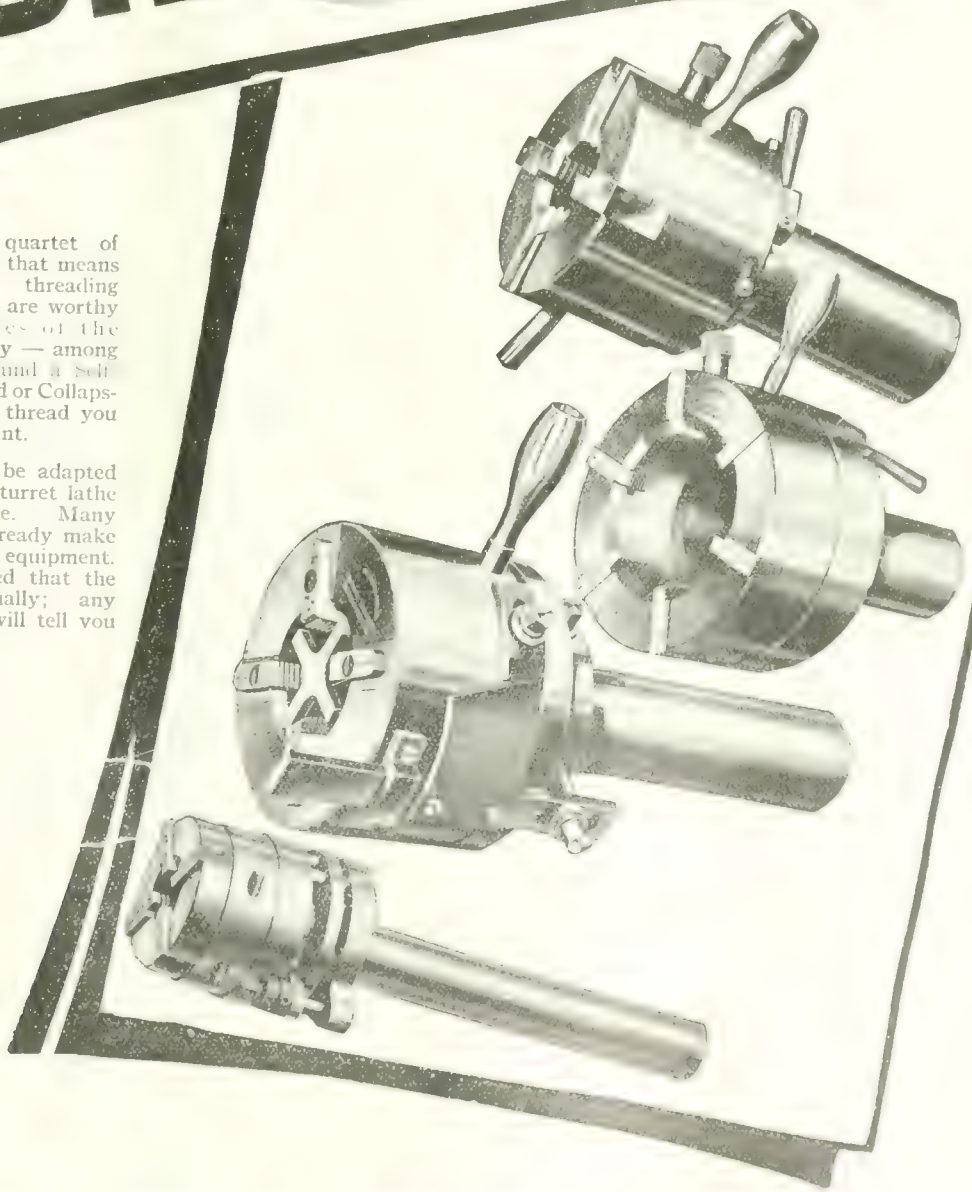
**Lumsden, Sask.**—The local electric light and power company will be purchased by the Town Council at a cost of $7,000.

**New Liskeard, Ont.**—The ratepayers will vote on a by-law on January 7 to

# GEOMETRIC DIE-HEADS

HERE'S a quartet of die heads that means death to threading trouble. They are worthy representatives of the Geometric family — among which can be found a Self-Opening Die Head or Collapsing Tap for any thread you could possibly want.

These tools can be adapted to any make of turret lathe or screw machine. Many manufacturers already make them standard equipment. We are convinced that the rest will, eventually; any Geometric user will tell you why.



## THE GEOMETRIC TOOL COMPANY
NEW HAVEN CONNECTICUT

**Canadian Agents: Williams & Wilson, Limited, Montreal; The A. R. Williams Machinery Co., Limited, Toronto, Winnipeg and St. John, N.B.**

raise $1,475 for the purchase of road machinery.

**Galt, Ont.**—By-law will be submitted to the ratepayers on Jan. 1, for an extension to waterworks system, costing $18,558.

**Bassano, Alta.**—The Town Council contemplate the purchase of an electric pumping unit, costing approximately $2,000.

**Brantford, Ont.**—The Town Council has passed the following by-laws: $100,000 for waterworks improvements, and $6,500 for purchase of new school site.

**Ottawa, Ont.**—It is proposed to spend $128,000 for construction of a new bridge over the Rideau River at St. Patrick Street. A by-law will be voted on at the elections on January 7.

**Alliston, Ont.**—The ratepayers will vote on a by-law on January 7 to authorize an expenditure of $6,000 for elecrifying the pumping plant of the town of Alliston. J. E. Addis, town clerk.

**Hamilton, Ont.**—The ratepayers of Barton Township will vote on a by-law on January 7 to raise $55,000 to purchase necessary material and equipment for installation of electric light and power system.

**Perth, Ont.**—The municipality propose to raise $120,000 by municipal debentures and to purchase the local electric and waterworks plant from the present owners, the Canadian Electric and Water Power Co.

**Owen Sound, Ont.**—The King Shoe Co. propose to establish a factory here if the town will guarantee bonds for $30,000. A by-law will be submitted to the ratepayers on January 7 in connection with this proposition.

**Whitby, Ont.**—The following by-laws have been passed by the Town Council: $1,150 for construction of sewer laterals; $3,200 for low level pumping station; $5,700 for extension waterworks and electric light.

**Forest, Ont.**—A by-law will be submitted to the ratepayers on January 7 in connection with the purchase of an electric fire engine, apparatus, appliances and appurtenances for fire protection, to cost $8,500.

**Toronto, Ont.**—The Ontario Railway and Municipal Board has aproved of the by-law of the Township of York with regard to an application to lay water mains on four streets. These mains will be laid on Rogers road, Lambton avenue, Dufferin street and St. John's road, and will be 12-inch size. They will connect with the city waterworks system, and the city is suppling the water, as agreed by contract.

**Simcoe County, Ont.**—The following [illegible] York pending the return [illegible] America of Lord Northcliffe, is on the Imperial Munitions Board and also president of the Dominion Textile Co., Montreal.

**H. C. Opie,** sales agent for the Arthur by-laws of municipalities have been guaranteed by the Simcoe County Council: Midland, $25,000 aid to the Midland [illegible] for patriotic grants; Collingwood, $13,000 for patriotic purposes; $9,000 under Debenture Act of 1899; $3,500 for cement sidewalks, curbs and gutters; Creemore, $1,600 for school building and hydro construction.

**Toronto, Ont.**—Works Commissioner Harris has reported to Mayor Church that the contractors for the Don section of the Bloor Street Viaduct had completed their work, which had been accepted. As soon as weather conditions permit the Works Department will proceed to lay foundations for the car tracks and the permanent pavement. Although many residents in Wards One and Two would like to have the new thoroughfare opened for pedestrian traffic immediately, it cannot be done this winter.

**Ottawa, Ont.**—Commissioner Macallum has written the Board of Control that the estimate of $128,000 placed in the by-law which is to be submitted to the ratepayers as the cost of a new bridge over the Rideau River at St. Patrick Street was not supplied by his department. A three span steel arch bridge would cost $190,000, he said, and a four span bridge $180,000. It is now too late to have the amount named in the by-law changed. It is suggested, however, that the Ottawa Electric Railway Co. may be expected to pay part of the cost of the bridge.

## PERSONAL

**Frederick G. Clarke,** president of Clarke & Clarke Ltd., leather manufacturers of Toronto, died suddenly in Baltimore, Md., recently while on his way to Florida for the benefit of his health.

**John M. Park,** member of the boilermaking firm of Park Brothers, and one of Chatham's most prominent business men, died at his home on Queen Street, Chatham, Ont., on Dec. 24. He was 57 years of age.

**Sir Charles Gordon,** who has been appointed to represent the British Govern- Balfour Co., Ltd., of Montreal, has been on a six weeks' trip through the Eastern Provinces, and while on this trip had the memorable experience of being one of those who survived the terrible disaster at Halifax. While sitting quietly in a room at the hotel, Mr. Opie suddenly found himself blown through an opening from which the door had just been torn. Before leaving the stricken city Mr. Opie aided in the relief work for some time after the accident.

## TRADE GOSSIP

**The Sherbrooke Machinery Co.** of Sherbrooke, Que., has increased its capital stock from $20,000 to $100,000.

**The Consumers' Metal Co.** has increased its capital stock from $40,000 to $150,000.

**The Roelofson Elevator Works,** Galt, Ont., have the contract for elevator equipment for manufacturing plant for the Alabastine Co., Paris, Ont.

**Building Situation at Windsor, Ont.**—During the year 1917, the city engineer of Windsor, Ont., issued 616 building permits having a total value of $1,155,000.

**Building Statistics for Regina.**—The building statistics for the City of Regina, Sask., show that for the year 1917, up to Nov. 30, there were 174 permits issued having a total value of $415,410.

**Substitute for Platinum Found.**—Rhotanium, the name of a new substitute for platinum, is an alloy of metals of the platinum group, and is being used for crucibles, ignition tubes and thermo couples.

**Chief Mining Provinces in Canada.**—Ontario and British Columbia are the chief mining provinces of Canada, the former producing 45.32 per cent. and the latter 22.66 per cent. of the mineral output of the Dominion in 1916.

**No Change in Coke Prices.**—A report from Washington states that there will be no general revision of coke prices for the year 1918. Fuel Administrator Garfield last Saturday issued an order continuing in force the prices fixed last September.

**The Jonathan Bartley Crucible Co.,** Trenton, N.J. announce that they have engaged the services of E. P. Welton of Stamford, Conn., to represent them in the sale of their line of crucibles and reorts through New England and Canadian trritory.

**Iron Ore Shipping.**—Authorities say that mines in the Lake Superior district will be in a position to produce and ship 70,000,000 tons of iron ore during the 1918 season. This would compare with a high record of 64,734,198 tons of ore shipped in the 1916 season.

**U. S. Government Fixes Price of Silver.**—A price to be paid by the United States Government for silver in agreement with western producers has been agreed upon and will be announced soon. It is said to be satisfactory to the producers and will be about one dollar an ounce.

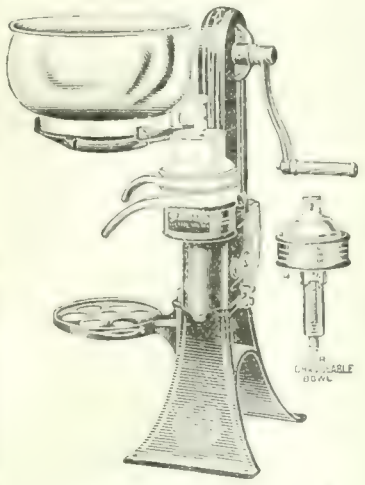
**Building Situation At Three Rivers.**—The value of building permits at Three Rivers, Que., for 1917 shows a decline when compared with the two preceeding years, the figures being as follows; 1915, $484,205; 1916, $537,345 and 1917, $422,950. The prospects for 1918, however, are improving and a better year is looked for than in 1917.

**Building Situation in Winnipeg.**—The building operations in Winnipeg for the year 1917 include 1,231 permits and 1,263 buildings erected at a cost of $2,206,500. City Architect Robert E. Davies predicts that the building operations during the coming year will be about the same as in 1917.

**License Not Needed for Goods in Transit.**—The war trade board at Washington has advised the Department of Trade and Commerce, Ottawa, that commodities passing through the United States in transit and not for consumption in that country do not require an import license. United States collectors of customs have been instructed to this effect.

**Iron Ore Shipments On Great Lakes.**—The closing of the season's navigation on the Great Lakes shows that the water

# This Machine Abounds With Live Selling Features



It is reasonable to expect heavy sales with a machine that outskims all others.

The Standard proves its claims by Canadian Government Dairy Schools Tests.

The Standard gets all but the last pound of butter-fat in five tons of milk skimmed. That record is convincing to both dealers and to the ultimate user. The result, as we have proven by experience, means splendid business. It will pay you to handle the

**Made in the British Empire** *Standard* CREAM SEPARATOR

Besides, the Standard has many other exclusive features that clinch sales. Its capacity may be changed from the [illegible] hour sizes up to 100 gallon capacity by simply changing the bowl and accessory parts. A new machine is not necessary.

Repair Parts carried in stock at chief distributing centres.

Our illustrated literature describes every selling feature in detail, including the self-oiling system [illegible] how the butter made from the cream the Standard separates is superior in firmness, due to our exclusive curved wing centre piece, etc., etc. Tests are fully described.

Catalogue and prices will be sent to responsible [illegible] are F.O.B. Montreal, St. John or New York. Immediate shipments can be made of all sizes.

Renfrew Household Scale [illegible] handy; guaranteed accurate; furnished with or without Canadian Government inspector's certificate [illegible] lbs. Scales are shipped with parts knocked down and all parts are numbered for easy assembling.

AGENTS: We invite correspondence from responsible agents to handle the Standard Cream Separator and Renfrew Household Scale. Write for descriptive catalogues and price lists. Careful packing and prompt shipments are guaranteed.

**The Renfrew Machinery Co., Limited, Renfrew, Ontario, Canada**



# Are you the man we need?

SOMEWHERE in Canada there's a man we would like to meet.

He may be a machinist, an office man, timekeeper or salesman. He may not be able to boast a college education, but so long as he has ambition and good judgment a lack of the higher education will not prove a handicap.

The man we want is a man whose fighting spirit would have carried him to France had he not been prevented. A man with energy and push and ambition and resourcefulness.

The work we have in mind for such a man would not be congenial at first (to a man lacking the qualities named) but it would prove the open door to splendid opportunities later (and not so very much later either, perhaps).

If you are not satisfied with your present outlook and feel, right down in your heart, that you could SELL (with proper direction), then write us.

If you are a hustler, prove it by replying promptly to this advertisement, and to prove you are thorough-going, give full particulars as to age, experience, present salary, etc. Replies will be considered strictly confidential.

Box 364,
CANADIAN MACHINERY.

# Waiting Your Request

[illegible]

M Air Cylinders, Air-Operated
E 2 and 3 Jaw Chucks, M.E.C.
C Master Hinge Collet Chucks
and Collapsible Taps.

[illegible]

**MANUFACTURERS EQUIPMENT COMPANY**

75-179 N. JEFFERSON STREET, CHICAGO, ILL.

Canadian Agents: J. R. Stone Tool and Supply Co., Detroit, Mich.
New York: J. R. Stone Tool and Supply Co., 30 Church Street

movement of iron ore in 1917 reached 62,498,901 tons, against 64,734,198 tons in 1916, the record year, and 46,318,804 tons in 1915. Probably 2,000,000 tons have been moved by rail this year, making total Superior shipments approximately 64,500,000 tons, or about 3.50 per cent. under the 1916 grand total.

**C. P. R. Has Built Many Cars.**—During this year the Canadian Pacific Railway has built over sixty thousand box cars in addition to many ordered from outside. The business of the railroads has increased so enormously since the Government undertook to supply Great Britain with foodstuffs and munitions, there is a considerable scarcity of cars, though the situation is being ameliorated through the efforts of the Canadian Railway War Board.

**Hamilton, Ont.**—The Canadian Cartridge Co. of this city has received from the United States Government an order for the manufacture of brass cartridge cases. Owing to the recent curtailment of munitions manufacturing in Canada the Canadian Cartridge Company has contemplated a partial shutting down, but it was intimated that the new order from Washington is large enough to assure the extensive staff of this concern plenty of work for many months to come.

**B. C. Spruce for Airplanes.**—Hon. T. D. Pattullo, Minister of Lands for British Columbia, stated recently that private enterprises have made definite arrangements to complete plans whereby about ten million feet of airplane spruce a month will be procured and placed on the market for disposal along the essential channels. Other concerns are making tentative plans which will be certain to materialize just as soon as the engineers now making practical investigations succeed in making their findings.

**Canadian Firm Extends Operations to U. S.**—The A. R. Williams Machinery Co., Toronto, in order to handle the increased demands on their munitions service department by American manufacturers, have incorporated the A. R. Williams Machinery and Supply Corporation of Buffalo, N.Y. T. B. Reid, formerly manager of the machine tool department of the Toronto house, will be in charge, supported by a number of Canadian experts. The offices of the Corporation are in Fidelity Building, Main Street, Buffalo.

**Railway War Board Aids Coal Saving.**—The Canadian Railway War Board calculates that in the measures it is taking for the elimination of passenger trains it will be able to save 100,000 tons of coal. Without incommoding the public there will be elimination wherever possible. The Railway War Board has gone carefully into the matter of passenger service, with the thought of conservation in [illegible] power. The crews liberated from passenger trains that are cut off may be [illegible]

**To Expand British Trade.**—The British Board of Trade have had under consideration the [illegible] to establish Trade Commissioner service in the British Empire. According to recent press despatches from London, it is now proposed to increase the number of Trade Commissioners in several of the Dominions, and to appoint commissioners in India, and in some of the Crown colonies and protectorates. It is understood that several commissioners are being appointed in Canada, which has hitherto been served by only one British Trade Commissioner.

**Flotation System of Canadian Invention.**—A contract has been let for the installation of a flotation plant on a molybdenite property near Amos, on the Transcontinental Railway and about twenty miles from the St. Maurice lines. The Groch centrifugal system of flotation is attracting more than ordinary attention. Arrangements have been made for the installation of a machine at the McIntyre Porcupine, the second largest gold producer in the Dominion. The machine will be for experimental work. The Groch machine is the product of Canadian inventive genius and is manufactured by Canadian labor.

**Winnipeg Hydro Has Good Surplus.**—The report of the Winnipeg Hydro-Electric department for the month of October shows a surplus to date of $144,537.69 over operating expenditure. The revenue for the month of October amounted to $91,907.75, with operating expenses figuring at $84,650.97, leaving a surplus for the month of October of $7,256.78. The six months ending October 31, however, showed a deficit of $23,640.28, but as there was a surplus of $168,177.97 on hand at the beginning of the year, there still remains to the credit of the Hydro-Electric system a net surplus of $144,537.69.

**Steel Price Schedule Extended.**—The fear that the present price schedules now prevailing in the iron and steel trade in the United States will be altered is gone and the trade has the satisfaction of knowing that it will enter 1918 upon established bases. The War Industries Board has recommended to the President the indefinite extension after January 1 of the prices fixed last September. It is expected that the President will issue a proclamation extending the present schedule. Whether a definite period will be named remains to be seen, but it is believed that some readjustments will come within the next ninety days.

**Two Patrol Boats Launched at Polson's.**—At 1.30 o'clock on Christmas afternoon two Government fishery patrol boats were launched at the Polson Iron Works. One was christened by Miss Church and the other by Miss Russell, daughter of John S. Russell. Those attending the ceremony included Mayor Church, Douglas Eby, Lieut.-Col. J. B. Miller, Sanford Evans, Ottawa; Holt Gurney, Mr. and Mrs. Osler Wade, Mr. and Mrs. T. G. McConkey, and Jos. McGregor. In order to launch the boats, each 130 feet in length, the ice in the bay had to be cut through to make a clearing. Both boats will be completed [illegible] time navigation opens.

**Sherbrooke, Que., Building Statistics.**—The building permits for 1917 amount to $254,000. This amount shows a decrease, compared with last year's operations, which is due to high cost of materials and scarcity of labor in this line; owing to these facts, many large contracts had to be postponed, and the number of permits issued were only for urgent works, which kept the building trades very busy during the season. For 1918 the outlook is as follows: As long as the war lasts it is not expected that any very large contracts will be proceeded with, but tre usual repairs and alterations, and erection of small buildings will no doubt be undertaken, there being a great demand for tenement houses and small dwellings.

**Cheaper Power at Orillia.**—The Water, Light and Power Commission has made a reduction of 20 per cent. in the rates, which will mean a total saving of over $12,000 per annum. This was rendered possible by the completion of the new plant at the Swift Rapids, which provides all the power the town requires for its industries, whereas formerly a large quantity had to be purchased from other sources in addition to what was obtained from the old plant at the Ragged Rapids. The power rate is now $13.50 per horse-power per annum for ten-hour power and $18 per horse-power for a 24-hour service. The light rates are correspondingly low, the consumers having their choice of flat or meter rates.

**C.A.S.E. Exhibitors' Association.**—The 29th Annual Convention of the Canadian Association of Stationary Engineers will be held at London, Ont., June 25, 26 and 27. As unanimously decided at the last anual meeting, the usual exhibition of power plant supplies will be held. The feeling of the meeting was that the convention and exhibition teach economical and efficient methods in the power plant and thus assist in the national effort to induce industrial production. London is a good centre for the convention, being a large growing city in the centre of Western Ontario, with distributing lines leading to all the important towns and cities in the Western part of the province. Full particulars regarding hall and other arrangements will be available at a later date. The secretary is Gordon C. Keith, 32 Colborne Street, Toronto.

**Situation in the Leather Trade.**—The chairman of the Tanners' Section of the Board of Trade, in his address at the annual meeting held in Toronto last week, said: "I believe that during the last eight months conditions generally throughout the leather market have not been satisfactory, and this may be accounted for to a considerable extent by the great increase in the cost of labor, tanning materials and fuel for power purposes, also the placing of an embargo in February by the British Government against shipments of leather to the British market, which embargo still continues, but figures show also that there is a considerable increase in the amount of leather shipped from Canada to Australia and New Zealand. There can be no question but that

the tanning industry in Canada is firmly established, as there has not been a single assignment or failure during the year."

**Move to Relieve Freight Congestion.**—The United States railways, like the Canadian, are cutting down their passenger traffic radically. Even on the main arteries of passenger travel, such as those between New York and Washington, two or three trains a day have been taken off single roads, because the passenger trains were blocking the freight service. One measure to avoid congestion of freight at ports, effective for the last three years in Canada, has just been adopted by the American lines. New York and the other Atlantic ports in the United States have been and still are badly jammed with freight awaiting shipment. Now, however, the situation is being relieved by the adoption of the Canadian system of refusing to accept freight for export, unless the shipper can show that space on ship has been reserved for it ahead of time. This system is now in full operation, under the direction of the export division of the general operating committee of the American Railway Board, which has offices in New York.

## ELECTRICAL

**Parkhill, Ont.**—The Town Council propose installing a hydro-electric system here.

**Hamilton, Ont.**—The ratepayers of Barton Township will vote on Jan. 7 to sanction an expenditure of $55,000 to purchase necessary material and equipment for installation of electric system.

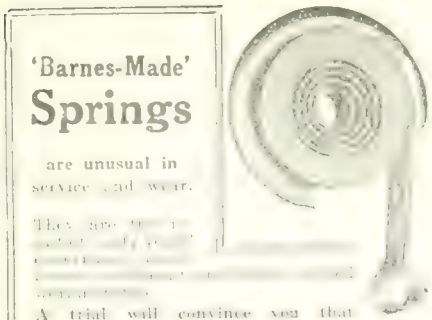
**Perth, Ont.**—The Hydro-Electric Commission proposes building a transmission line between Perth and Smith's Falls in order to supply the town with power. It is proposed to change over the present generating stations and distributing system from 133 cycles to standard 60-cycle equipment.

## MARINE

**Toronto, Ont.**—The Dominion Shipbuilding Co. has taken out a permit for the foundation of their new building at the foot of Bathurst Street; foundations to be of timber and piles to cost $15,000.

**Victoria, B.C.**—It is reported that the Foundation Co., will establish another large wooden shipbuilding plant on the North Pacific Coast. The location of the proposed new plant had not definitely been decided upon but it was intimated that it rested between Puget Sound and the Columbia River districts.

**Esquimalt, B.C.**—Yarrows, Limited, have been awarded the contract for repairing the Grand Trunk Pacific liner Prince John, which ran aground near Skidegate in the Queen Charlotte Islands two weeks ago. The damage is only of a minor nature; three or four shell plates forward will have to be renewed. The job of placing the Prince John in seaworthy condition again will occupy about a week. It will then go north to resume the service between Prince Rupert and the Queen Charlotte Islands.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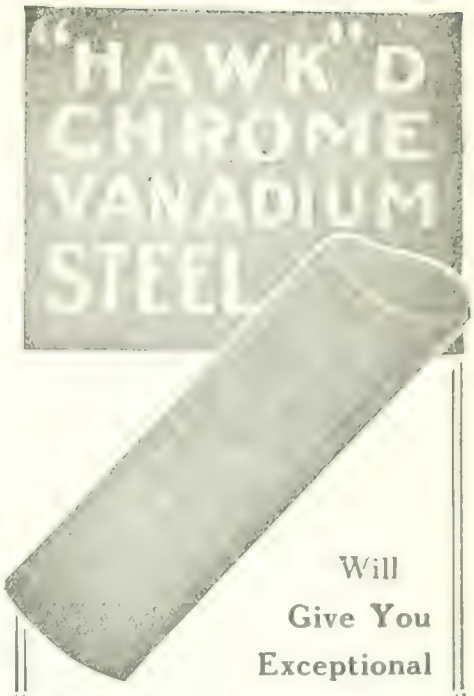


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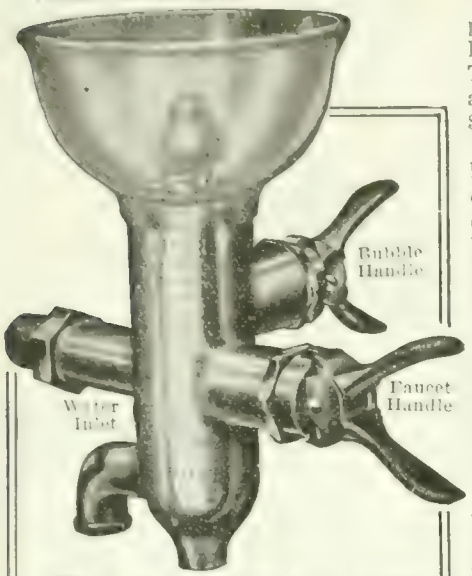


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# CONTRACTS

**Toronto, Ont.**—The Jackson Lewis Co., Toronto, has been awarded contract for the erection of an addition to cost $30,000 to the factory of Canadian Aeroplanes, Ltd., Dufferin Street.

# INCORPORATIONS

**The Okotoks Electric Co.** of Calgary, Alta., has been incorporated with a capital of $20,000.

**The King Shoe Co.** has been incorporated at Ottawa by John S. King, W. F. Marquardt, and F. W. Wenegast, of Toronto, to manufacture boots and shoes at Owen Sound, Ont., with a capital of $100,000.

**Rae Machine Tool Works Ltd.** have been incorporated at Toronto with a capital of $45,000 to manufacture machinery and appliances of all kinds at Hamilton. The provisional directors are Willis B. Sturrup, John J. Duggan and Craig McKay.

**Douglas Bremner & Co.** has been incorporated at Ottawa by W. S. Johnson, W. S. Wilson and A. R. Hall, all of Montreal to carry on business as civil and hydraulic engineers, foundrymen and machinists, etc., at Montreal with a capital of $50,000.

**The Wedgerite Piston Ring Co.** has been incorporated at Ottawa with a capital of $49,000 to manufacture a patent piston packing, also engines and motors of all kinds at Montreal. The incorporators are Ulric and Ernest Duchesne and Charles A. Gareau, all of Montreal.

**The Great Lakes Steel Corporation** has been incorporated at Ottawa by Frank Regan, William N. Irwin, and E. J. Murphy, all of Toronto, to manufacture iron and steel products of all kinds at Owen Sound, Ont., with a capital of $1,000,000.

**The Eugene F. Phillips Electrical Works,** Montreal, has changed its name to that of Phillips, Ltd. The company has also been incorporated with a capital of $4,000,000 to engage in the manufacture of wire cables and electrical apparatus of all kinds.

**British Explosives Ltd.** has been incorporated at Ottawa by D. M. McLean, F. E. Westergard and A. C. E. Owen all of Ottawa, to manufacture explosives, chemicals, acids and fertilizers of all kinds. The chief place of business is at Ottawa and the capital is $50,000.

**The Newell Manufacturing Co.** has been incorporated at Ottawa with a capital of $45,000 to manufacture sheet copper, brass, steel, tinplate, etc., at Prescott, Ont. The incorporators are: Edgar A. Newell, William A. Newell, and Albert P. Newell, all of Ogdensburg, N.Y.

**Electric Smelting Co., of Brantford, Ltd.,** has been incorporated at Ottawa with a capital of $45,000 to manufacture steel castings by the electric furnace process at Brantford, Ont. The incorporators are H. M. McIntyre, John Ker and Philip H. Secord, all of Brantford, Ont.

**O'Connors Ltd.** have been incorporated at Ottawa with a capital of $100,000 to carry on business as steel and iron founders, tool makers and engineers. The chief place of business is at Montreal and the incorporators are Andrew P. O'Connor, Walter P. O'Connor, both of Sorel, Que., and Edward A. D. Morgan of Montreal.

**Imperial Oil Ltd.** has been incorporated at Ottawa with a capital of $50,000,000 to acquire, and take over as a going concern the refining and the business of marketing petroleum and its products now carried on by the Imperial Oil Co., with head office at Toronto. The incorporators are W. C. Teagle, C. O. Stillman and G. W. Mayor, all of Toronto.

# RAILWAYS

**Ottawa, Ont.**—Hon. J. D. Reid, Minister of Railways, has received information from the executives of the Canadian Government Railways at Halifax that the work of reconstruction is proceeding rapidly. At Pier "A" the grading for tracks is fifty per cent. complete and grillage is being made for sheds. At the dockyard some material is delivered and construction of buildings under way, and repairs being made to the naval hospital. At new Pier 2 repairs are far enough advanced so that hospital ships may be docked after the 26th. The elevator is expected to be in service by the 23rd or 24th. North Street station tower has been removed and the roof is being sealed.

# CATALOGUES

**Gravity Conveyors.**—Bulletin describing gravity conveying systems made by the Lawson Company, Boston, Mass. A number of colored illustrations show various applications of the Lawson system to suit different classes of service.

**A Sure Hit** is the title of an illustrated folder featuring the line of quarter-turn cocks made by the Homestead Valve Co., Homestead, Pa. Patriotism, Homestead, Economy are referred to as a three-cornered combination that always hits the mark.

**Three Jaw Air Chuck.**—The Manufacturers' Equipment Co., Chicago, have issued an attractive catalogue dealing with a labor saving device in the form of a three jaw air chuck. The principal features of this chuck are fully described while detail illustrations are given showing the mechanism.

**Machine Tools.**—The Bilton Machine Tool Co., Bridgeport, Conn., have issued a new series of bulletins describing an interesting line of machine tools including automatic gear milling machines, manufacturing milling machines, riveting machines and gear hobbing machines. Each size of the various types of machine is illustrated together with specification and full description. The bulletins are bound together in a loose leaf folder and gotten up in an attractive manner.

**Line Reaming Bearings.**—The Taft-Peirce Mfg. Co., Woonsocket, R. I. have issued a new bulletin No. 101, describing the Martell system of line reaming bear-

ings in preference to hand scraping of bearings to obtain true alignment. The bulletin deals with the necessity of true alignment, particularly in high speed machines such as gasoline motors, for which the reamer was specially developed, and proceeds to describe the construction and operation of the Martell reamer. All the parts of the reamer are illustrated and described in detail, special mention being made of its principal features. Special applications of the Martell reamer are also described and accompanied by illustrations showing its construction. Other illustrations show the reamer in operation on various classes of work for both large and small bearings.

## BOOK REVIEW

**Tests of Oxacetylene Welded Joints in Steel Plates.**—A series of tests of the strength of oxacetylene welded joints in mild steel plates has been completed by the engineering experiment station of the University of Illinois under the direction of H. F. Moore, Research Professor of Engineering Materials. Specimens were supplied by the Oxweld Acetylene Company of Chicago and tests were made in the laboratories of the Station at Urbana under three conditions of loading: (a) static load in tension (in a testing machine); (b) repeated load (bending), and (c) impact in tension (in a drop testing machine). For joints made with no subsequent treatment after welding, the joint efficiency for static tension was found to be about 100 per cent. for plates one-half inch in thickness or less, and to decrease for thicker plates. For static tension tests, the efficiency of the material in the joints welded with no subsequent treatment was found to be not greater than 75 per cent. The joints were strengthened by working the metal after welding and were weakened by annealing at 800 degrees C. For static tests and for repeated stress tests, the joint efficiency sometimes reaches 100 per cent.; the efficiency of the material in the joint is always less. This indicates the necessity of building up the weld to a thickness greater than that of the plate. The impact tests show that oxacetylene welded joints are decidedly weaker under shock than is the original material; for joints welded with no subsequent treatment, the strength under impact seems to be about half that of the material. In general, the tests results tend to increase confidence in the static strength and in the strength under repeated stress of carefully made oxacetylene welded joints in mild steel plates. The results of these tests have been published as Bulletin No. 98 of the Engineering Experiment Station, copies of which may be obtained without cost by addressing C. R. Richards, Director, Urbana, Illinois.

The physician was soliciting information from the patient's wife.

"Does he grind his teeth in his sleep?" he asked.

"Oh, no," said the wife. "He don't wear 'em to bed."


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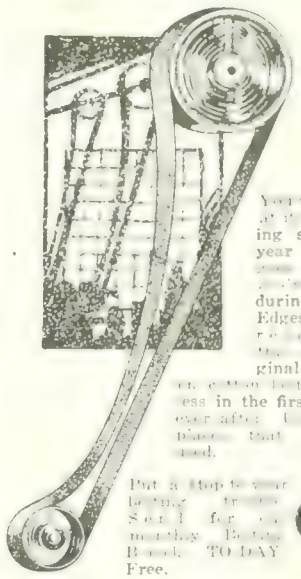

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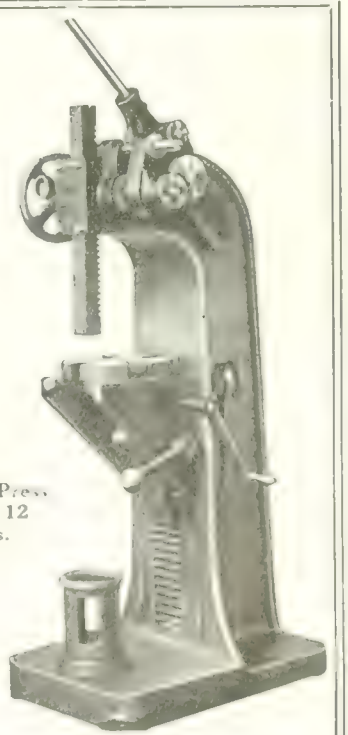

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WANTED — GOOD SECOND-HAND GAP [illegible] (approximately 18" x 36", with long [illegible] to 4" centre. Also good used 24" or [illegible] turret, about 12" x 60". Turret [illegible] Box 367, Canadian Machinery. (c1m)

WANTED ONE NEWTON OR ESPEN-LUCAS second-hand cold cutting saw, with capacity for sawing sections up to 20" in diameter. Address Ellis O. Friedman, Inc., 82 State Street, Albany, N.Y. (c3m)

WANTED ENGINE LATHE, 18 TO 24-INCH x 10 or 12-foot bed. Give full particulars and price. Northwestern Iron Works, Regina, Sask. (c9m)

WANTED A GOOD, POWERFUL TURRET lathe for 4.5 shell work. Second-hand and in first-class order. Price must be low. Box 366, Canadian Machinery. (c26m)

WANTED DESIGNS, SHOP DRAWINGS, tracings, estimates, specifications made to requirements by experienced practical engineer and designer. Any mechanical proposition carried through. Box 363, Canadian Machinery. (c6m)

WANTED — COMPLETE BOLT AND NUT machinery to manufacture sizes ¼-inch diameter and up. Advise offerings in either second-hand or new. Box 360, Canadian Machinery, Toronto. (c2m)

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"The fact is the answers have surpassed our expectations, and we feel certain of being in touch now with the proper parties in Canada to arrange our business there most satisfactorily.

"If in further need of your assistance along these lines in the future, we shall most surely avail ourselves of your valuable space again."

## Perhaps we can help you to get what you want.

*Canadian Machinery's Classified Advertising Section*

# CANADIAN MACHINERY

## AND MANUFACTURING NEWS

*A weekly newspaper devoted to the machinery and manufacturing interests.*

Vol. XIX. TORONTO, JANUARY 10, 1918 No. 2


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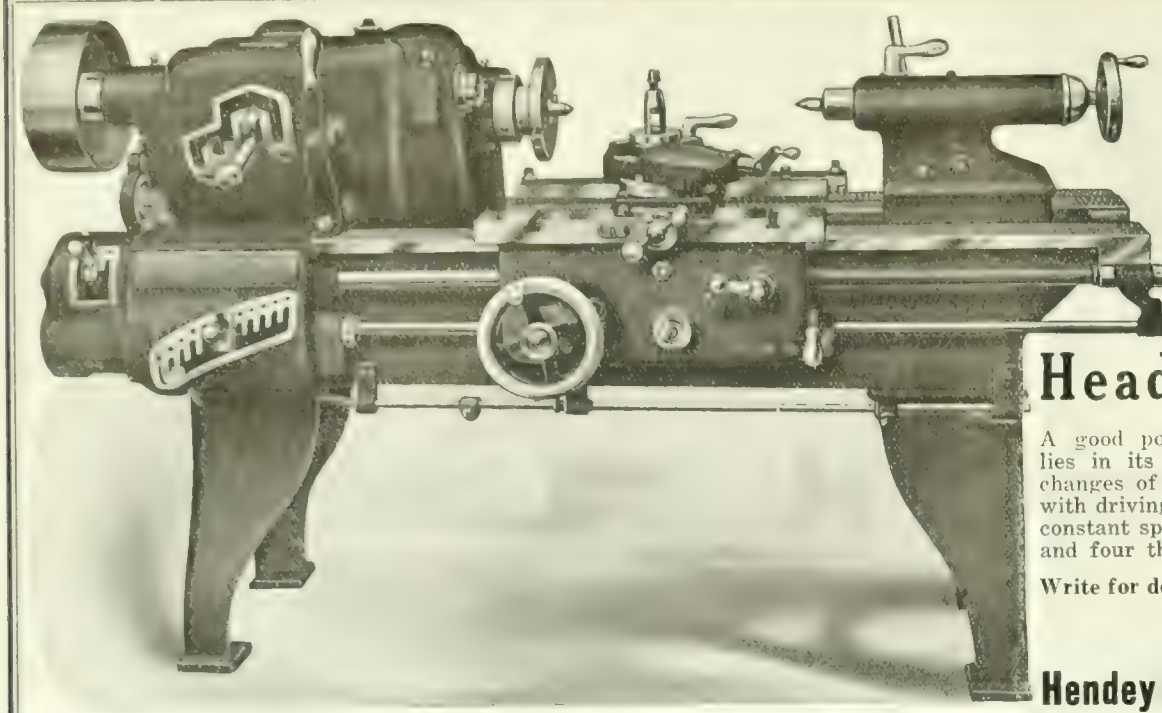

# Hendey 18-inch Geared Head Lathe

A good point in this lathe lies in its eight mechanical changes of speed for spindle with driving shaft running at constant speed — four direct and four through back.

**Write for descriptive circular.**

**The Hendey Machine Co.**
**Torrington, Conn.**

Canadian Agents: A. R. Williams Machinery Co., Toronto, Ont.; A. R. Williams Machinery Co., 260 Princess St., Winnipeg; A. R. Williams Machinery Co., Vancouver; A. R. Williams Machinery Co., St. John, N.B.; Williams & Wilson, Montreal.

## SPEED, ACCURACY, ADAPTABILITY

Thirty-six different threads and feeds are had through mounted change gearing, each change being quickly made through controlling handles in gear boxes.

Lathe has automatic stop for stopping carriage in either direction when feeding or screw-cutting—invaluable for internal work to shoulders and for duplicating pieces.


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# Shell Machining Pitfalls--4.5 in. H.E., Marks VII. and IX.

By H. A. Wilson *

*The extent and duration of shell production has enabled considerable progress to be made in the standardizing of methods and devices whereby machining losses are kept at a minimum. There still exists some diversity of opinion, due probably to local conditions, regarding the superiority of certain routine or apparatus. The writer's opinions presented in the following article represent specialized practice which has proven satisfactory.*

WITH the revival of the shell industry in Canada, perhaps a few suggestions in reference to simple operations which have the faculty of causing trouble would help some contractors who have recently gone into the shell business for the first time, or who have started to manufacture a new type of shell. Thus in the following paragraphs the writer will try to describe briefly a few trouble savers and money savers which three years of experience have shown were good investments.

**Special Attention to Centering Base Ends**

Most firms, in the rough turning operation, support the base end of the shell with a tail centre. It is very important that the centering be carefully watched, so that this centre is absolutely concentric with the hole in the forging. A badly worn die used in the piercing operation in forging will sometimes leave small longitudinal ribs in the interior walls of the forging. A common method for centering in a lathe or under in drill press is to use a locating arbor, either solid or expanding, which enters the shell forging. Such ribs, as referred to above, will cause the centre to be more or less eccentric. Sometimes a hard bit of scale will throw the locator out. The shell should be thoroughly examined and if these obstructions exist they should be removed. A mechanical method is to use a rough form tool with a double blade operated by a drill press spindle.

If a shell, which has been centred off centre, passes through the rough turning and goes on to the boring lathes in nine out of ten cases there will be a thin wall and a thick wall and the boring tools will have a tendency to follow the hole. Some people claim to have overcome this by using a single tool in the bar on the first boring operation. This does overcome the difficulty as far as the straight portion of the bore is concerned, provided that the fixtures are sufficiently rigid to resist the tendency to "work" and "spring," but when the roughing and finishing form tools go into the bottom they form a pocket. To overcome this a tool to form the bottom of the bore has been designed. It is simply a double form tool about fifty per cent. longer in the body than the average tool. This costs money for high speed steel and it would appear that proper centering is the easiest and most economical method to adopt to escape the difficulties of a thin wall. No one has yet discovered a method of salvaging a shell with a thin wall.

*Manager, J. C. Wilson & Co., Belleville, Ont.

**Deductions from Rough Turning Experiences**

The writer's experience has been entirely confined to the British 4.5 high explosive shell. Rough turning was tried both with one tool and two tools, also at various speeds and on various diameters. Taking all things into consideration, economy in high speed steel, and sustained output, it was proved that one tool holds up better and will remove more steel at about 40 revs. per min. than at any other speed. A broad cutting surface is used and a coarse feed. The shell is turned one diameter from base to nose. One tool is sufficient.

**Face Base Square Before Boring**

No one need impress the experienced shell manufacturer with the importance of the weight in high explosive shells. The thickness of metal in the base has resolved itself into the determining weight factor. Boring is a final operation on one portion of the base. If the base has not been faced square with the rough turned body there is a chance of making a thin base, if the bottom of the shell is being used against a stop. It has been demonstrated that it pays to set up a machine to finish the base square just previous to boring.

**Boring and Nosing**

A few points on boring have been mentioned in the foregoing paragraph. Rigidity is one of the main requirements. The type of lathe which has a large cast iron spindle which will bore out to allow the shell to be chucked in the main bearing gives best results. The large bearing also shows but little wear. Nine out of ten turret lathes made for this purpose fall down under pressure of constant use. If a designer can get a turret that will not work loose, this type of fixture is to be preferred, and roughing and finishing can be completed with one chucking. Designs of satisfactory turrets are available, some which have given satisfaction over a long period of constant

WEIGHTS.
4.5 IN. MK. IX.

| | H.E. | L.D.W. |
|---|---|---|
| AFTER INSIDE PROFILE SHELL WEIGHS | 28 2 | 29 13 |
| BASE SHOULD BE FACED TO WEIGH | 27 11 | 27 13 |
| BASE RECESS CUT, NO BAND GROOVE | 26 7 | 26 2 |
| BASE RECESS AND BAND GROOVE CUT | 26 4 | 25 15 |
| BASE PLATE IN, NO BAND | 27 2 | 26 13 |
| FINISHED SHELL, UNPAINTED | 27 8 13 | 27 2 1 |
| METAL REMOVED IN BAND GROOVE | 3 oz 4 dr | |
| BASE PLATE IN SHELL ADDS | 14 oz | |
| COPPER BAND IN SHELL WEIGHS | 6 oz 8 dr | |

FIG. 1. WEIGHTS WORKED TO ON MK. IX SHELLS.

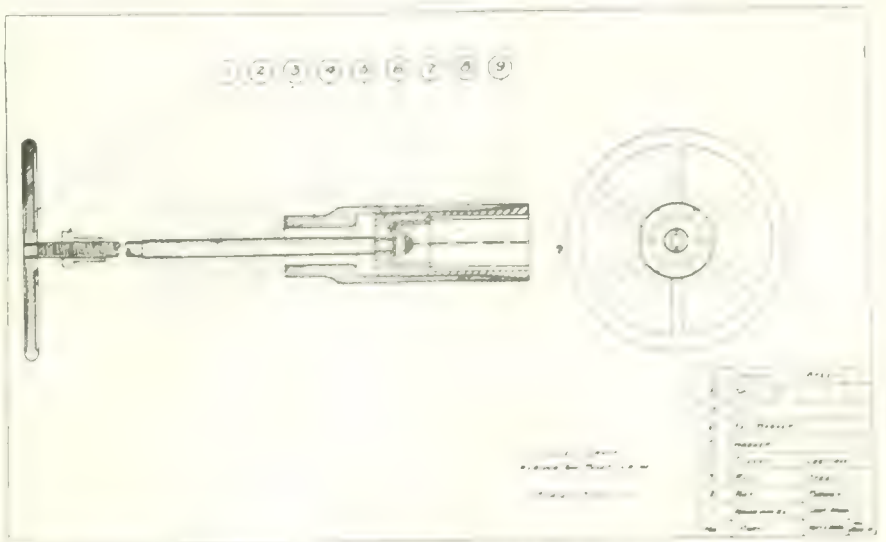
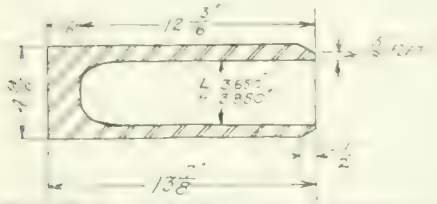


FIG. 2. TYPE OF [illegible] LARGE BOTTOM CAST IRON SPINDLE SHELL CHUCKED [illegible] AT REAR END.

are. The main boring bar had in two diameter cast integral with a specially designed carriage having a long bearing on the ways of the lathe gives excellent results but only one operation can be completed on one lathe and roughing and finishing must be done on different machines which requires extra handling. This is not necessary on a shell of so small a calibre as the 4.5 in. howitzer.

Properly designed form cutters for finishing the bore are essential. Clearances, rakes, etc., are available at any one of a large number of shops.

In getting uniform results in nosing it has been found very useful to trim the nose end of the shell while it is in the boring lathe making all shells uniform in length within one thirty-second of an inch. It is also good practice to bore shells within a few thousandths of the low limit in diameter. This allows you to gain weight in case a short shell or thin base turns up. It also helps to guard against thin walls. Shells which are hard to bore smooth can be polished smooth in a grinder of simple design. Lathes boring 4.5 in. shells can operate at about 75 revs. per min. Feeds must



DIMENSIONS OF SHELL WITH CHAMFERED NOSE. READY FOR NOSING.

be adjusted to suit the hardness of the steel and whether finishing or roughing these feeds vary from one-sixteenth to three-sixteenths of an inch.

### Chamfer or Bell-mouth

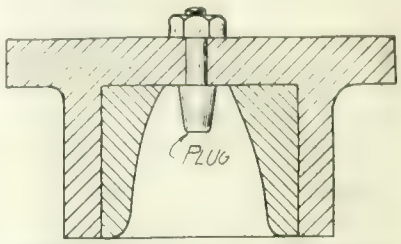
The nose is usually chamfered in the nosing operation. It is a question now as to the advisability of chamfering the outside of the shell or making it "bell-mouthed." Both methods give good results. The amount of metal removed has to be accurately determined by experiment so that approximately the correct amount is left to be properly formed in nosing. These general dimensions shown in the accompanying line cut are the ones which the writer feels safe in recommending, provided that a nosing die and plug of the dimensions shown are also used. To get these results the shell, after nosing, must have been "upset" so that its overall length is 13 1/16 in. Further the shell must be heated in a furnace uniformly. If hotter on one side than another when nosed, the cooler side will not act under the die as the hotter side and the probability is that the shell will have to be fitted with a socket. Similar defects in nosing will be encountered if the shell is heated lower down on one side than another. If the shell is turned from one quarter to one half turn every half minute to minute the heat will be found to be very uniformly distributed. The shell should be a white heat on the nose and all appearances of a glow should disappear at a distance of three and one half inches from the nose. As long as a shell is not burnt on the tip of the nose it is not too hot.

### Nosing Furnace

The furnace that has given the best all around satisfaction for heating 4.5 in. shells is an oil fired furnace of either the low pressure or high pressure type. Originally these furnaces were equipped with a cast iron front waterjacketed. To nose properly the later marks of 4.5 in. shells, there was great difficulty in getting the proper heat. Solid brick fronts were then tried. The shells were heated faster than the press could nose them and consequently shells were burned, and were thus spoiled. Several nosing sheds, and in some cases whole factories, were burned, from these overheated furnaces. A happy medium has been developed. This is in the shape of a cast iron front waterjacketed with one layer of brick placed behind it. Very satisfactory results have been obtained from this type of front and at a reduction in the consumption of oil.

The shell has a tendency to bulge if heated below a point three and one half inches from the nose. This bulge is later removed in the finish turn operation leaving a thin wall. If a shell is too cool on the nose and heated too far down this bulging becomes a serious factor. To get shells all nosed to a uniform length the shell is held in a heavy type hinged vie. This vise comes against the die and die holder and thus acts as a stop.

The question of whether it is advisable to chamfer the nose on the outside or make the shell bell-mouthed is a difficult one. The writer prefers to chamfer the outside as shown. This type of shell is nosed with less power and the chamfering offers less wear to the die. It, however, is harder on the plug. The metal seems to grip the plug and heat it to a red heat. When the shell is removed the downward pull on the hot plug seems to draw it out forming a thin neck into which the metal is forced and the shell thus grips the plug. A high speed steel plug properly tapered does not lose its temper at a red heat and thus resists and overcomes the difficulty. Plugs can be arranged to be easily removed and thus if a plug becomes distorted it can be replaced. Plugs can be




TYPE OF CHILLED DIE USED FOR NOSING SHELLS.

repaired and used many times. The bell-mouthed shell gives more die trouble and less plug trouble.

A water cooled die is not an unqualified success, and cast iron chilled dies have largely replaced hardened die block steel dies. Thus the least troublesome way to cool a die is to shoot water right up into it for a few seconds after each shell is nosed and previous to lubricating it. The high speed steel plug does not seem to be harmed by this treatment and the chilled cast iron die seems to be improved. To lubricate the plug and die a cheap form of foundry facing is used, mixed with any low-grade oil, which does not give off too much smoke. A small hole through the centre of the plug one quarter inch in diameter will carry away a lot of smoke. Three thousand pounds hydraulic pressure on a press with 12 in. diam. plunger is used.

### Gauging After Nosing

Immediately after nosing it is good practice to run a high speed drill 1 11/16

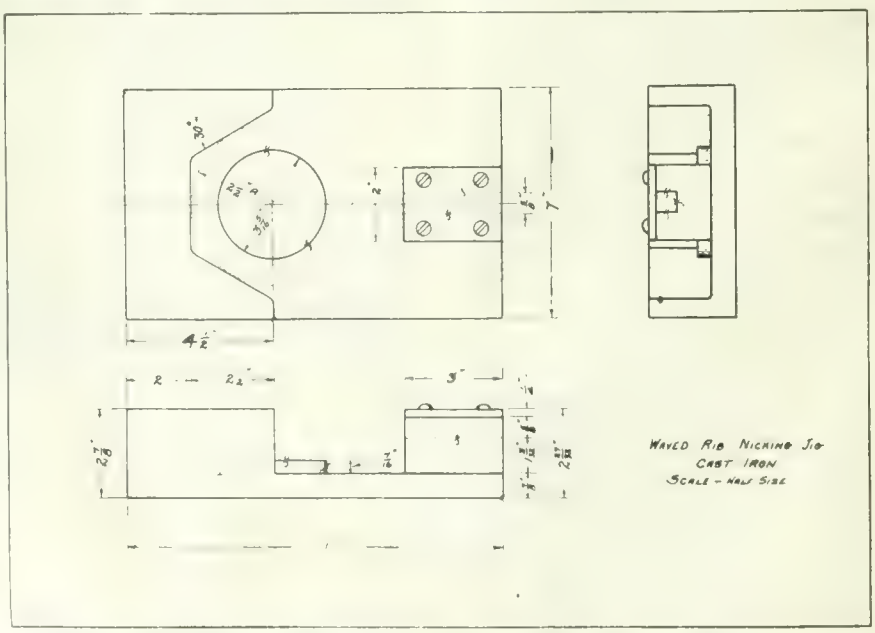



FIG. DEVICE OR JIG FOR NICKING THE WAVED LINES IN THE DRIVING BAND GROOVE. THIS JIG HOLDS THE NICKING CHISEL IN PLACE.

in. diam. into the nose. The amount of metal in the nose is then gauged, also it is noted if it has been located symmetrically with the axis of the shell. If any irregularities appear the shell is laid aside and later rectified by being nosed again with a special plug somewhat larger than the normal size which displaces the eccentric metal and allows the shell to be recovered with but little or no expense.

### Operations on Nose

The succeeding operation is to machine the nose. A boring bar with a single tool roughs out the surplus metal. Next bar carries a flat, double blade reamer which leaves the hole in the nose a few thousandths smaller than the finished diameter of the container seat. A similar type of reamer, floating in its bar, next reams the nose to the diameter of the tips of the threads and this bar works to a stop which allows it to go only to that point which is later to be recessed. The rough boring tool carries a small tool which levels the nose. Thus three bars complete this operation.

### Finish Turning

Finish turning comes next. A very accurate expanding centre has been fitted to the live spindle of the lathe. This has been found to give better results than loose centres with squared ends for driving. A speed of 80 revs. per min. with from 1/32 to 3/64 feed gives good results in practice. High speed steel ½ in. square is used in Armstrong tool holders. For months past broken high speed tools have been reclaimed by annealing them and forging down to size.

A profile former on the rear of the machine gives the proper contour to the shell. It is so arranged that the pulling in of the tool slide toward the centre of the lathe is done by positive mechanism. Springs have nothing to do with the transverse motion of tool slide when the tool is travelling towards the head stock. When being returned, however, the springs keep it in register with the former. All shells are turned with the carriage travelling toward the head stock of the lathe.

### Inside Profiling

This is done with a solid form tool carried in a special form of bar made of hardened cast steel. The inspector on this machine should see that all shells are profiled between the following weights:—High 28 lbs. 5 ozs.; low 27 lbs. 15 ozs.

### Milling Nose Thread

Milling threads in the nose has to a considerable extent superseded the collapsible tap method. There are machines on the market to day which true up the fuse seat at the same chucking. This machine has two speeds. At the high speed, a lathe tool trues up the fuse seat and when a lever is thrown the machine revolves at low speed and the thread is milled. In this machine the shell is chucked from two points in conical locators one near the tip of the nose and the other at the base. This method gives more accurate and concentric results than when chucked only from the main body of the shell.

### Finishing the Recess and Container Seat

An old nose thread miller was utilized for this operation. Two small milling cutters are placed on the spindle. The cutters are of the following dimensions: 1½ in. dia. x 3/16 in. face and 1 5/16 in. dia. x ¼ in. face. Stops are provided for the machine and the larger cutter mills the recess below the thread while the smaller cutter mills the container seat to size. No hand tapping, no hand reaming nor trueing of fuse seat by hand is necessary to enable shells to pass the shop or government examiners.

WEIGHTS

4.5" HOWE Mk VII

| | HIGH lbs. ozs. | LOW lbs. ozs. |
|---|---|---|
| Finish Turned Shell Be Cut To Weight | 27-14 | 27-10. |
| Base Recess Cut, No Band Groove | 26-6 | 26-2. |
| Base Recess And Band Groove Cut | 25-14 | 25-10. |
| Base Plate In, No Band | 26-12 | 26-8. |
| Finished Shell, Unpainted | 27-8 | 27-3. |
| Metal Removed In Band Groove | 8 ozs. | |
| Base Plate In Shell Adds | 14 ozs. NET. | |
| Copper Band In Shell Adds | 12 ozs. | |

FIG. 4. WEIGHTS WORKED TO ON MK. VII SHELLS

### Facing Base to Weight

The rivetted base plate is used and great care is used in facing metal from the base of the shell. Roughly speaking 1/64 in. removed from the base of a shell removes one ounce. The base is faced in for a distance of ½ in. from the outside at that point where, (if it were faced square all the way across) it would leave the shell weighing between the limits:—high 27 lbs. 15 ozs., low 27 lbs. 10 ozs. The number of sixty-fourths removed are calculated from the rule stated above, after shell has been weighed. It has been the practice to bring the shell through shop to this stage with an excess thickness of metal in the base and an excess length. As there is approximately one quarter of inch between gauge limits the weight can easily be adjusted here.

### Machining Recess in Base

The roughing out of metal for the base recess has been accomplished in rather a unique and simple way. High speed steel 1½ x ¾ in. is used. This is cut on a bias so as to have a cutting edge of 1 9/16 in. as shown in illustration. The steel is held in a rigid tool holder. A special jointed bar is placed in the tail spindle which enables the tool to be fed into the work easily as a large handwheel has been placed on the end of the tail spindle. As high as sixteen and seventeen shells an hour have been turned out from this lathe over an extended period of ten hours. With proper clearance and rake on the tool the machine, which is driven by a 3½ in. belt, handles the work easily. The jointed bar allows the carriage to be pulled back quickly as the shell can be removed from the chuck without moving the tailstock.

The recess is then trued up in another machine to the proper diameter and is

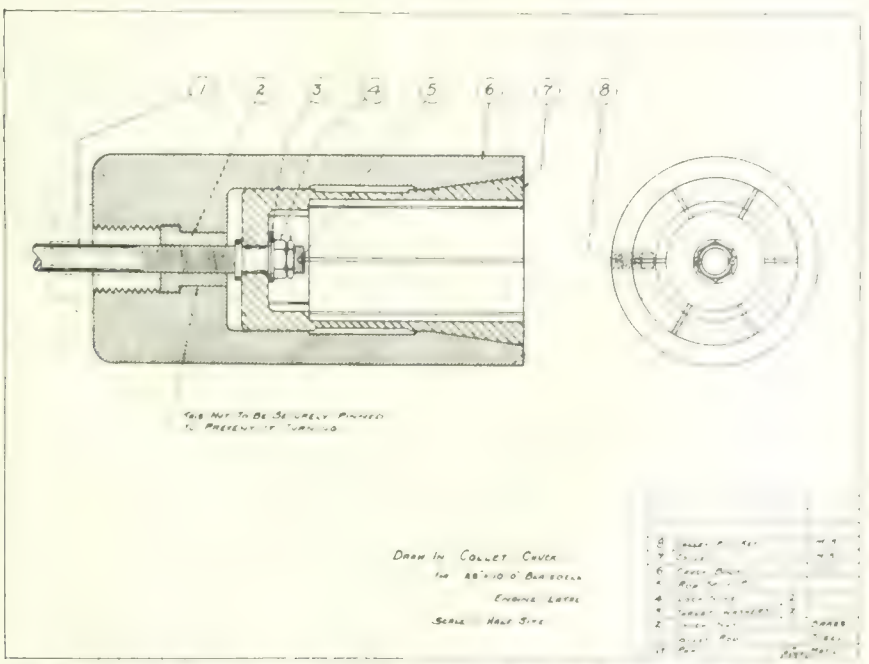
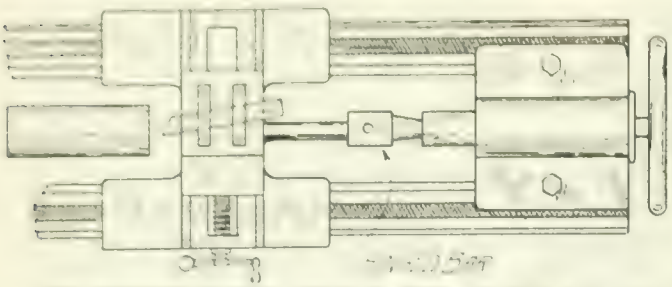


FIG. 5. SIMPLE COLLET CHUCK USED FOR 4.5 SHELLS MK. VII AND MK. IX. THIS TYPE OF CHUCK USED ON HOLLOW SPINDLE LATHES. TIGHTENED WITH AIR CYLINDER OR HANDWHEEL WITH NUT.

face square across the bottom. A glass finish here makes the riveting of the base plate a more difficult matter than if some tool marks are visible.



ARRANGEMENT OF TAIL SPINDLE WITH JOINTED BAR USED IN RECESSING BASE.

### Machining the Driving Band Groove

This operation has been accomplished in a multitude of ways and seems to present no great difficulties if a careful operator is chosen. Eighteen to twenty shells an hour are common records for a sustained output of ten hours.

### Cleaning Interior for Inspection

A very rapid and efficient method of cleaning the interior of shells and removing all traces of the cutting compound is to place a loop of leather on the end of steel spindle which is driven at about 1,000 revs. per min. Place in the shell a handful of dry abrasive sand, preferably a silica sand, push the shell up to the spindle allowing same to enter the shell. A little carriage on rollers running on a track is necessary. Then start the spindle in motion and the leather will give the interior of the shell a good polishing, centrifugal force throwing it against the formed wall of the shell.

Blasting with steel shot is the final cleaning operation. This chilled steel shot is preferable to sand blasting because it is dustless, or practically so, and can be done anywhere in the shop.

### Succeeding Operations

Pressing bands should be done before the base plate is rivetted. Rivetting base plates and turning bands follow in the succeeding operations. These present no difficulties to the machinist neither does the simple operation of putting the three slots in the nose.

### Varnishing

Cleanliness is the slogan for this operation. It is useless to try to get results in the open shop. A separate, dust proof room is essential. As air drying varnish is not permitted in Canadian shells a baking oven is required. An electric oven is best suited to the purpose for obtaining uniform results.

Just previous to the entry into the varnish room or immediately afterward, a good practice is to wash the shell out with a turpentine substitute such as terpol. Then wipe thoroughly with rags free from "lint." Varnish gives a more uniform covering if poured into the shell through a fine muslin strainer and then drained out again. This method insures against all brushing trouble and patent spray troubles. It takes a little longer but it is a "safety first" practice. An excellent method of preventing varnish from entering the threads and recess of the nose is to get some thin sheet rubber packing and make packing washers. Place these little washers in the recess, below the thread. From 2 in. dia. boiler tubes make thimbles as illustrated. Screw the thimbles down into the shell and have them nip tightly against the washer. This absolutely protects the thread and recess from varnish. The rubber washers are only used once. The thimbles are used over and over again. After each baking the thimbles are put in a hot solution of lye which removes all traces of varnish and leaves them clean for the next heating. A clean transparent coating is required. The proper results can be obtained if a good grade of two hour copal baking varnish is used and it is watched carefully and kept strained; regular practice being to bring the oven up to about 350 deg. F. and keep it there for one hour and a half. Different grades of varnish require different treatment.

### General Practices

Shop inspection is vital. It should be so organized as to look over every shell from every machine. When a machine gets a trifle out of adjustment the first shell that comes off wrong should be caught and the machine adjusted. If six shells a day have to be repaired, it will pay a good share of an inspector's wages. Inspectors keep the quality of the product up and if the shop is balanced it maintains that balance. It enables a firm to make a quicker turnover on the money invested in wages. All shells which can be repaired and salvaged with nose sockets and other means should be taken care of as they accumulate. The loss in allowing them to stand over is greater than most executives realize.

The collet chuck has proved its superiority over all others. It can stand up day in and day out. In hollow spindle lathes a rod and nut with a handwheel at the outer end is a common method of tightening. An air cylinder is used to advantage on short operations where frequent chucking is necessary. A nut on the front of the chuck can be used to advantage on solid spindle machines.

Base plate operations do not give much trouble as a rule. The face of a base plate may have fins removed and the face trued up smooth by placing a hardwood face plate on a small speed lathe, and glued to the face plate a sheet of emery cloth No. 2½. About a twelve inch face plate is a good size. Press the base plate against this when in motion and the results will be surprising if the face plate has been planed true.

Soluble oil gives quite as good results as the expensive paste preparations. Any good reliable oil company can deliver a good grade of soluble oil.

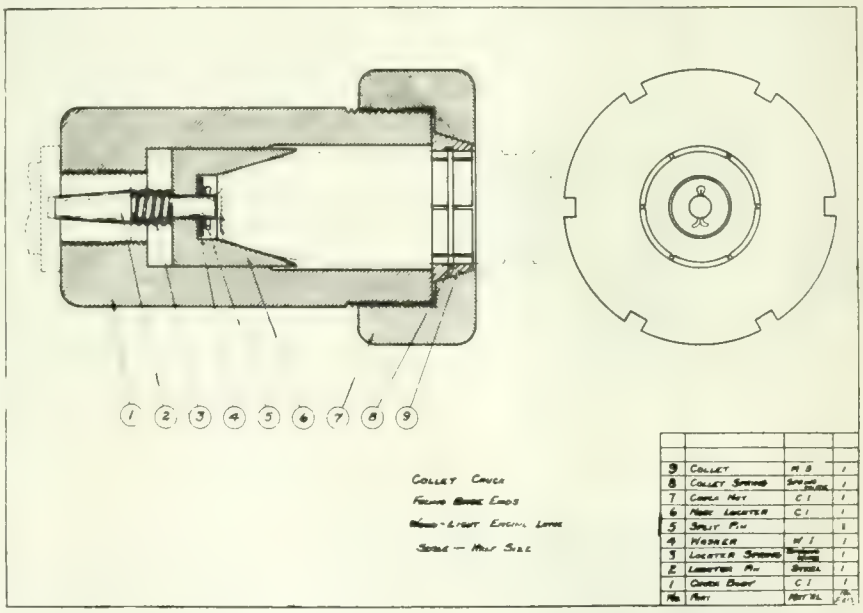


FIG. 6. TYPE OF CHUCK USED ON OLD SOLID SPINDLE LATHES. NOTE THE SMALL COLLET OF STEEL. LARGE ROUND BARS OF STEEL ARE HARD TO GET. NOTE THE SMALL AMOUNT OF STEEL USED.

## BLACK SEA—BALTIC CANAL PROJECTED BY CENTRAL POWERS

By Mark Meredith

THE importance of inland waterways is appreciated in all countries where cheap transportation is an absolute necessity, and the latest project in this line that will be carried out is the construction of a chain of canals to connect the Austro-Hungarian rivers with the Vistula and the Elbe to form a great inland waterway system, with the Baltic for an outlet. By this Hamburg will be in touch with Vienna, Bulgarian and Roumanian points, and with the Black Sea, giving the enterprise stategical as well as commercial value.

A glance at the map of Hungary shows how much of the most navigable portion of the Danube flows through that country and no other waterway in Europe is so suitable for large steamer traffic. Obviously, too, there are great advantages in quick conveyance between Silesia, with its mines and industries, and Vienna, and between the Austrian capital, and the coal fields and tin mines of Bohemia.

The project contemplated provides for a canal for large vessels, branching off from the Danube at Ganserndorf, going north-west to Pardubitz, Bohemia, and north-east through the Silesian mining and industrial districts to Oderberg. Another canal will connect the Danube above Vienna with Budweis and Bohemia, and join the Moldau River and a subsidiary waterway will branch off at Manrisch-Ostrau, Moravia, connecting with the Vistula and leading to Cracow. Work is also now in progress on canalizing the Elbe between Meinik, Bohemia, and Jaromir for ships of 600 tons.

It is calculated that freight could be shipped by these inland waterways from Cologne to the centre of the Balkans a distance of 1,560 miles at 8/- per ton. With a Rhine-Danube Canal goods could be conveyed from Germany to Turkey much more cheaply than now, and such a waterway would make the Central Powers much more independent of British sea power, which is perhaps the prime reason why such a costly undertaking is being pushed now.

## MUNITIONS EXPENDITURE FOR 1918

A MINIMUM expenditure of $360,000,000 in the coming year is planned by the Imperial Munitions Board. This outlay will be on the basis of thirty million a month, and it is quite possible that it will be materially increased. In any event, the munitions industry will be maintained.

Of the present monthly outlay of thirty millions, twenty-five millions, by way of Imperial credits, are furnished by the Canadian Government and five millions by the United States in respect of materials purchased there, but entering into the production of Canadian munitions.

A hundred thousand 4.5 shells and a hundred thousand shrapnel are now being turned out monthly. In the near future the latter will be notably increased. The munitions business has long since been down to a permanent working basis. The extent of the orders varies from time to time, but at least the average monthly outlay on the basis above indicated is assured of maintenance in the new year.

## STEEL RAIL SUPPLY IS INSUFFICIENT

AN important conference was held last Thursday at Ottawa at which were present representatives of the railway companies, Imperial Munitions Board and the steel companies. The steel supply is proving inadequate to meet the increasing demand for munition work and steel rails, while the steel companies are being worked to their full capacity. On the new Government railway system, the Canadian Northern, there will be required at least five hundred miles of heavy rails on the main line. This would release enough light rails for the graded extensions and similar trackage. The other roads, including the C. P. R., Grand Trunk and the Intercolonial, all require rails. It is believed that the Government will take action at once to increase the capacity of the rolling mills in connection with the steel plants to meet the essential requirements of the transportation companies without interfering with the production of steel for munitions and other requisites.

## CANADA WILL BUILD CARGO STEAMERS

HON. C. C. BALLANTYNE, Minister of Marine, announced last Thursday that it is the policy of the Government to utilize to the fullest capacity the shipyards of Canada in producing modern cargo steamers of the most approved type for the use of the Government and for registry in Canada. The production capacity of these yards at present engaged in the construction of ships for the British Government, local interests and for foreign account is estimated at from 275,000 to 300,000 tons annually. No more building for foreign registry will be permitted.

The naval constructors' branch is now engaged in developing details of this programme. One type will comprise vessels of 3,000 tons. They will be built on the Great Lakes. Another will be from 8,000 to 10,000 tons.

For the present existing shipbuilding yards will be utilized. These include Vickers' at Montreal, the Geo. DaviesCo. at Levis, the Polson Iron Works at Toronto, the Collingwood Shipbuilding Co., the Port Arthur Drydock Co., and the yards on the Pacific coast. Ships already contracted for by the Imperial Munitions Board and now under construction for Great Britain will be completed. Thereafter Canada will build for Canada and for nobody else. The capacity of the yards is estimated at 300,000 tons per year. This will be increased by careful and economical distribution of labor.

## FORECASTS WAR TRADE BOARD FOR CANADA

A War Trade Board for Canada to deal with industrial relations with the United States in view of coal, steel and other raw material difficulties and embargoes is forecast by the *Financial Post*, which adds:

"This body, which is now being organized at Ottawa, will look after the question of trade between Canada and the United States. F. C. T. O'Hara, who we believe has not been able to handle the situation with the curtailed powers of Deputy Minister of Trade and Commerce, will probably be made chairman. On the board there will be representatives from the Customs Department, the Industrial and Scientific Research Council, Food Controller's office, etc., and also, likely, trade experts from the Manufacturers' Association. The board will co-ordinate the work of issuing licenses and try to work system out of the present confusion over the question of shipments between Canada and the States.

## EMBARGO REMOVED ON METAL ALLOYS

THE Dominion Government has decided for the present and until further notice to permit under license the free export of the metals molybdenum and tungsten, their ores, concentrates, alloys and chemical salts to approved consignees in the United States and France. This will relieve the situation that has been considered somewhat oppressive to Canadian producers.

Since an embargo was placed on the export of these metals the market for the Canadian production has been confined very largely to purchases made on account of the British Government at fixed prices. These fixed prices have been lower, at times considerably lower, than the open market prices offered in the United States and France.

The requirements of the British Government are being met and Canadian producers will now be permitted to take full advantage of the open markets in the United States and France.

It will be necessary for the exporter, previous to shipment, to obtain from the Commissioner of Customs at Ottawa a license to export, and in the case of exports to the United States, it will be necessary under the United States regulations for the shipper or the consignee to obtain from the Bureau of Imports, War Trade Board, Bond Building, Washington, a license permitting the importation of the shipment into the United States.

## SHIPBUILDING PROGRAM IN U. S.

PLANS for a $2,000,000,000 Government shipbuilding programme were revealed at Washington on Friday when the Shipping Board asked Congress for authority to place $701,000,000 worth of additional ship contracts. At the same time an immediate appropriation of $82,000,000 was asked for the extension of shipyards and for providing housing facilities for workmen.

Thus far the board has been authorized to spend for shipbuilding $1,234,000,000, contracts for most of which have been awarded. To-day's request for a further authorization and an additional appropriation brings the estimates of funds needed for shipbuilding to $2,018,000,000. If the additional funds are made available they will be put largely into fabricated steel ship contracts, although some contracts for ordinary steel ships will be let, as will a few for wooden ships on the Pacific Coast.

No new shipyards are planned by the board. The fabricating yards have contracts for about 500 ships now, which will keep them constantly employed into 1919, but the board is anxious to place more contracts and begin on the task of providing materials.

The board's housing plans call for the expenditure of about $35,000,000. The remainder of the $82,000,000 asked for will be used to expand shipyards already built.

# Sidelights on Some United States War Activities

Special Correspondence

*Distinctive traits and characteristics betray themselves in the actions of nations as in individuals. Standardization is pre-eminently an American qualification, and its value as a contributing factor in commerce is being doubly proven by its adoption wherever possible in war. Other distinctive happenings are included in this interesting resume of present conditions across the line.*

EVERY business man knows the importance and the significance of standardization. The word ranks second only to efficiency. It denotes the realization of modern business that waste must be eliminated — the kind of waste that produces the same article a dozen different ways and makes repairs and replacements a matter of tremendous difficulty.

With reference to standardization in peace time opinions are not unanimous. Some do not favor it entirely. They feel that competition in design and variety in process of manufacture are healthy factors in trade and the means of satisfying the widely divergent tastes of the public. Some feel that in certain lines of goods there will never be possible a very rigid measure of standardization. Others, again, favor the most complete degree of standardization all through. They would have uniformity enforced by law in as many lines as conditions would permit. All agree that in many things standardization is very necessary and very beneficial.

With regard to war there can be no question whatever, no difference of opinion. Standardization of supplies is as necessary as discipline in the ranks. Bullets must be made the same to a ten-thousandth part of an inch, rifles must be turned out absolutely to a model; guns, aeroplanes, motor trucks, gas helmets, everything used in the deadly business of war must adhere to set standards. This is the theory of war, at least; it is not always the practice.

### The Moral of the Motor Truck

A young American engineer returned to the United States as soon after President Wilson's declaration of war as the limits of space and the handicaps of travelling out of France would permit. He had been serving with the French army in the engineering branch of the service for a couple of years, but got permission to return home as soon as his own country entered the war. In offering his services to *La Belle France* he had hoped, or at any rate expected, to assist in some of the more spectacular phases of war time engineering. It had developed, however, that he was on most intimate terms with the workings and the parts of motor trucks. No one was more capable than he in reassembling and doctoring disabled motor lorries. Accordingly he had been put in charge of a large workshop some distance back from the lines, where he worked anywhere from fourteen to eighteen hours a day—and saw to it that his staff did the same—at the highly useful if not spectacular business of repairing army trucks.

It was gruelling work in every sense of the word. When a shell lands in the neighborhod of a truck, the result is not hard to imagine. Generally the wreckage is left to rust where it has landed and the Western front is strewn with mangled remnants of wrecked cars. The need for trucks is very great, however, and anything that can be saved must be saved. Accordingly the young American and his staff had to tackle repair jobs that would have made any garage man on this side of the ocean throw up his arms in desperation.

But the great difficulty lay in the matter of duplication of parts. The French army had recruited and conscripted cars and motor trucks from all corners of the earth. There were French cars, English cars, American cars. There were so many different shapes and constructions that the repair depot had to carry no less than 20,000 parts! When a wrecked truck was brought in for treatment, it had to be identified, its origin traced back, its particular make and model determined and then the proper parts found. Necessarily work was slow and the difficulties great.

On his return to the United States, this engineer was a strong advocate of standardization. He had seen the lack of it in its worst phase and, to use an army term, he was "fed up with it." He told of one incident that illustrated effectively the dire results of lack of standardization.

Three motor trucks were parked by the side of a road back of the French line—a big English truck, a French truck of an antiquated model and a converted Ford. A shell landed close enough to scramble the three of them. Only the English truck was left sufficiently intact to be worth bothering with at all, but some of its parts had been scattered about and, when the repair men came to gather that machine together, they struck the job of their lives. There was three of everything in the mass of wreckage.

### Standardizing the Truck

It hardly required the testimony of this officer and others who had had a like experience to convince Uncle Sam of the need for proper standardization. It had already been determined that only one type of truck should be used with the American army.

The means of attaining this end was supplied through the agency of the Advisory Commission of the Council of National Defence. Committees had been appointed to act with the General Munitions Board. The Committee on Army Vehicles consisted of William Butterworth, of Deere & Co., chairman; A. N. Thielaus, Studebaker Corporation; R. V. Bond, Kentucky Wagon Co., and E. E. Parsonage, of the National Implement and Vehicle Association. A committee on Armored Cars had also been appointed consisting of Col. J. H. Rice, of the Ordnance Department of the U.S. Army; Col. C. B. Baker, Quarter-master General, and F. A. Scott, of the General Munitions Board. Finally there was a committee on Automotive Transport, consisting of Karl W. Zimmerschield, of General Motors Co., Detroit, vice-chairman; Charles Clifton, representing National Automobile Chamber of Commerce; C. W. Stiger, representing motor and accessory manufacturers; H. L. Horning, representing tractor interests; Henry R. Sutphen, representing watercraft interests; Frank H. Russell, representing Aviation Engine Association of America; Coker F. Clarkson, secretary and general manager of Society of Automotive Engineers; T. W. Henderson, Henderson Motorcycle Co., Detroit, Mich.

The task of standardizing motor trucks for army use was in its various phases turned over to these committees of business men. The ultimate result was one of the miracles of manufacture that the war has brought about.

### Engineers in Conference

The coöperation of all the manufacturers was first obtained. It was a very earnest evidence of coöperation that was demanded of them. They were asked to "go the limit," to throw in everything they knew to help in the planning construction of the perfect motor truck. They agreed.

New Government buildings in course of construction at Washington, D.C.

The concluding phase of the proceedings was when there gathered at Washington the head engineers of all the big manufacturers. They were collected together in one room, provided with plenty of material for the preparation of plans and then told to "go to it." It was impressed upon them that the country needed a truck as near perfect as was possible under existing conditions and that it was a patriotic duty with each and every one of them to help toward that end without a shade of reservation.

The story goes that the door was actually locked on them. This may or may not be true. But it is a fact that the conference brought forth wonderful results once they got down to work.

Imagine the situation; a score or more of jealous engineers who for years had been feverishly striving to excel each other in the improvement of truck construction. Each man there had shop secrets, exclusive processes, ideas that had been guarded as more sacred than the secret of the Sphinx; and they were asked to coöperate in the production of a perfect truck!

It did not take long for the ice to thaw. First one man laid a shop secret on the table, then another uncorked a hoarded kink and a third explained the nature of a projected improvement. In an hour all the cards were on the table and the group were up to their ears in details and specifications.

To-day every truck manufacturer has handed over to his rivals what was once supposed to be his chief stock in trade—his secrets of construction. But a truck is being produced for the use of the American army that will be as near perfect as it is possible to go to-day—a truck containing just one thousand parts where nearly two thousand were needed before. Every truck that goes to France will be of that model.

Activities incident to the war, have made enlarged quarters imperative.

The repair depots behind the American lines will carry one thousand parts only.

### The Liberty Motor

The same story could be told with reference to the standardizing of the motor used for aeroplanes. It is, of course, generally known that the worth of a flying machine lies in the heart that drives it—speed, durability, facility, all depend upon the humming little mechanism in the nose of the machine. As the United States has felt, and perhaps rightly, that the only road to Berlin is one that cuts through the clouds—in other words, that the war can best be won in the air—the need for the finest motor possible was early recognized:

The same procedure was followed. The coöperation of the manufacturers was sought and obtained, the engineers were summoned to Washington and put into a room with the same instructions, "Evolve us a perfect motor." There was the same letting down of the bars, the same surrender of cherished secrets, the same mutual discussion of specifications and details.

The result was the Liberty motor. American aeroplanes will fly over the enemy lines with the assurance that the motive power throbbing in them comes from a motor that has all the good points American makers know and none of the faults they have been able to find and correct—a hundred per cent. machine as far as present knowledge goes.

### In All Lines Now

The same idea is being carried through in all lines included within the needs of war. The army and the navy demand uniformity, absolute standardization, and Uncle Sam is putting the issue up to the business men of the country. On them is devolving the task of cutting straight roads through the rough hills of competitive construction. And the business men are living up to their task.

Reference has previously been made to waterproofing, as a line in which there was much mystery and mutual secrecy. Manufacturers jealously guarded their methods and processes from their competitors. Standardization for army purposes is being effected, however. Through the mutual efforts of the manufacturers the best methods are being determined for the waterproofing of clothing, tents, coverings, etc.

This is quoted merely as an evidence of what is going on in practically all lines.

### And Now "Camouflage"

The standardization idea is being carried to all extremes and is being made to apply to what may seem the smallest details.

Every now and then a favorite artist drops from the pages of the magazines. His drawings are no longer seen and the public wonders what has become of him. In all such cases the answer is that he has gone into the service of the army. He is being employed on the devising and perfecting of "camouflage."

The war has coined many new words and phrases, but perhaps none more expressive or widely used than "camouflage," the art of concealment. The airship has provided the enemy with a far-reaching, all observing eye and it has become necessary to disguise batteries, hide roads and camps, cover "ammunition dumps" and, in fact, so change the appearance of everything the aerial observer can see that he will be deceived. The work must be well done, for the aerial observer uses a camera—and it is hard to deceive a camera!

With great thoroughness Uncle Sam is working on the standardization of camouflage. Hundreds of artists have been conscripted into the service and are being used in devising and preparing methods of disguise. They are attached to the various camps and the results that they obtain are duly reported. Information is exchanged among the various camps. Even this seemingly small phase of warfare is being worked out on a basis of absolute standardization.

The moral of it all is that the U.S. Government is obtaining tremendous results in the matter of standardization because the coördination of business men has been obtained. In no other way could the Liberty motor have been evolved. The system of national committees is making it possible to organize any industry to the point where anything needed for war purposes can be obtained.

Standardization is a matter for business men to handle and Uncle Sam has had the good, common sense to delegate it to business men.

And the results prove the wisdom of this course.

## HOW A SCREW MACHINE JOB WAS DONE

By H. Middletown

WE had to turn out a quantity of the rods shown in the drawing. They were easy to make but at the time the only machine available was a ⅜ in. Hartford automatic which was suitable for work only 1½ in. in length. That was sufficient for the portion to be turned and it was by stretching things a little increased to feed 1¾ in. The stock was then arranged to feed out 1 9 16 in. for the first operation of turning and then to feed the remaining 1¾ in. for the necking and cutting off operations. Two stock stops were used in the turret and the box milling tool located between them to provide the proper sequence of operations. The fourth hole in the turret head was left vacant.

As is apt to be the case when working near the limit, an interference occurred and in an unexpected quarter. It was found that on bringing back the turret after the turning operation the turret would start to index before the box tool had cleared the work. This was

was enough to clear the tool while it swung by, this to be followed by feeding up to the stop as before. This simple little trick solved the problem and the job was run satisfactorily.

## SHIPBUILDING PROGRESS IN B. C.

EVERY shipyard in British Columbia [illegible] for the Imperial Munitions Board is well ahead of its schedule, according to E. C. Walsh, who is the official responsible for the launching into the water, and whose supervision is one of the most important under the Munitions Board. The building of these twenty-seven steamers has meant a great deal for the lumbering industry of the province, for about 1,400,000 feet of timber is needed for each ship, and ten million feet has yet to be delivered. Not only are old-established logging camps engaged on getting out ship timber, but four new camps have been started for this purpose. Merrill & King, on Thurlow Island, get out 100,000 feet a day, and a similar quantity is logged on Thurlow Island at the P. D. Anderson camp. The Hansen camp at Granite Bay is getting out 100,000 feet, and so does the Jackson Bay camp, which is a Munitions Board plant, operated by the Colonial Trust Co. The needs of the shipping has resulted in lumbermen getting out the long lengths necessary for the programme, and the production of ship knees is also a big feature. These knees are very essential in order to give the requisite strength to the vessels, and the fleet now under construction will be a big advertisement for British Columbia timber.

### Lumber Inspected

The lumber is very carefully inspected and it must come up to a grading set by Mr. Walsh, who was with the Hastings mill for twenty-five years. The Inspectors' Bureau Association also checks up the quality and issues a certificate if it comes up to grade, and there is a representative at every mill cutting timber for the ships. The shipyards are also held responsible for what they receive, so there is small chance of faulty lumber going into the vessels.

At the Western Canada Shipyards, of which W. W. Clark is superintendent, there are four ways. Number One hull is completed and should be launched at any time, but she was finished so far ahead of the scheduled time, which was February 1, that the shafting and other engine room gear has not arrived. Otherwise she could be sent into the water. When it is considered that the ground for the yard was broken as recently as June 5, it will be seen that rapid work has been done. Work on the second vessel will be about 20 per cent. faster than on the first ship as the workmen get more efficient and more men are trained. The ceiling has been started on the third vessel, and the fourth is in frame, while the saws are whining on the lumber for the fifth.

False Creek is beginning to look like a miniature Clyde, for right across from the Western Canada yard is the big Coughlan plant, where steel steamers are under construction and the hull of one is looming large, for she will be [illegible] this month.

### Launching Dates

The launching dates set for the six ships at the Western Canada yard are: Feb. 1, March 15, April 21, May 15, June 7, and June 13. The dates at Lyall's yard, North Vancouver, are: Jan. 20, Feb. 10, March 2, March 23 and April 11. The Cameron-Genoa, Victoria, launching dates are: Feb. 1, March 1, April 1 and May 1. The Foundation yard, Victoria, dates are: Jan. 20, Feb. 20, March 20 and May 20. The dates for the New Westminster Construction and Engineering Co. are: Feb. 1, March 1, May 15 and June 15, and for the Pacific Construction Co., Coquitlam, March 1 and May 1.

All the yards engaged in the work have been fortunate in that no labor troubles have interfered with the progress, and Mr. Walsh states that the greatest harmony has prevailed, all hands apparently realizing the need for turning out the tonnage as rapidly as possible. This feeling is prevalent from the logger who drops the trees to the men who build the ship, and the six yards are working in a spirit of friendly rivalry.

The steamers under construction are 250 feet long, 43½ feet beam, and a moulded depth of 25 feet. They will carry 2,800 tons deadweight on a draught of 21 feet, and most of the lumber used in construction is Douglas fir.

### Are Strong Vessels

A visit to the Western Canada yard shows that the specifications of the Imperial Munitions Board are high. From the vessel in frame to the completed No. 1 hull every timber seems to be of beautiful lumber of immense strength, and the vessels are very solidly built. There is no evidence of any weakness, and the magnificent timbers are a great testimony to British Columbia's great lumbering asset. The ships are to be built to Lloyd's A1 classification and the British Board of Trade's requirements for cargo steamers.

The frames, of course, vary in size. Some are as big as 21 x 23 inches, and the smallest is 12 x 14 inches. The rudder-post is 37 feet long and 20 x 20 inches, and is in one piece, as is the propeller post, which is 30 x 36 inches and 37 feet long. The beams are 14 x 12 and 14 x 13, and the stem is in one piece, 45 feet long and 18 x 26 inches.

It will be seen from the few instances quoted that strength is insisted on, and there is no reason to fear that this British Columbia fleet built of B. C. lumber will bring discredit on the province.

## BRITAIN'S HIGH SPEED STEEL MARKET

"The Ironmonger," London, in a recent issue expresses concern regarding Great Britain's future market for high-speed steel. It is stated that in the last three years many countries have been forced to provide themselves with products formerly imported. In its editorial columns "The Ironmonger" comments on the situation as follows:

"Until the outbreak of war, Sheffield was doing a lucrative export trade to the United States, Germany, Japan, and other markets in high-speed steel and the more expensive varieties of carbon crucible steel. This has been practically extinguished by prohibition of exports, and the manufacturers concerned fear that the chances of its recovery are not very encouraging. Recent inquiries in the United States as to the position of the high-speed steel supply and the desirability of relaxing the regulations prohibiting export to that country have elicited the emphatic reply that the American engineers are now able to get all they need, which means that the Sheffield article is no longer indispensable to them. It is evident, therefore, that the American tool-steel makers have made considerable advances both in output and in the quality of their product, since the consumption is now much greater than at any previous time. Sheffield's German connection in the same kind of material has, of course, gone, and if the American trade suffers a like fate, the cutting off of these two valuable markets will represent a serious loss to our manufacturers. Our trade with Japan is affected in the same way. The development of Japanese engineering and shipbuilding brings with it a large and progressive consumption of best tool and other steels, which in the past have been supplied mainly from Britain, but such commodities are now produced in the country itself. Fortunately for our manufacturers the Japanese steel of this class is not of really good quality, and the Japanese Government still continues to employ the British product."

## STORING COAL IN BULK

WHEN coal is stored in bulk the piles should not be higher than 10 ft. according to the British Fire Prevention Committee. Iron pipes 3-in. or 4-in. in diameter, or, failing these, eathenware pipes or ducts formed of incombustible material, should be inserted vertically in the piles as they are built up, their lower ends being at different heights above the ground throughout the piles, with about one pipe or duct to every 300 sq. ft. of surface; a thermometer should be occasionally lowered down these pipes or ducts to ascertain the temperature from the centre of the pile; and if wet, very small, soft, or impure coal is received it should be dumped round the edges of the pile, or in some position where the air can get to it freely and where other coal will not be packed on top of it.

SOME years ago molybdenum looked very promising as an alloy in tool steel, but unfortunately it was found that while the steel had very often remarkably efficient cutting qualities, it frequently ran with fine hairline seams, and very peculiarly the molybdenum tended to volatilize out of the surface of the steel on heat treatment. Also in magnet steel it has not proved as satisfactory as tungsten. Metallurgically considered molybdenum should have about twice the efficiency of tungsten.

# PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

## DOING SMALL JOBS SIMPLY AND ECONOMICALLY

By H. Middleton

THE four jobs described in detail below were not of an unusual nature in any particular respect, but were successfully performed with simplicity of method and small outlay.

### To Prevent Slipping in Sensitive Drill Chucks

The average drill chuck in use on sensitive machines is extremely hard on the shanks of drills. Should there be the slightest doubt of this, an examination of the drills under ½ inch in any shop will remove it at once. The "Hartford" drill chuck, Fig. 1, is typical of a class of stronger chucks which ought to hold any drill without shipping but which the youth of to-day can beat a mile. Give him a new drill and some holes to put through one inch steel plates and he will have the drill turning around in the chuck in the first twenty minutes. The driver shown is nothing but a piece of round steel slotted to fit loosely over the projecting jaws of the chuck and having two tightly fitted set screws that run into the flutes of the drill but it effectually prevents slipping and scoring the shanks and we find it a time saver on all quantity work.

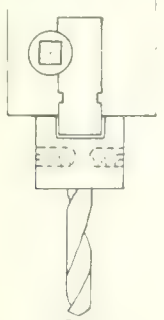


FIG. 1.

### Turning With Swiss Files

We had three or four thousand of the pins shown in Fig. 2 that were made on the screw machine and on which the journals had to be brought closer than was possible in that machine. As turned out the journals ran from 0.156 to 0.157½ and the proposition was to reduce the larger ones to the former size.

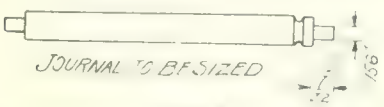



FIG. 2.

The short length, the sharp corner, and the small amount to come off made it look like a difficult job of turning. But it was easily and quickly done by filing, holding the pieces in a good chuck and using 4 in. American Swiss files, No. 2 cut. Being only ¼ in. wide, the workman could feel the file resting flat on the piece and having a safe edge and full teeth right up to that edge it was

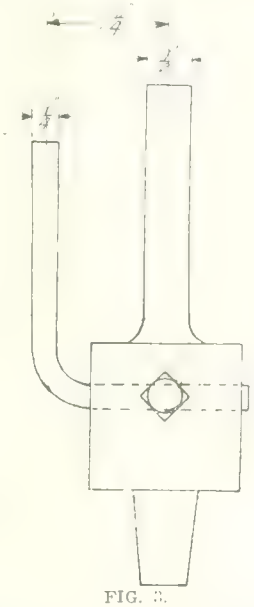


FIG. 3.

comparatively easy to do perfect work, impossible with big files.

### Ratchet Drilling Large Holes

Down at the nail factory they wanted to get four large holes put through the frame of a hammer they were setting up but there was as yet no power of any sort in the building. To make a hard job easy, we ratchet drilled one half inch pilot holes through first and by the time that was done had made up the sweep tool that is shown in Fig. 3. The tool requires no explanation, suffice it to say that the blade, of tool steel, was strong enough for the work if not fed too fast and that rate of feed was fast enough to suit a white man and the result was a nice job in a reasonable time.

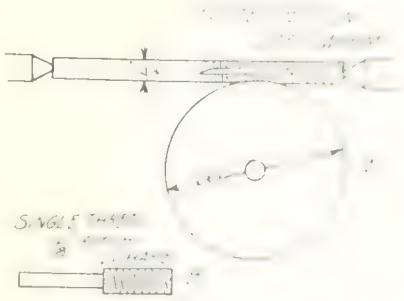


FIG. 4.

### Hobbing a Small Worm Gear in a Job Shop

A mechanical engineer needed a small worm and gear for an experiment and took the job to a nearby shop with a suggested method without the use of special tools. The details of both members are given in Fig. 4. The method as outlined produced a most satisfactory piece of work.

Though only soft steel was required, the worm was made of tool steel and a longer piece was threaded than was needed at the finish. This is shown at A where the worm is mounted on the centers. In the extra threaded part, teeth were cut which formed a hob that answered to cut the gear. As the gear was ordinary bar brass, the unhardened steel hob cut it fairly well and a sufficient length of the latter was provided to shift along and present a sharp face for the final sizing. After the gear was cut, the stem was turned off and the rest of the tool steel thrown away. The work was done with a pair of plain centers in a hand milling machine.

## THREADING PIPE FITTINGS ON A HARTFORD AUTOMATIC

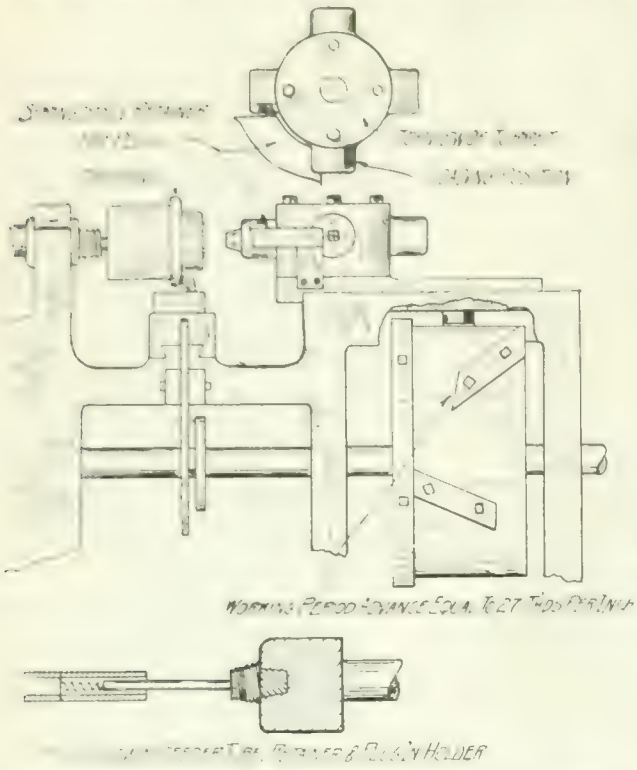
By Donald C. Hampson

THE automatic screw machine would not ordinarily be the proper tool on which to thread pipe fittings, but in one case it proved to be all that could be asked. The fittings were ⅛-inch square head plugs of cast iron—the kind commonly retailed for a couple of cents. The making of pipe fittings has been carried on by specialists and developed until it seems as if further methods of manufacture would not result in any marked saving. However the experiment as instanced in the automatic screw machine herewith described proved successful in all respects.

Reference to the drawing shows that complicated parts, springs, dirt collecting spot, etc., were eliminated in the design. The work holders are tool steel pieces with a square hole in one end, which end is hardened. An opening die is used and after it has been run over the plug the right length, it is tripped and the turret recedes which might give the plug a chance to fall or catch in the die but for a rod actuated by the feeding mechanism which advances and holds the plug upright until the turret clears sufficiently. The plugs are ejected by the centrifugal force of the revolving turret. In place of a trip lever on the outside of the die head, a ring has been provided that permits the chasers to be opened at any part of the revolution and to perform this the cross slide movement is employed to bring up a pusher against the ring. The normal move-

[illegible] place of expensive and complicated devices to accomplish the same results.

The die, of course, has no movement other than that of revolving, the plug being carried up to it and back. As even the most carefully made castings vary a trifle and in threading the die must pass over and beyond the round part to



SKETCH SHOWING CAM ARRANGEMENT FOR AUTOMATIC OPERATION.

ticularly as it has been found necessary to set an eighth of an inch as the safe maximum length for a grip on the plug at the moment of die opening. To keep the die and the holders at a safe distance, the turret is allowed to advance so the distance between these parts is ⅛-inch and from that point the die draws the plug out of the holder which is quite permissible, as the slight taper on the head cannot turn in the square hole at any point and the real object of setting the head in full length at the start is to bring the plug up central with the dies.

To avoid any possibility of the plug being drawn out of the holder, drawing the turret slide along with it, the turret drum has a "cam" at its forward end that limits the travel of the roller in that direction, this cam taking the form of a band entirely around the drum. Another feature of the camming is found on the turret advance cam which has a portion beveled to give an advance equal to very nearly the lead of the thread to be cut. The idea of this is to start the thread without the use of springs which is possible in the case of pipe threads and with a set up such as this: after the chasers have taken hold, the slight difference between their lead and that of the cam pulls the plug from the holder and there is nothing to jam the die and cause injury.

The running of the machine is entrusted to a boy who sits in front of the machine and puts a plug in each holder as it is indexed to the loading position before him. To retain the plug in the holder as the turret revolves, a clock spring retainer bent to shape is used. The centrifugal force of the turret ejects the plug after threading, throwing it into a box on the rear. Four sets of cams were put on each drum, all of them made of cast iron and used without machining.

Another pipe job done on the automatic was the making of some headless plugs, the same size and shape as the threaded part of the ones mentioned above. In this case the plugs were made of steel. The bars were handled just as any automatic job—the forming tool put on the pipe taper, the die in the turret threaded, and the cut off tool severed the piece. There was no need for the turret to revolve and this was fixed by limiting the travel of the slide so the index and lock were not engaged.

## MANUFACTURE OF HARDENED THREAD GAUGES.—V*

By G. Doorakkers

WE mentioned previously that about .001 in. is left on all diameters for shrinking and lapping allowance for the large and medium sizes, and about .0005 in. for the smaller sizes.

### Laps For Male Screw Gauges

Fig. 33 shows the design of the different types of laps used. They are made of a close-grained cast iron and split after being finished. A collar with a screw or even a carrier will serve for lapping. These laps are made in five different types:—

Lap 1 For all thread (.001 over size.)

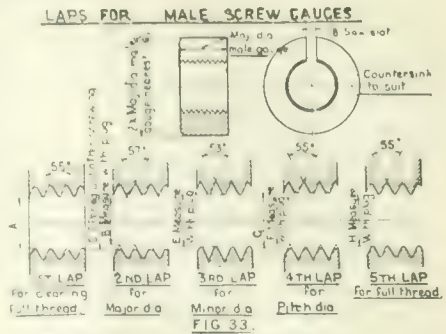

LAPS FOR MALE SCREW GAUGES
Countersink to suit
55°
57°
1ST LAP For Clearing full thread
2ND LAP For Major d.o
3RD LAP For Minor d.o
4TH LAP For Pitch dia
5TH LAP For Full Thread.

FIG 33.

Lap 2 –For major diameter.
Lap 3—For minor diameter.
Lap 4—For pitch diameter.
Lap 5—For full thread.

Lap 1.—Lap 1 is used for cleaning the thread all over, and is therefore made .001 larger in all diameters than the finished size of the gauge. It is cut with the circular tool for internal gauges—Fig. 25—and if that tool is set up correctly it should be sufficient to measure dimension A only.

A=(f—1.28064P+.001), where f is the major diameter of the male gauge. This dimension can be measured with a plain plug.

Example.—Dimension A wanted for Lap 1 for a male screw gauge .886 24 RH.

A=.886—.05335+.001=.8336.

Lap 2.—Lap 2 is used for lapping the major diameter only. The lap, therefore, has to clear on the flanks and the core diameter. It is cut with the 57 deg. tool till a plug of diameter B enters tightly.

B f—2x where x can be calculated as follows, in Fig. 35:—

$$X = AC - BC$$

$$AE = \tfrac{1}{2}P$$

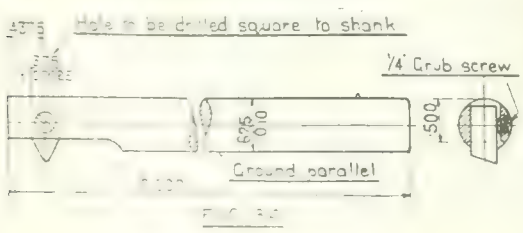
$$AC = \frac{\tfrac{1}{2}P}{2 \tan 28\tfrac{1}{2}\text{ deg.}}$$

$$BC = DC - R = \frac{R}{\text{Sin } 28\tfrac{1}{2}\text{ deg.}} - R$$

$$X = \frac{\tfrac{1}{2}P}{2 \tan 28\tfrac{1}{2}\text{ deg.}} - \frac{R}{\text{Sin } 28\tfrac{1}{2}\text{ deg.}} + R$$

After screwing to dimension B the hole has to be opened out to diameter C as minimum size. C f—(2C—2D) (see Fig. 1)=f—1.32808 P. This dimension C is a minimum and the hole can be opened out slightly larger.

*Contributed to a recent number of The Engineer. No. 4 appeared Dec. 13.



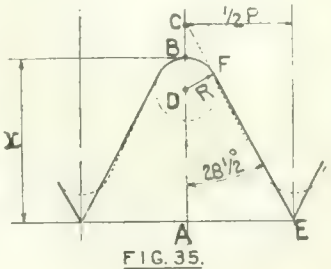




FIG. 35.

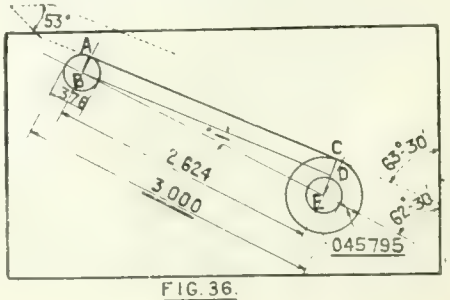



FIG. 36.

Example.—Wanted dimensions B and C for lap for major diameter for male screw gauge .886—24 RH.

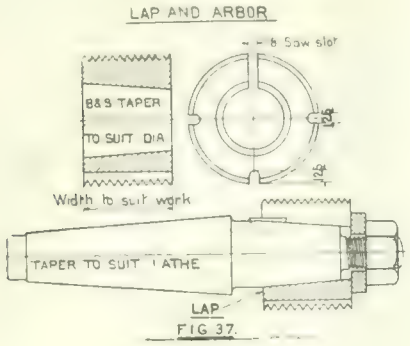


FIG 37.

$$B = .886 - \frac{.04166}{\tan 28\frac{1}{2}\text{ deg.}} - \frac{.82182}{\sin 28\frac{1}{2}\text{ deg.}} + .011442$$

$$= .886 - .06418 = .82182$$

$$C = .886 - 1.132808P = .886 - .040012 = .846$$

Lap 3.—Lap 3 is used for lapping the minor diameter only. It is cut with the circular tool for internal gauges—Fig. 25—to dimension E. This dimension can again be measured with a plain plug.

$$E = f - 1.28064P$$

The flanks are then cut away with a sharp-pointed 53 deg. angle tool. This tool is made in the same way as the master tool and afterwards cut off with an elastic wheel to suit the holder shown in Fig. 34. The angle of the tool is ground on the fixture shown in Fig. 3 by using a packing piece or a bush of a certain thickness between the tool and the bottom peg. The thickness of the packing piece is calculated as follows:

In Fig. 36 AB=.188. The new angle of inclination with the vertical is 63½ deg. BD is a line drawn parallel with AC. BD therefore makes an angle of 1 deg. with the line joining the centres of the peg.

DC = AB

In triangle BDE:

DE = 2.624 × sin 1 deg. = .0457910

EC = DC + DE = .188 + .045791 = .233791

The thickness of the bush or the packing piece is therefore .233791 — .188 = .045791.

Example.—Dimension E wanted for lap for minor diameter for a male screw gauge .886—24 RH.

$$E = .886 - .05335 = .83265$$

Lap 4.—Lap 4 is used for lapping the pitch diameter or the flanks. It is cut with a 55 deg. sharp pointed tool, shortened to suit the holder shown in Fig. 34. With that tool the lap is cut to dimension F.

$$F = f - 1.6008\ P \text{ (see Fig. 1)}$$

The hole is then opened out to G = 1.13282 (see Fig. 1).

Example.—Wanted dimensions F and G for a lap for pitch diameter for a male screw gauge .886—24 RH.

$$F = .886 - .0667 = .8193$$

$$G = .886 - .040012 = .846$$

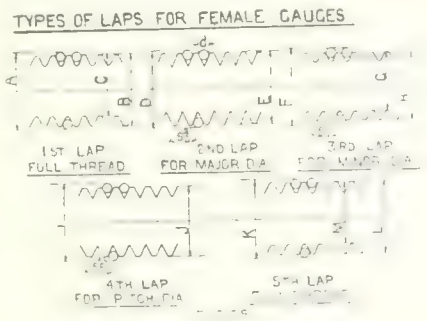
Lap 5.—Lap 5 is used for lapping the entire shape of the thread. It is cut with the circular tool for internal gauges—Fig. 25. Dimension H can be measured with a plain plug.

$$H = f - 1.28064 \text{ (see Fig. 1).}$$

Example.—Wanted, dimension H for a lap for full thread for a male screw gauge .886—24 RH.

$$H = .886 - .05335 = .83265$$

It might be mentioned that good lapping results have been obtained by using carborundum paste for roughing and diamontine for finishing and polishing.




### Laps For Female Gauges

We mentioned before that it is good practice to leave .001 to be lapped out in medium sized female gauges, and about .0005 in the smaller tapped gauges. The laps are made of close grained cast iron, and Fig. 37 shows the cheapest and most effective kind of lap, together with the arbor on which it is mounted. The lap is sawn right through in one place, and the taper hole allows a certain amount of expansion. A Woodruff key prevents the lap turning round on the arbor. The laps are again divided into five types:—

Lap 1—For full thread (.001 under size).
Lap 2—For major diameter.
Lap 3—For minor diameter.
Lap 4—For pitch diameter.
Lap 5—For full thread.

These five types are shown in Fig. 38.

Lap 1.—Lap 1 is cut the correct shape of thread .001 under size. It is cut with a circular form tool—Fig. 18—and is used for cleaning out the thread. The dimension A over the three wires is one thousandth under the dimension over the three wires for the check for pitch diameter or the full thread check. The major and the minor diameters are one thousandth under the major and minor diameter of the finished female gauge. Assume f the major diameter of the female gauge.

$$A = f + \frac{d}{\sin 27\frac{1}{2}\text{ deg.}} + d - 1.6008P - .001.$$

$$B = f - .001.$$

$$C = f - .64032 - .001.$$

Example.—Wanted the dimensions A, B and C for a female screw gauge 1.998—14 RH; d for 14 thread=.040.

$$A = 1.998 + \frac{.040}{.9617486} - .040 - .11434 - .001$$

$$= 2.00928$$

$$B = 1.998 - .001 = 1.997.$$

$$C = 1.998 - .04574 - .001 = 1.95126.$$

Lap 2.—Lap 2 is used for lapping the major diameter of the female gauge only. It is cut with a 53 deg. sharp pointed tool and a standard female radius tool. The 53 deg. tool is manufactured in the same way as the tool for Lap 3 for male gauges, except the length which is not shortened. Dimension E equals the major diameter of the female gauge. Dimension D equals the major diameter of the female screw gauge + 2x, where the value x is calculated as follows:—In Fig. 39, in triangle DBE:

$$DB = \frac{1}{2}P.$$

$$DE = \frac{DB}{\tan 26\frac{1}{2}\text{ deg.}} = \frac{P}{2\tan 26\frac{1}{2}\text{ deg.}}$$

In triangle ABC:

$$AC = R.$$

$$AB = \frac{R}{\sin 26\frac{1}{2}\text{ deg.}}$$

$$DG = AB - R = \frac{R}{\sin 26\frac{1}{2}\text{ deg.}} - R.$$

$$FG = ED - DG = \frac{P}{2\tan 26\frac{1}{2}\text{ deg.}} - \frac{R}{\sin 26\frac{1}{2}\text{ deg.}}$$

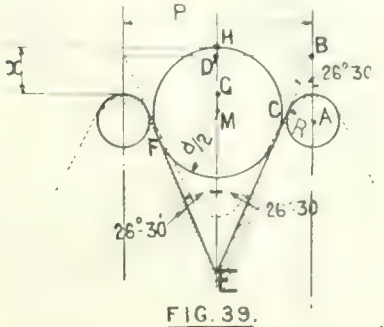


FIG. 39.

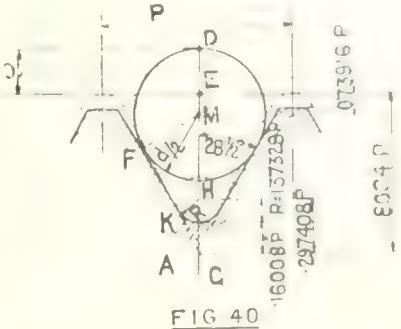


FIG 40

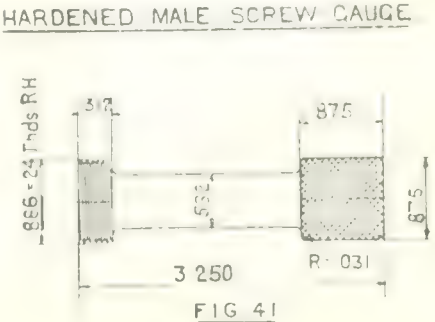


FIG 41

In [illegible] FMF

$$\frac{FM}{MF} = \frac{d}{\text{[illegible]}}$$

[illegible] $= \sin 26^\circ$ [illegible]

$$FH = FM + MH = \frac{d}{2 \sin 26\frac{1}{2} \text{ deg.}} + \frac{d}{2}$$

$$x = FH - FG = \frac{d}{2 \sin 26[illegible] \text{ deg.}} + \frac{d}{2} - \frac{P}{\text{[illegible]}} + R$$

$$2 \text{ [illegible] } 26\frac{1}{2} \text{ deg.} \qquad \sin 26\frac{1}{2} \text{ deg.}$$

rect radius, the same tool which is used for shaping the female radius tool—see Fig. 15. Dimension F over the three wires $= f + 2x$, where $x$ is calculated as follows: In Fig. 40:—

$x = AD - AF$

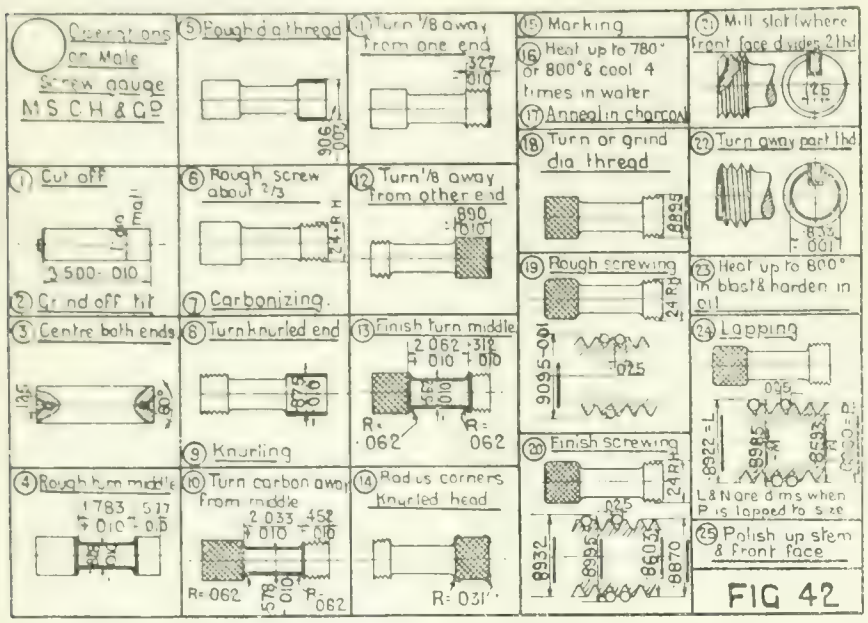
$AD = AM + DM = AM + \frac{1}{2}d$.

$AF = GE + GH + AH$.

$x = AM + \frac{1}{2}d - GE + GH - AH$

In triangle AMF:

$$AM = \frac{FM}{\sin 28\frac{1}{2} \text{ deg.}} = \frac{d}{2 \sin 28\frac{1}{2} \text{ deg.}}$$


Operations on Male Screw gauge M S C H & G P
1 Cut off
2 Grind off nit
3 Centre both ends
4 Rough turn middle
5 Rough d a thread
6 Rough screw about 2/3
7 Carbonizing.
8 Turn knurled end
9 Knurling
10 Turn carbon away from middle
11 Turn 1/8 away from one end
12 Turn 1/8 away from other end
13 Finish turn middle
14 Radius corners Knurled head
15 Marking
16 Heat up to 780° or 800° & cool 4 times in water
17 Anneal in charcoal
18 Turn or grind dia thread
19 Rough screwing
20 Finish screwing
21 Mill slot (where front face divides 2 thd
22 Turn away part thd
23 Heat up to 800° in blast & harden in oil
24 Lapping
25 Polish up stem & front face
L & N are d ms when P is lapped to size
FIG 42

Example. Wanted dimensions E and D for a female screw gauge 1.998—14 RH.

d = .040.

$$x = \frac{.020}{\sin 26\frac{1}{2} \text{ deg.}} + .020 - \frac{.071428}{2 \tan 26\frac{1}{2} \text{ deg.}}$$

$$= \frac{.0098}{\sin 26\frac{1}{2} \text{ deg.}} + .0098$$

$x = .0648232 - (.0716312 - .0219634 + .0098) = 3.00535$

$D = f + 2x = 1.998 + .01070 = 2.0087$.

$E = 1.998$.

Lap 3.—Lap 3 is used for lapping the minor diameter of the gauge. The minor diameter of the lap is therefore

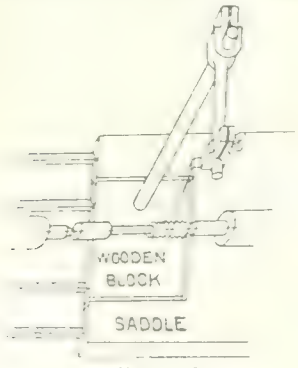


FIG. 43.

the same as the minor diameter of the finished female gauge. It is screwed with a 57 deg. angle tool with the cor-

$GE = .8004$ P (see Fig. 1).

$GH = .297408$ P (see Fig. 1).

In triangle AHK:

$$AH = \frac{R}{\sin 28\frac{1}{2} \text{ deg.}}$$

$$\text{Therefore } x = \frac{d}{2 \sin 28\frac{1}{2} \text{ deg.}} + \frac{1}{2}d - \frac{R}{\sin 28\frac{1}{2} \text{ deg.}}$$

$$.8004 \text{ P} + .287408 \text{ P} - \frac{R}{\sin 28\frac{1}{2} \text{ deg.}}$$

Diameter H is the diameter with the radius cut away.

$H = f - .147832$ P (see Fig. 1).

G [illegible] $f - 2$ D—(C [illegible] D) (see Fig. 1) $f - .71423$ P

Example.—Wanted dimensions F, G and H for a female screw gauge 1.998—14 RH.

$F = 1.998 + 2x$, where $x = .0419148 + .020 - .05717 + .02123 - .02054 = .00543$

$F = 1.998 + .01086 = 2.00886$.

$G = 1.998 - .0510 = 1.9470$.

$H = 1.998 - .0106 = 1.9874$.

Lap 4.—Lap 4 is used for lapping the pitch diameter. It is cut with a 55 deg. sharp pointed tool. Dimension I. over the three wires, is the same as dimension B for check for pitch diameter—see Fig. 32.

$$I = f + 2x, \text{ where } x = \frac{d}{2 \sin 27\frac{1}{2} \text{ deg.}} + \frac{1}{2}d - .8004 \text{ P.}$$

Dimension J equals dimension H for the third lap.

$J = f - .147832$ P.

Example.—Wanted the dimensions I and J for a female screw gauge 1.998—14 RH.

$I = 1.998 + .01228 = 2.01208$.

$J = 1.998 - .0106 = 1.9874$.

Lap 5.—Lap 5 is used for lapping the entire shape of the thread. Dimension K is the same as dimension I for Lap 4, and the minor and major diameters are the same as for the gauge.

Example.—Wanted the dimensions K, L and M for a female screw gauge 1.998—14 RH.

$K = 1.998 + .01228 = 2.01028$.

$L = 1.998$.

$M = 1.998 - .04574 = 1.95226$.

### Hardening Male Screw Gauge

Fig. 41 shows a simple type of a male screw gauge. The same gauge is shown laid out in operations of manufacture in Fig. 42. The operation drawing is practically self-explanatory. It will be seen that the gauge is hard in the threads only, and that the carbon has been turned away everywhere else. In case of thread depth gauges hard faces cannot always be avoided, and have to be put up with. The carbon is turned away to eliminate distortion after hardening.

Remarks.—Operation 5: Rough diameter thread.—The outside diameter is turned to $(f + .020) - .003$, where f is finished outside diameter of gauge, and the value behind the brackets represents the limit of accuracy. The diameter for the gauge in question is therefore $(.886 + .020) - .003 = .906 - .003$.

Operation 6: Rough screwing.—On this operation thread is roughed out to about two-thirds of the depth to obviate a too deep penetration of carbon which would necessitate a long carbonising time.

Operation 16.—Heat up to 800 deg. and cool four times in water. This operation is performed to minimize the stresses and strains after the final hardening.

Operation 18.—Turn or grind thread diameter. The diameter of the thread $= (f + .0025 + a)$ with no limit where a is a shrinking allowance.

$a = .001$ for medium and larger gauges.

$a = .0005$ for the very small sizes.

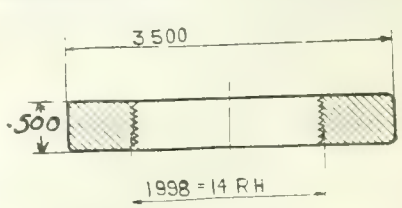


FIG. 44

The diameter for the gauge in question is

$.886 + .0025 + .001 = .8895$

Operation 19.—Rough screwing.—The dimension over the three wires is

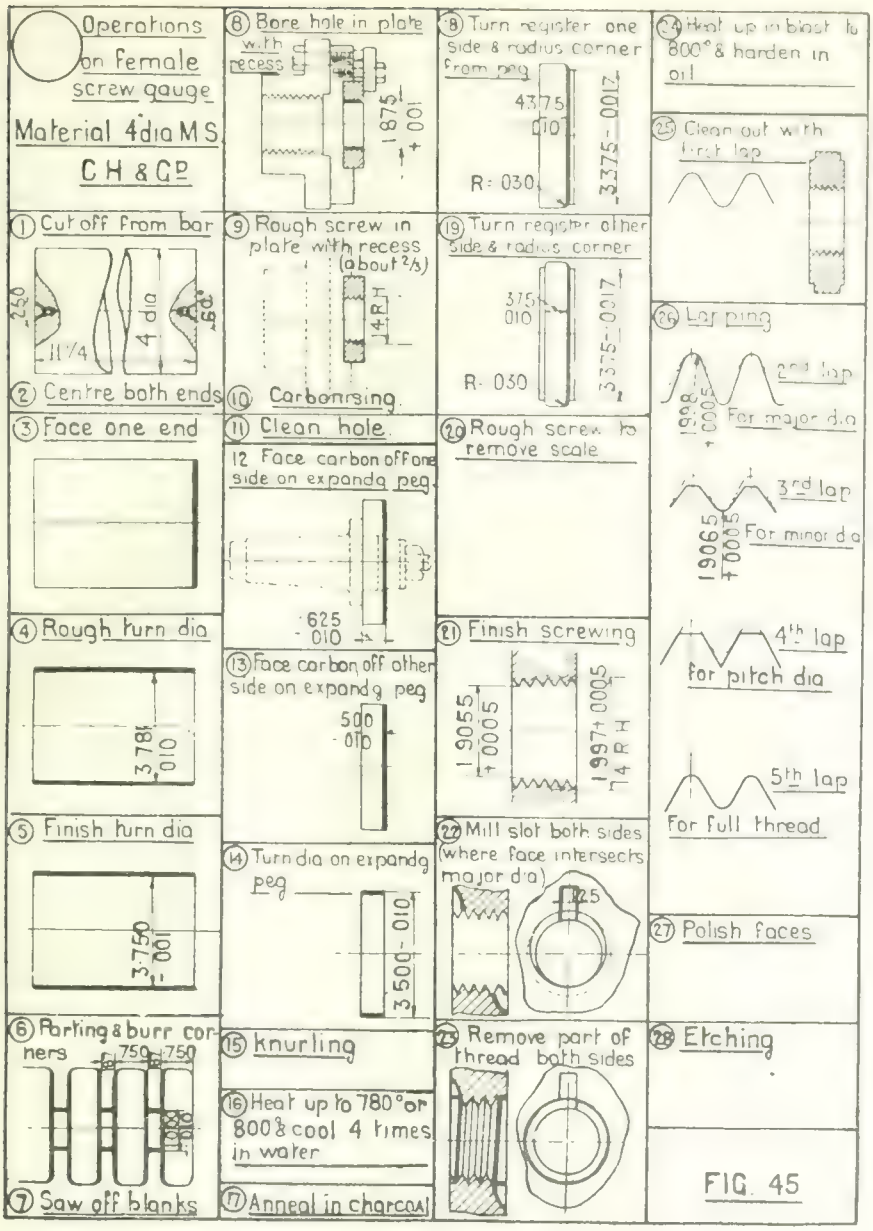

Operations on Female screw gauge
Material 4 dia M.S.
C H & C P
1 Cut off from bar
2 Centre both ends
3 Face one end
4 Rough turn dia
5 Finish turn dia
6 Parting & burr corners
7 Saw off blanks
8 Bore hole in plate with recess
9 Rough screw in plate with recess (about 2/3)
10 Carbonising
11 Clean hole
12 Face carbon off one side on expanding peg
13 Face carbon off other side on expanding peg
14 Turn dia on expanding peg
15 Knurling
16 Heat up to 780° or 800° & cool 4 times in water
17 Anneal in charcoal
18 Turn register one side & radius corner from peg
19 Turn register other side & radius corner
20 Rough screw to remove scale
21 Finish screwing
22 Mill slot both sides (where face intersects major dia)
23 Remove part of thread both sides
24 Heat up in blast to 800° & harden in oil
25 Clean out with first lap
26 Lapping
1st lap
For major dia
3rd lap
For minor dia
4th lap
For pitch dia
5th lap
For full thread
27 Polish faces
28 Etching

FIG. 45

$$(f + a + 2x + .010) - .001, \text{ where } x = \frac{d}{2 \sin 27\frac{1}{2} \text{ deg.}} + \tfrac{1}{2}d - .8004 \text{ P.}$$

d for 24 threads = .025.

x for 24 threads per inch = .006227.

The dimension over the three wires for the gauge in question is (.886 + .001 + .01245 + .010) — .001 = .9095 — .001.

Operation 20.—Finish screwing.—This is, of course, the most important operation. By preference all dimensions should be taken without removing the gauge from the centres. The only dimension that presents difficulties is the dimension over the three wires. This difficulty can be overcome by slipping in the wooden fixture shown in Fig. 43. In that fixture the three wires are suspended on cotton. The wires are fastened to an adjustable arm which can be adjusted at will. When a cut is taken the fixture is removed. The dimension from the top of the thread on one side to the bottom of the thread on the other side is f—.64032 P + .001.

For the gauge in question that dimension is .886—.026675 + .001 = .8603. The dimension is measured with the special micrometer attachment. The dimension over one wire is f + x + .001, which is for our gauge .886 + .00622 + .001 = .8932. The dimension over three wires is f + 2x + .001, which is for our gauge .886 + .01245 + .001 = .89945. The outside diameter is f + .001. For our gauge .887.

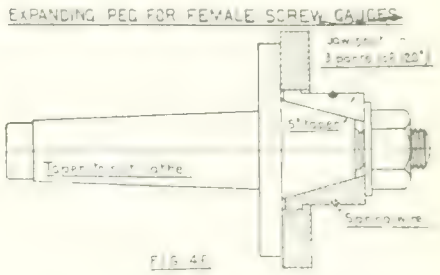
Operations 21 and 22—Mill slot and turn away part thread. These operations are performed to do away with the thin part of the thread, which would easily break off or chip after hardening.

Operation 23.—Heat up in blast and hardren in oil. It was found that the quicker the gauge was brought to its hardening temperature the smaller was the amount of distortion. For the final inspection after lapping the dimension over the three wires can be measured on a similar fixture to that shown in Fig. 43, except that a block has to be added to clamp the work.

### Hardened Female Screw Gauge

Fig. 44 shows the simplest form of a female screw gauge, and Fig. 45 shows the successive operations in making it. It will be seen that the carbon is turned away wherever hardness is not essential.

Remarks.—Operation 8: Bore hole.—For this operation the blanks are held in an adapter plate, and the hole is bored out to (f—1.28064 P—.030) + .001, where f = finished major diameter of gauge, and the value behind the brackets represents the limit of accuracy. For our gauge the diameter of the hole is (1.998 — .09148 — .030) + .001 = 1.877




+ .001. The dimension, being very close to a standard size, was taken as 1.875 + .001.

Operations 12, 13, and 14.—In these operations the carbon is turned from the two faces, and the diameter on an expanding peg shown in Fig. 46.

Operations 18 and 19.—In these operations registers are turned on both sides of the gauge to suit the adapter plate for the finished screwing. The finished screwing is left .001 under size, slots are milled on both sides of the gauge, and the part threaded is turned out for the same reason as stated for the male gauges.

## EACH MAN TO HIS MATERIAL

By D. A. Hampson

THE most famous saying of the late Bob Fitzsimmons was to "strike from where your hand is." The machinist doing work around in various factories cannot help notice that the employees of the various places follow this advice unknowingly. For instance in a large creamery, the writer saw the engineer cutting threads on some pipe and for a lubricant he had a squirt can filled with butter: he was cutting nice threads too—his pipe vise was near the engine and he kept the can resting on the cylinder head where the butter was heated to a liquid.

In a leather tanning plant, they burned leather scraps under a 40 h.p. boiler and while it wasn't coal by any means, it did very well with the aid of a blower. Elsewhere in the plant leather scrap was used—in babbitting, a piece of leather took the place of putty, ends of leather were slitted up into belt laces, etc. Down at the paper mill they worked over vast quantities of old rope into pulp but it was only natural that for repairs and in an emergency rope was used for supports and slings and ties where an outsider would have insisted that iron rods and wood blocks were the only materials that would fill the bill.

## STEAM POWER DEVELOPMENT

A SHORT time ago V. H. Manning, Director of the Bureau of Mines, Department of the Interior, Washington, D.C., made the statement that 25 per cent. of the coal production of the United States was wasted through inefficient use. His point was that a large proportion of the steam engine and boiler plants of the country are not up-to-date and are consuming coal wastefully as compared with results given by plants of the latest and most approved design.

Since engineering methods are always advancing, it is out of the question that all of the power plants of the country should be at any one time of the latest design, but Mr. Manning's statement is very suggestive as to the importance to the country of improvements in its power equipment. The annual production of coal in the United States is now about 600,000,000 tons, and 150,000,000 tons of this would be saved if all consuming plants were as good as those of the best type. Perhaps the most impressive idea of this saving can be obtained if the reader will think of the labor involved in mining, handling, and transporting 150,000,000 tons of coal, and of shoveling it into the fire-boxes; and of the benefits that might be derived by having that labor distributed in the other industries.

### Generation Back Comparison

If it is interesting to calculate the savings that may be effected in the future by bringing all equipment up to the standard of what at this date is recognized as the best, it is also interesting to compare not only the best practice but the common practice of to-day with the best practice of a generation ago. Mr. Manning's statement has led us to make an inquiry along this line, says a statement issued by the National City Bank, New York, and looking backward for a starting point we fixed upon the Centennial Exhibition at Philadelphia in 1876. Doubtless many of our mature readers will remember viewing, as youths, with awe and wonderment, the great Corliss engine which stood at the centre of Machinery Hall, and furnished the driving power for all the exhibits in the building. There were seats for the public about the engines; the motion of the great flywheels created a breeze, and the engine was the admiration not only of the non-technical public, but of the members of the engineering profession from all over the world.

With the Corliss engine standing out prominently as a landmark in engine development, we appealed to President Alexander C. Humphreys, of Stevens Institute of Technology, for information as to progress in engine-building since that time. It will add a touch of human interest to the story to state that it then developed that Professor Robert M. Anderson, of the Department of Engineering, Stevens Institute, was in part influenced to his choice of a profession by seeing, as a boy, the big Corliss engine in Machinery Hall. By the courtesy of Stevens Institute we have the interesting sketch which follows:

To summarize in the briefest possible manner the progress which it records, the Corliss engine at the Centennial occupied about 54,000 cubic feet of space and consumed 2.2 pounds of coal to develop one horse-power; while a modern steam turbine of equal capacity will occupy 115 cubic feet of space and consume nine-tenths of a pound of coal to develop a horse-power, giving a saving in coal consumption of 59 per cent. According to Mr. Manning's estimate, that the average engine efficiency at the present time is 25 per cent. below the standard of the best type, the average now is well above the best of 1876; and, of course, the average efficiency in 1876 was much below the Corliss standard.

### Electric Power Transmission

Even more notable than the improvement in engine and boiler efficiency is the gain accomplished by the development of power transmission through the electric current. The transmission of power by electricity was unknown when the Centennial Exhibition was held, but in the year 1915 51 per cent. of all the power applied to industry in the United States, outside of transportation, was delivered by electric current, and as a result of all this development the total horse-power in use in the United States, to each million inhabitants, was 482,392 in 1915, as compared with 68,182 in 1879, or an increase of more than seven-fold. The facility with which power can be transmitted by electric current does away with the necessity of generating power where it is to be used. It can be generated at the most economical spot, as at the mouth of a coal mine or the site of a water-fall, and the industries which use it may be located in a spot more suitable to them.

### High Speed Reciprocating Engines

The introduction of the high speed reciprocating engine dates from shortly after Mr. Edison's invention of the incandescent lamp and development of the direct-current generator in 1881. The isolated lighting plants, followed by small lighting and power plants, gave an impetus to shaft-governed automatic cut-off engines, allowing of higher rotative speeds than were attainable with drop cut-off mechanisms. Among these were: the Buckeye, the Porter-Allen, the Fitchburg, the Armington and Sims, the McIntosh and Seymour, the Ball, the Westinghouse, the Willans, and many others. These were built simple and compound and were operated either non-densing or condensing. They varied in economy from 3.6 lbs. of coal per hour per B.H.P. for simple non-condensing to 2.15 lbs. of coal per hour per B.H.P. in compound condensing types.

Up to date the highest economy developed in reciprocating engines has been attained in the Stumpf (Straight) or Uniflow engine, obtaining a B.H.P. on 1.08 lbs. of coal per hour, same being in a 300 h.p. engine with an initial steam pressure of 130 lbs. per square inch absolute, and superheat of 261 deg. F. This record has been equalled by the best performances of stationary triple-expansion engines using steam at 170 lbs. per sq. in. absolute and 203 deg. F. superheat. The highest of all steam engine efficiencies so far reached has been obtained by the Wolf tandem-compound "locomobile," which consists of an internally fired through-tube boiler, having the engine combined so that the cylinders are jacketed by the final pass of the hot gases flowing to the stack—in other words, the cylinder projects into the smoke box. The initial steam pressure is from 175 to 225 lbs. per sq. in. absolute, is superheated to 800-850 deg. F. before entering the high pressure cylinder and again superheated to 450-500 deg. F. before entering the low pressure cylinder. The feed water is heated in an economizer in the breeching. The coal consumption of 1 lb. per hour per B.H.P. is common practice and 0.8 lb. per hour per B.H.P. has been attained.

### The Steam Turbine

The reaction type of steam turbine, known under his name, was first introduced in England by the Hon. Charles A. Parsons in 1884, and was introduced in the United States by the Westinghouse Co. in 1895, but it was not until about 1900 that it met with general approval. The DeLaval impulse turbine was introduced in its present form in 1889. The compound velocity impulse turbine, known as the Curtis, was introduced into the United States by Charles G. Curtis about 1896.

Since their introduction there have been many modifications and combinations of these types, better fitting their application to various power developments. For central station work the steam turbine has replaced the reciprocating engine. In fact, the turbine has the advantage in all electric generation, especially in the larger outputs. This is not, however, on account of better fuel economy, since for the same grades of machinery and equal ranges of temperature, pressure, etc., there has been found no appreciable difference in economy betwewen the best turbines and the best reciprocating engines, other characteristics influencing the preference. The real reason for the replacement of the engine by the turbine has been the greater compactness of the latter, thus resulting in a smaller investment in real estate.

### Boiler Efficiency

There has been marked improvement in boiler efficiency since 1876. The combined efficiency of furnace and boiler, being the ratio of delivered energy in the steam to that available in the fuel, ranges in coal-fired boilers from about 55 per cent. to 75 per cent. With liquid (oil) fuel and powdered coal, 80 per cent. is attainable. The most remarkable and promising development, the restriction being that the fuel must first be transformed into a gas, is the Bone system of so-called "surface combustion." This consists in burning a perfect mixture of gas and air in boiler tubes filled with porous refractory material, the result being incandescent combination, with no radiation or excess air losses. An effi-

ciency of 94 per cent. has been attained.

The development of the steam engine illustrates very clearly the part which capital plays in community progress. A steam engine is the servant of the community, no matter who owns it, and the improvements upon the engine, the changing over of power plants to bring them up-to-date, and the construction of new power plants, constantly absorb an enormous amount of new capital. Into such enterprises the profits of business largely go, while the resulting benefits go to the entire community. The man without property, who spends every dollar of his income the same week he receives it, is able to buy more with his wages, because steam engine efficiency has been doubled in the last forty years.

### Making Good War Losses

The world is suffering frightful losses through the war, and people are wondering what the effects of these gigantic debts will be upon the earnings of industry and the welfare of the peoples. We may learn something about this from the experience of the past. "It is our improved steam engine," wrote Francis Jeffrey in the "Edinburgh Review" in 1819, "that has fought the battles of Europe, and exalted and sustained, through the late tremendous contest, the political greatness of our land. It is the same great power which enables us now to pay the interest on our debt and to maintain the arduous struggle in which we are still engaged with the skill and enterprise of other countries less oppressed with taxation."

The steam engine which helped England bear the burdens of the wars with Napoleon was a poor affair compared with the engine of to-day, but even the latter, as Mr. Manning and Professor Anderson have indicated, may have its average efficiency in practice greatly increased. Beyond these prospective gains are those which lie in other sources of power, and in all the improvements in industrial equipment which are only partially introduced, or as yet only forming in the minds of inventors. More important than all these are the possibilities which lie in more thoroughly organized and harmonious industry, the development of intelligence and efficiency among the people, and the spread of a better understanding of common interests. We must look to these changes for gains in production which will enable society to overcome the losses of the war, and repeat the progress accomplished by the original application of the steam engine to industry.

## EARLY HISTORY OF THE WIRE-DRAWING INDUSTRY

By J. P. Bedson*

PUDDLED iron was at its zenith in 1872. The process of puddling devised by Henry Cort, who revived the art of making iron with raw coal, the secret having died with Dan Dudley, was on a sand bottom. It required two tons of pig iron to produce one ton of malleable iron, and though this amount was reduced later it was never possible to work with less than 30 cwt. of pig, and the labor was so great that only 2½ cwt. could be treated at a time. Attempts were made to reduce the waste, but it was not till 1820 that Joseph Hall, of Tipton, came upon the solution in the process known as "pig-boiling." That he made for his firm a reputation for quality second to none was largely due to the fettling used for lining the furnace, and much of his improvement in fettling depended on the employment of "bull dog," a calcined cinder from pig-boiling. But even in this improved process the work was most arduous and exacting.

Puddled iron was largely used in the wire trade for all common purposes, such as low-grade telegraph wire, armor for submarine cables, and fencing; but for the higher grades at that time English and Swedish charcoal irons were required, the former being made in the South Staffordshire district and in Shropshire. From 1850, when the first experiments in submarine telegraphy were made by the laying of a cable between Dover and Calais, the wire trade found an increasing demand for its productions, and Mr. Bedson mentioned that half of the wire required for the first Atlantic cable was drawn within 600 yards of the place where his audience were assembled. At the same works the wire was drawn for the first two wire bridges built in the United States by John A. Roebling, one being at Covington, Cincinnati, where the suspension cables were 1,760 feet long and were each composed of 5,200 wires, and the other the Niagara Railway Suspension Bridge.

### Continuous Rolling

A patent was granted in 1862 to George Bedson, of Manchester, for his continuous system of wire rod rolling mill, whereby rods could be rolled in 1 cwt. pieces, subsequently increased to 3 cwt., instead of small pieces of rod and coils of 14 lb. The three leading features of this mill were that the door of the heating furnace was placed immediately in front of the first pair of rolls, so that the heated billet when placed in them would draw the remaining length out of the furnace; that the rolls, 16 in number, were placed in line so that No. 1 delivered to No. 2, and so on, each roll being graduated in increased speeds to suit the acceleration of the reduced size of the billet as it progressed to the end of the mill, where the outcoming rods were coiled on suitable reels; and that a twisted guide was provided to present the partly-rolled rod to the succeeding pair of rolls, though this was required only once in the first mills when rolling iron. The rolls in the original mill were placed alternately horizontal and vertical, to give the requisite compression on top and sides alternately.

An experimental mill erected in the Adelphi, Salford, in 1857 proved successful, and was then removed to Bradford Ironworks, Manchester, where it ran till 1884. Of a second mill built in 1866 part is running to-day. A duplicate of it was built in 1867 for Messrs. Washburn and Moen, of Worcester, Mass., U.S.A., and from it, under the guidance of Mr. Charles H. Morgan, sprang the successful adoption of the continuous system of rolling not only in America but on the Continent and, in one instance, in South Wales. There is, however, a Sheffield installation of one of his mills which it is to be hoped will give an impetus to continuous rolling in this country. That system the author pronounced the greatest advance in rolling since it left the hands of Cort.

Another imperfection in the manufacture of wire besides the short pieces—the deteriorating effect of galvanizing on the wire—was remedied by Mr. Bedson in his continuous system of galvanizing, patented in 1860, which secured an excellent coat of zinc on the wire, perfect mechanical adhesions of the two metals, and maintenance of all the ductility and strength of the wire.

### Bessemer and Basic Steel

Next came the era of homogeneity, as against the fibrous iron given by puddled and charcoal material. In 1866 a ton of Bessemer steel was drawn, with good results. The material did not, however, displace the qualities of iron just mentioned, but gave the wire-drawer a stronger material in addition, thus increasing his ability to meet higher and extending requirements in engineering design. The treatment was much the same as for iron, except that the steel was heated only to a bright red for the rolling mill, whereas for iron a "wash heat" was required.

Basic steel, the invention of two Englishmen, Thomas and Gilchrist, created a great revolution in wire-drawing. Its great ductility made it ideal for the purpose, and through it the cost has been reduced and the work greatly simplified—so much so, that it would break the heart of a wide drawer to-day if he had to draw puddled iron to small sizes. The general use of basic metal began about 1884, and to-day it holds the premier position for wire-drawing purposes.

### Electrical Drive

In 1862 the author left Manchester to put down a wire rod rolling mill, a wire drawing mill, and galvanizing plant at Middlesbrough. He intended to use producer gas as the motive power, except for the rod mill, which was to be steam driven, but before his plans were completed his attention was drawn to what was being done with electrical drive on the Continent. The idea of driving each wire block direct from its own motor, suggested to him by M. Pieper, of the Compaignie de l'Electricité, at Liége, appealed to him strongly. Experiments were made with success, and a steam-driven dynamo of 600 h.p. was ordered, then the largest continuous current dynamo in the country. At the start over 40 individual motors, varying from 5 to 30 h.p. each, were required. This plant was the first in this country put down as a purely electrically driven plant.

*Abstract of address to Manchester Association of Engineers.

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## BUILDING A CANADIAN MERCHANT MARINE

A MOMENTOUS event in the industrial history of Canada was foreshadowed in the recent announcement by the Hon. C. C. Ballantyne of the national shipbuilding policy which is to be carried out by the Union Government. Some such action of this nature could hardly be otherwise than expected in view of parallel developments in allied fields both in Britain and the States.

It is now many weeks since the United States Government took over all the tonnage in course of construction in American yards for both home and foreign owners, and the pending action of the Canadian Government is but a natural sequel to the systematic transfer to British registry of ships which had originally been contracted for with foreign owners.

That such action on the part of the Government will meet with unanimous approval throughout the country is a foregone conclusion. One of the chief handicaps of the future and which till now seemed insuperable would have been the lack of tonnage wherewith to insure the world-wide distribution of Canadian products when commerce resumes its natural course. The lack of American-owned tonnage has been a consistent factor in retarding the export trade of that nation for many decades, and the certainty that the termination of hostilities will find the States in possession of a vast fleet of merchantmen is a source of much pleasurable anticipation to the manufacturing interests of that country besides acting as a desirable stimulant to the production of ships in the meantime. Much harmful lassitude may creep in unawares when it is felt that no permanent benefit of an individual nature would be derived from the shipbuilding activity of the Dominion, and visions of foreign-built and owned ships enjoying advantages in cost of production and choice of freights while Canadian yards were undergoing gradual disintegration are not calculated to insure the same degree of efficiency which would be otherwise obtained.

All of this uncertainty is removed, particularly by the fact that negotiations are already under way with the object of installing plate and shape mills at some suitable place or places best calculated to fit in with the present disposition of steel plants and the location of principal shipyards.

The certainty of an ample supply of material insured by these conditions may be offset to a considerable extent by financial consideration which no amount of well-intentioned government assistance can sidetrack. We refer particularly to the cost and availability of imported material which will be ruling when, if not before, such a plant as essayed by the Government could be obtained and put into operation.

Equipment such as is required can only be obtained from the States, and under present conditions contracts for such machinery would have to receive approval and some degree of priority in delivery by the United States authorities if it is to be had inside of two years. A plate mill capable of producing maximum size plates as used in the construction of 10,000-ton boats would have an annual capacity largely in excess of our requirements, and the cost of maintaining the plant idle for perhaps six months in the year would have to be taken care of by Government subsidy. Certainly the cost of producing ships in this manner could not be expected to equal that in other countries where continuous operation was possible.

The deciding factor would therefore be as to whether the shipowners or the nation in general should pay the extra cost involved through using Canadian plates. If conditions could be foreseen accurately enough to determine the certainty and amount of foreign material which could be obtained at any specified time, the advisability of installing plate mills might be seriously questioned. The possibility of securing equipment may be increased through diplomatic channels to a degree which would be most desirable in insuring, through the availability of material at a suitable cost, the continuance of shipbuilding in this country during the most critical time,—the transition period, when competition with the world would begin to assume an important influence on affairs. The most important benefit, however, is the insurance of a supply of bottoms wherewith to transport Canadian products, and the maintaining of the freight rates at reasonable levels, as indicated by the announcement referred to.

## WHY NOT A PRIORITY BOARD?

ALTHOUGH somewhat belated, the announcement that the Dominion Government contemplate assisting in an effort to increase the production of iron and steel will be received with gratification in manufacturing circles. For some time the shortage of iron and steel has been becoming acute and has more recently assumed serious proportions, particularly since the enormous demand in the United States necessitated the introduction of an embargo. It is of vital importance that a sufficient supply of steel should be available for those of our industries engaged upon the production of munitions and other war supplies. Shipbuilding and the railways, of course, come under this category.

Although few details have been given out, the time seems opportune for the creation of a Priority Board to distribute available supplies of steel, etc., where most urgently required and to generally supervise the production and consumption of iron and steel, so that every pound may be used to the best advantage. The effect of such a system would be both immediate and beneficial. The Priority Board at Washington has been a great success and is a good precedent to follow. A board at Ottawa could not regulate prices to the same extent but could do more valuable service in the distribution of materials. Prices at this time are of secondary consideration; the urgent need of steel is the primary factor in the situation.

The appointment of a Priority Board does not necessarily mean any drastic interference with the management of the different steel companies but could be used as a species of clearing house and arrange production schedules with the mills. Such an organization would be able to speed up the delivery of raw materials to the mills and ensure maximum operating capacity at all times.

# INDUSTRIAL NOTABILITIES

JOHN JOSEPH HARTY, president and director, Canadian Locomotive Co., Kingston, Ont.; director, Dominion Steel Foundry Co., Hamilton, Ont.; director, Hamilton Steel Wheel Co., Hamilton, Ont.; director, Wabasso Cotton Co., Three Rivers, Que., was born in Kingston, Sept. 16, 1874, son of the Hon. William and Katherine Harty (deceased).

He received his education in Private School, Kingston; Kingston Collegiate Institute; and St. Mary's College, Montreal; graduating later from Queen's University, Kingston, with degree of M.D., but never practised medicine.

JOHN JOSEPH HARTY

In 1899 Mr. Harty engaged in real estate business with Strong & Ireland, New York, and joined the Canadian Locomotive Co., Kingston, in 1900, as secretary. He became vice-president and general manager in 1916, and has been president since Sept., 1917.

Mr. Harty's civic activities include six years' service as alderman of Kingston, representing Cataraqui Ward.

His clubs are: Frontenac; Kingston Yacht; Thousand Islands Yacht; Thousand Islands Country; Kingston Golf and Country; R.C.Y.C. and University (Toronto); University (Montreal). Golf, motor-boating and motoring are his principal recreations.

Mr. Harty married Anna Fitzhugh Powell, April, 1906, and resides at Kingston, Ont.

# Ottawa to Take Steps to Relieve Iron and Steel Situation

*Authorities Recognize Necessity for Increased Production in Addition to Equitable Distribution—Trade More Settled Since Fixing of Price Schedule—Coal Shortage Causes Mill Activity—Non-Ferrous Metals Unchanged.*

RECENT announcements at Ottawa indicate that official notice has been taken of the acute situation in the iron and steel trade. Conditions in respect to the shortage of iron and steel are getting worse and in view of the necessity of utilizing all available supplies to the best advantage, efforts will be made not only to increase production but to supply those industries which are most in need of raw materials. Munitions, shipbuilding and railways require steel and it is of vital importance that there should be sufficient steel available for these purposes. It is also important that the non-war industries should not be entirely cut off from supplies of iron and steel. There is a more settled feeling in the trade now that the fixed price schedule has been extended for three months. Prices of steel products remain firm and unchanged. The severe weather has played havoc with operating schedules and the freight congestion is worse as a result. Both coal and coke are in short supply which is curtailing operations at the mills and adversely affecting the industrial situation generally. Prices of non-ferrous metals are unchanged this week and there is practically no change in the general situation. Tin, in future, will be shipped across the Pacific and permits will not be necessary. Prices of a number of lines of machine shop supplies have advanced, while the machine tool business generally is somewhat quieter than usual.

MONTREAL, QUE., Jan. 7, 1918.—The general industrial situation is again moving in its regular channels after the quiet period of the holiday season. Markets have been more or less disorganized by the pronounced delay in getting delivery of raw-materials. The Canadian situation at present is less acute, the milder weather enabling the railroads to maintain a higher efficiency in operation. Present activity is normal but prospects are for an increase in the near future.

### Steel

Conditions are beginning to show some sign of improvement and the acute situation that has been so pronounced for several weeks past is taking on a more encouraging tone. The relief that was anticipated by the recent developments in the railroad situation, both here and in the States, has not yet been particularly emphasized, but operations are begining to indicate that the near future will mark a turn for the better. While every effort has been made to conserve the available supply of coal, the shortage has been so pronounced in certain districts that the closing down of industries and the curtailment of heating in many public buildings has been a feature of the past few weeks. Immediate relief can only be realized by the most efficient co-operation of the manufacturers and the railroads to facilitate the movement of coal from the source to the destination. The production of iron and steel has suffered greatly from the inability to secure sufficient fuel for maximum operation, and many temporary close-downs have been necessary.

The Canadian situation has been more or less affected by the American developments owing to the inability of obtaining delivery of much needed materials. The situation is the all-absorbing problem at the present time as it is practically impossible to secure the required quantity from the United States. Steps are, however, being taken by the Canadian Government and other interested parties to establish new or additional units to existing steel plants with a view of increasing the output of steel plates of a grad erequired for shipbuilding purposes. While nothing definite has yet been announced in this connection, it is anticipated that in the very near future action will be taken in this very important matter. With the understanding that existing prices in the States will continue for several months without further adjustment or revision, the dealers here do not look for any immediate change in quotations now ruling. Local business has been quiet owing to the difficulty of getting delivery of material.

### Metals

The possibility that some revision would be made by the American Government in connection with the prices now ruling in the copper and other commodities has practically been dissipated by the announcement that it is very unlikely that any further readjustment would be made for at least three months and probably longer, as the present system of regulation is in most respects entirely satisfactory. Copper will remain at the price fixed as demands are well within the output of the refineries. Tin is still a feature, as relief on this side has not yet followed the sharp decline on the London market. Spelter is not active but continues firm. Lead is again returning to a stronger position. Antimony and aluminum are both firm and unchanged.

### Copper

With the definite announcement that no early change will be made in the price that governs the sale of copper in the States, the situation has taken on a settled aspect with producers and consumers well satisfied. Owing to the great falling off in the demand for domestic purposes the present production is ample for war requirements. The demand locally has been a little more active following the holidays, the steady tone of the market being well maintained with prices firm at 32 and 33 cents per lb.

**Tin.**—The acute condition that has characterized the tin situation for several weeks shows signs of relief, but the tension is still felt on this side of the Atlantic. The London market recorded a drop of £22 per ton over that quoted last week but so far this easier tone has not affected the price of tin on the New York market, the uncertainty of shipments still being a factor. Supplies on the local market are not abundant but sufficient to meet the requirements of the trade. Quotations have declined one cent during the week, dealers here asking 76 cents per lb.

**Spelter.**—The market has developed a slightly firmer tone following the placing of American Government orders for fairly large supplies. Stocks on hand are, however, more than sufficient to meet all demands and no immediate strength is looked for. Domestic inquiry is light but with a better undertone. The market here is steady and quotations are firm at 10½ cents per lb.

**Lead.**—A renewal of interest has developed in the lead situation owing to the strength shown during the past week. In addition to the increased demand, the apparent reluctance on the part of sellers to accept orders has awakened the waning interest of consumers, the latter showing some anxiety to cover their requirements. The return to the stronger position is shown in the advance on the New York market, the quotation of 6½ cents for Trust and 7 cents for independents representing an advance of ¼ cent per lb. Local dealers report a stronger market and quotations have advanced ¼ cent during the week, the current price being 9¾ cents per lb.

**Antimony.**—The market is devoid of feature and the demand light. The firmness of the New York situation is maintained as a result of recent reports that the American Government would soon be buyers of considerable quantities of metal. The local market is quiet with price firm at 18 cents per lb.

**Aluminum.**—This market continues steady and firm with quotations well maintained; local dealers are asking 60 cents per lb.

### Machine Tools and Supplies

The opening week of the New Year has not developed any marked activity in the machine tool industry but the prospects are encouraging for a continuance of a fair volume of business throughout the winter months. The recent placing of American shell orders has somewhat revived the interest of machine tool builders and considerable equipment has been placed for this type of shell. It is anticipated that more orders may be placed and also further British shells which will call for additional machinery. In some respects, however, the plants that will receive this business are already well equipped with the necessary machinery, and the new tools that may be required will be more a question of replacing those that have become unsatisfactory for production purposes. The demands for general equipment are showing signs of declining but the volume of business in this respect is still of an encouraging character. Inquiries for machine tool supplies and general shop necessities have shown a slight increase and the continued activity in the manufacturing industries appears to indicate that present activity is on a par with that of the past several months. All quotations are firm and well maintained.

### Scrap

Activity in the old metal market has been affected by the difficulties experienced in transportation. Dealers are still at a loss to understand the attitude of the American Government in connection with the scrap situation and the market as a result, has been comparatively quiet, business being of the restricted character. It is expected that when the wishes of the Government are thoroughly understood and the dealers are satisfied with this ruling that conditions will again return to their normal state. Local conditions are more or less reflected in those prevailing in the States and dealers here report a very quiet market and light business; quotations are unchanged and firm.

## Toronto

TORONTO, Ont., Jan. 8.—The Dominion Government purpose to take a hand in relieving the acute situation in the iron and steel trade will doubtless be productive of good results. According to reports from Ottawa, an ambitious scheme is under contemplation whereby the production of steel in Canada is to be considerably increased. The Government also propose taking over the shipbuilding plants and undertaking the construction of a large number of steel vessels, involving a large sum of money. It is to be honed that there will be an improvement in the coal situation. Fuel Controller C. A. Magrath has been to Washington and, as a result, coal shipments are to be given precedence at the border over everything else. Special arrangements have been made with the railways to this end.

### Steel

The recent announcement at Ottawa relative to the conditions in the iron and steel trade indicates that a determined effort will be made to relieve the present acute situation in so far as this is possible. The supply of steel is proving inadequate to meet the increasing demand. The shortage which has existed for some months is getting worse and has reached a point where something must be done to avert a most serious state of affairs. The Imperial Munitions Board, representatives of the railway companies, and also of the steel companies met in conference at Ottawa last Thursday and Friday to discuss ways and means of relieving the shortage of iron and steel supplies for munitions, railways and industrial purposes. Plans were discussed for co-ordinating supplies as far as possible, according to relative necessities.

It is understood that the Dominion Government has under consideration plans for increasing the iron and steel output in Canada, and it is possible that some arrangement will be made for helping to finance extensions of present plants or else for the establishment of new plants, especially in regard to the production of steel plates for shipbuilding. Another matter discussed was the supply of steel for rails, of which the railways are in great need. It is believed that the Government will take action at once to increase the output of steel rails to meet the essential requirements of the railway companies.

**CANADIAN GOVERNMENT PURCHASING COMMISSION**

**The following gentlemen constitute the War Purchasing Commission appointed by the Canadian Government: Hormidas Laporte, Montreal, chairman; George F. Galt, Winnipeg; William P. Gundy, Toronto. Thomas Hillier is secretary, and the Commission headquarters are at Ottawa.**

It will be interesting to see what steps the Government propose taking to increase the output of the steel products mentioned in view of the difficulty that will be experienced in obtaining machinery for rolling plates and rails. There is no question as to the need of these materials, but their manufacture presents difficulties not easy to overcome under prevailing conditions. What will likely be done first is to form a Priority Board similar to the one at Washington. By this means the rolling schedule and other operations at the mills can be regulated in accordance with the requirements of the consumers and the output distributed where it is most needed.

Locally the steel market is quiet and there have been no price changes this week. The extension of the price schedule by the War Industries Board, Washington, has been well received in the trade, and the market is more settled on this account. The maximum prices will be continued in effect until March 31. It was further directed that no contracts calling for delivery of any of the commodities included in the schedule on or after April 1st are to specify a price unless the contract includes a clause making the price subject to revision by Government agency. Prices of steel products are holding firm, and in view of the heavy demand for steel products there seems to be little possibility of a decline in prices at any rate for the first quarter. The continued severe weather is seriously interfering with the movement of freight on the railways, while the output of the mills has been further restricted due to operating difficulties and shortage of fuel.

### Pig Iron

The severe weather has seriously interfered with the movement of coke and the shortage of this material is getting more acute. The Steel Company of Canada has been forced to bank one of its blast furnaces at Hamilton owing to the difficulty of obtaining coke, and has consequently withdrawn prices on foundry iron. This furnace was producing foundry iron, the other furnace producing basic iron. No general revision of coke prices is expected to be made throughout this year, according to the latest statement by Dr. Garfield, United States Fuel Director. Prospects have not improved for Connellsville coke shipments aside from promise of better things under Government railroad control. As yet Government control of the railroads in the States has not made a perceptible effect upon either coke or iron, but it is hoped that with an improvement in traffic conditions the coke situation will be considerably bettered, which in time will materially help the production of pig iron. H. Bayne, Dominion Controller of Metals, has gone to Washington to discuss with the officials there the pig iron supply in the States available for Canadian manufacturers.

### Scrap

The scrap metal market continues dull, with no improvement to note. Prices of steel and cast iron scrap are holding firm, but copper, lead and spelter continue weak. The maximum price of No. 1 heavy melting steel has been fixed at $30 per gross ton at any consuming mill in the United States.

### Machine Tools

The machine tool market is still rather quiet. Some munitions plants are being equipped for turning out 6-inch shells. The freight congestion, due to the severe weather is holding up shipments from the States; delay is also being caused by the necessity of obtaining licenses before tools can be shipped.

### Supplies

Business is fairly active and prices are still advancing on a number of lines. Pratt & Cady pop valves have advanced,

while water proof valves of the same make are also higher in price. As a result the [illegible] pipe cutters, [illegible] now quoted at 40 per cent. off as against 45 per cent. off list. Pipe extractors are also higher, being now quoted at 12½ per cent., as against 25 per cent. formerly. Higher prices on Manila rope are expected on account of the upward tendency in fibre.

### Metals

Business in the metal trade has been rather quiet this week, not having recovered from the effect of the holidays and stock-taking. There have been no important developments and conditions in the markets remain much the same as for the past few weeks. No activity in the copper market is looked for now that the producers' committee control the distribution of supplies, and the price is fixed; speculation is, of course, impossible. Tin is at a standstill, there being no spot metal and no transactions. Lead is firmer, but unchanged, while spelter is also the same price as last week. There has been no change in either antimony or aluminum.

**Copper.**—No marked change in the copper trade developed during the past week. The producers' committee continues to judiciously release metal to dealers in carload lots, with full regard to the prior necessities of the Government and Allies. Routine conditions prevail in the market and no material change in the situation is expected on account of the price being fixed and distribution under control. Prices locally are unchanged, lake and electrolytic being quoted at 32c and castings at 31c per pound.

**Tin.**—This metal has been placed on the war material list, which will eliminate all speculative trading. No more permits are to be issued for the shipment of tin from London to this side. All consignments for the United States and Canada will have to come via Singapore, and will not be subject to permit restrictions. This means that shipments of tin will in future come from Singapore via the Pacific. Prices are unchanged and nominal at 80c per pound.

**Spelter.**—The market is quiet, but producers are holding to their quotations and the price is firm at 10½c per pound.

**Lead.**—The leading interest has advanced its price in New York to 6½c, or ¼c over the previous quotation. This has strengthened the market and created a better sentiment in the trade. There has been as yet no change in price locally, and lead is still quoted at 8½c per pound.

**Antimony.**—The market continues dull and weak. The demand for antimony is high and quotations nominal and unchanged at 18c per pound.

**Aluminum.**—The market is steady and quiet, with quotations unchanged at 62c per pound.

## Sydney

SYDNEY, N.S., January 3.—Closely appCroximate figures at the end of 1917 [illegible] of Nova Scotia [illegible] than anticipated, owing to the great falling off in the last few weeks of the year. The total production was 5,687,000 tons comparing with 6,171,424 tons in 1916, a drop of well over half a million tons. Production during December was at a very low ebb. The Glace Bay collieries of the Dominion Coal Company put out only 236,000 tons, this being the smallest monthly output for ten years—with the exception of the strike period. Away back in 1902 these collieries were getting larger outputs at comparable seasons. The Inverness Coal Co. shows a rapid decline in production, and the output of the Acadia Coal Co. was adversely affected by the necessity of closing the Albion Slope because of fear of an underground fire. A snowfall on New Year's Eve—said to have been the greatest in 40 years—has thoroughly disorganized production in Cape Breton, and coming on top of the broken period of the Christmas holidays, has caused a quite unprecedented coal shortage locally. The Dominion Steel Company's plant has been completely or partially closed down for several days, and will not resume full operations for a number of days. Coal production seems to be going from bad to worse.

### Wage Dispute

The appointment of a tribunal is expected to adjust the wage question between the Amalgamated Mine Workers and the coal companies of the Sydney District. The Dominion Coal Company has increased the wages of its workmen in the period from June1, 1916, to May 1, 1917, by an average of 40 per cent., and has now offered a cumulative advance, on top of the 40 per cent. mentioned, of ten cents per day to men rated below $3.00 per day, plus a general increase of 12½ per cent. This means that within a period of 18 months the Dominion Coal Company has offered increases to its workmen aggregating 57 per cent. This last-named offer the Amalgamated Mine Workers refuse even to consider, and events are now awaiting the decision of the Minister of Labor as to the appointment of a tribunal to settle the disagreement.

The Dominion Coal Company has announced that its offer in any case is retroactive to the 1st of January, 1918. It has been stated the miners would, in case of refusal of their full demands, limit their work to four days per week, but it is not thought the general body of the men would follow their leaders to this extent, and in face of the unusual coal shortage neither the public or the government is likely to tolerate any stoppage of work.

## New York

NEW YORK, Jan. 5.—Because of the war the United States machinery industry transacted as much business in 1917 as in any three previous years in its history. It would not be surprising to find that contracts placed in the last twelve months for machinery and machine tools, to equip arsenals, navy yards, ordnance plants, shipbuilding works, airplane engine plants, and other mills and foundries engaged in the manufacture of war munitions, have called for the expenditure of $1,000,000,000. The buying movement is far from being over, although a lull was evident during the holiday period. In fact, the additional heavy appropriations called for by the United States Shipping Board to acquire and to build more shipbuilding plants will make further heavy drafts upon the resources of the machinery makers.

Productive capacity of the machinery factories in 1917 was increased from 50 to 150 per cent., but facilities are still inadequate to meet the pressing needs of the Government and manufacturers of war munitions. The Rock Island arsenal has distributed additional orders among tool builders calling for the expenditure of $1,000,000. Deliveries of these machines are to be made at various times over the next six months. Other Government orders will be closed in the next few days.

### New Ship Appropriation

Through the Secretary of the Treasury the United States Shipping Board has asked the House for an additional appropriation of $82,000,000 to acquire and establish shipbuilding plants. For the construction of new ships other than those for which contracts have been placed an additional appropriation of $701,000,000 is asked which will bring the total to be expended for construction of ships alone to $1,935,000,000. The Sound Shipbuilding Co., which has taken over the plant of the American Arms & U-boat Corporation, expects to obtain a contract for ships from the Emergency Fleet Corporation, and is now negotiating for cranes and machine tools. The Todd Shipbuilding Corporation has acquired the Puillon shipyard in Brooklyn, which it will utilize for boat repairs.

Additional heavy tonnages of steel plates and shapes for shipbuilding have been distributed among the steel mills by the War Industries Board. Canadian shipbuilders have also been seeking ship steel from American mills and have secured a moderate tonnage from plants on the lakes. Specifications are being prepared for large tonnages of steel sheets, which the Government will require to be shipped to manufacturers of war munitions.

### Railroad Equipment Contracts

Now that the Government has taken over control of the railroads, the plans to provide transportation companies with adequate equipment will be pushed. It is understood that specifications are in preparation for the building of 100,000 cars and several thousand locomotives for domestic service, and the steel mills will necessarily be called upon to furnish upward of 2,000,000 tons of steel to build this equipment. The War Industries Board has distributed orders for 9,000 freight cars for Italy, most of which will be constructed by the Standard Steel Car Co. and the American Car & Foundry Co., as these builders have steel which was designed for executing

the Russian contract, now suspended, which can be utilized in large measure to build cars for Italian service.

A large contract for machine guns has been placed by the U. S. Government with the New England Westinghouse Co. Heretofore the Westinghouse company has been manufacturing Russian rifles under contract with the British Government. Satisfactory arrangements have been made between the U. S. and British Governments by which the Westinghouse plant becomes available for manufacturing the heavy type of Browning gun for the U. S. army. Some purchases of machinery will be necessary to enable this plant to make machine guns instead of rifles.

## Pittsburgh

PITTSBURGH, Pa., Jan. 7.—This week opens with operating conditions at blast furnaces and steel works slightly improved. Although there is a somewhat freer movement of coal and coke, the supplies are still deficient at practically all the furnaces, and the percentage of banked furnaces resuming operations has thus far been very small. Consequently the production of iron is still on a greatly reduced scale.

### Traffic Conditions

The railroads remain very much congested, but are making strenuous efforts to improve matters. Iron and steel interests are all hopeful that the operation of the railroads by the Government will result in material improvement in traffic conditions, but they do not look for much change in the situation for a few weeks. Despite the fact that several additional embargoes have been placed, it is the belief that several months will elapse before the full results of the taking over of the transportation facilities will be felt.

### Pig Iron

The market for pig iron and finished steel products remains absolutely stagnan. Commercial demand is insignificant all along the line, and will likely remain so during the first quarter. Most of the consumers have bought for their full requirements covering a period of three months in anticipation of a revision in prices after March 31. On the other hand, the selling interests claim there is a big unsatisfied demand, and they look for a larger volume of new inquiry for small individual lots.

Following the formal announcement at Washington, as presaged in the last report, that there will be no iron and steel price revision before March 31, contracts are being made for Lake Superior iron ore for the season of 1918 at the prices ruling for the 1917 season, but with a proviso that they are subject to readjustment in case prices are changed later.

Big-head keeps more men from succeeding in this world than lack of education was ever accused of doing.

# Enlarged Canadian Trade Intelligence Service

**Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.**

CHILE—Valparaiso, British Consul General.

COLOMBIA—[illegible] eeral.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT—Alexandria, British Consul General.

FRANCE—[illegible] Marseilles, British Consul General..

INDIA—Calcutta, Director-General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul. Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA—Caracas, British Vice-Consul.

BRAZIL—Bahia, British Consul. Rio de Janeira, British Consul General.

# Canadian Commercial Intelligence Service

**The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.**

### CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address, Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. L. Crowe, Acting Canadian Trade Commissioner, P. O. Box 102, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Gerretd, Acting Canadian Trade Commissioner, Zandbaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Pensch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, 73 Basinghall Street, London, E.C.2, England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Anne's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Cantracom.

### CANADIAN COMMERCIAL AGENTS.

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—[illegible], Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

### CANADIAN HIGH COMMISSIONER'S OFFICE.

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

## CANADA'S TRADE POSITION

COMMENTING on the thrift of Canadians the "Wall Street Journal" says:

Canadian foreign trade for ten months of 1917 approaches $2,000,000,000—a per capita of $2,000. Of but recent development, the volume of commerce for the whole year will doubtless nearly equal in dollar value our own foreign trade for 1900, when we had 97,000,000 people. With but one-thirteenth our man-power, Canadian exports and imports will exceed one-fifth of our own.

It may be said low cost production and high prices of farm exports and manufactured food and shipments of military supplies have made this possible. But in reckoning these factors the adverse [illegible] in which Canada had the opportunity to lay the foundation for future international trade must be given due consideration.

### Position in 1914

In the summer of 1914 Canada was tentatively surveying the means of recovery from continent-wide liquidation. In the west and also in the east a prolonged real estate boom had collapsed, coincident and correlative with a severe contraction of commercial credit and radical readjustment of domestic trade in volume and method. It was a moot question whether real business revival would manifest itself in the autumn of 1914 or the following spring.

Credit was in its most sensitive stage of convalescence, when the declaration of war came as a clap of thunder from a cloudless sky, and 100,000 industrial effectives went voluntarily to the colors. The supply of labor was never adequate to pioneer construction; nevertheless, over 400,000 men went into service voluntarily from all classes and from the most productive occupations.

### War Bonds

At least $500,000,000 of war bonds have been purchased by the Canadians. The Ministers of the Crown were justified in the implicit confidence which they placed in the Canadian instinct of thrift. There are racial and political differences in Canada, but thrift in common, homely household terms, is a Dominion-wide virtue, characteristic of the passive and the unaggressive, as well as of the industrious and ambitious.

## CANADA'S PRODUCTION

The value of production in Canada during the year ending to-day from field crops, forests, mines and fisheries, according to the *Monetary Times*, was approximately $1,507,667,000, compared with $1,275,734,812 in 1916. The value of production (field crops, mines, fisheries and forest products) in 1908 was $703,590,000.

For the first time on record, in 1917 the value of Canada's field crops was over $1,000,000,000. This was due to the high prices prevailing.

## SOME ASPECTS OF SHIP DESIGN

THE present activity in shipbuilding, combined with the fact that most of the tonnage is for ocean use has directed considerable attention to the various bodies under whose supervision the vessels are constructed. Attention was drawn recently to an agreement between the leading registration societies whereby greater uniformity of specifications would be obtained. The difficulties of operating under the previously existing variety of requirements was exemplified by a writer in the Times Engineering Supplement who dealt with the possibilities of saving steel in ships.

### Draught and Strength

In designing warships or special types of merchant vessels calculations are made to decide whether the vessels will be strong enough for their intended work. These calculations are very complicated and involve a large amount of labor. The ship is treated as if she were a beam supported by her buoyancy, which is equal to her displacement, and loaded with weights made up of her own weight and that of any loads she may be carrying. This gives the bending moment and shearing force at any point in her length.

The value of these factors will vary in accordance with the distribution of the buoyancy and weight, but the maximum bending moment will occur at or near amidships, and the shearing force will have a maximum at about the quarter lengths of the ship. The strength of the section can be estimated at any point so that the stresses acting can at once be determined. Usually if the strength is sufficient amidships it will be so throughout. In special cases, however, the strength is estimated at any doubtful point and the material disposed accordingly. It should, of course, be understood that these calculations are not to be regarded as absolute. They really form a means of comparison between vessels, and it is doubtful if the stresses obtained by this means really represent those actually existing in a vessel at sea.

In ordinary merchant vessels calculations are not required. Registration societies have drawn up tables of scantlings for steel vessels by means of which the necessary strength in any ship can be provided. These tables have been derived to some extent by calculation, but for the most part they are based on experience. It is not surprising, therefore, that similar vessels built under different societies' rules vary in strength.

### Work of the Load Line Committee

The greater the displacement of a ship the larger will be the forces acting on her. The question of the relation between draught and strength of ships was very fully dealt with by the Load Line Committee. This committee estimated the strength of various ships at their amidships sections with steel scantlings as fixed by the four principal registration societies. The values were found to vary, and they were plotted as curves having for their base the length to depth ratio of the ship. Fair curves were drawn for each society, representing the minimum values, and a minimum curve was then drawn which was taken as a standard by the Load Line Committee. It was found that the strength of the section varied directly as the draught of the ship, the beam, and as a factor depending on the length of the ship. A standard of transverse strength was also investigated by the committee and determined in a similar way to the longitudinal strength. It follows, therefore, that in most cases the scantlings at present adopted by the registration societies will give a strength greater than the standard. Hence it is to be expected that some modifications will be brought about in the rules of the societies with the object of reducing the amount of steel in merchant ships.

The rules, however, have a further application which is important. The standard of strength set up by the Load Line Committee refers to vessels running at a draught equal to the maximum laid down by the Load Line rules. Many ships are built the carrying capacity of which is determined by the cargo space available rather than by the cargo weight. Such vessels cannot stow a sufficient weight of cargo to load them down to the maximum permissible draught. In consequence, the forces brought to bear on them are less, and their strength could accordingly be reduced in the direct ratio of their actual draught to the maximum. The registration societies have partly recognized this consideration already. Lloyd's Register will allow a reduction in scantlings for vessels carrying a limited amount of cargo with a fixed freeboard. Germanischer Lloyd specifically state the reduction in scantlings for reduced draught, but fix a maximum reduction which can be applied to the longitudinal and transverse structural parts. These reductions apply to the half length of the vessel amidships. At the ends only half the amount is allowed. The principle used is that the strength of the ship must vary as the draught. Bureau Veritas adopt a similar procedure to the German society, and state that all the midship tabular scantlings, that is the scantlings of the strength parts, may be reduced in the direct ratio of the proposed draught of water to the full draught allowable, while the scantlings at the ends are to be those which correspond with the reduced midship scantlings. A limit below which the scantlings are not to be reduced is fixed.

### Subdivision

In addition to the reason already given for many ships running at draughts below the maximum permissible there is now the operation of the International Convention Rules to be taken into account. Any vessel carrying 12 or more passengers comes under this convention, which fixes the subdivision in accordance with the freeboard ratio—that is, the ratio between the freeboard and the draught. While it is theoretically possible to put a sufficient number of bulkheads into a ship to enable her to run at her maximum draught and still fulfil the convention rules, the result will often be the introduction of so many bulkheads into the ship that she would not be satisfactory commercially. In consequence,

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

### PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $[illegible] 7 |
| Lake Superior, charcoal, Chicago | 37 50 |
| Standard low phos., Philadelphia | [illegible] |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 35 00 |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | | |
| Victoria | 50 00 | |

### FINISHED IRON AND STEEL

| Per lb. to Large Buyers. | Cents |
|---|---|
| Iron bars, base, Toronto | [illegible] 2.5 |
| Steel bars, base, Toronto | 3 50 |
| Steel bars, 2 in. to 4 in. base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel, hoops | [illegible] |
| Refined iron | [illegible] |
| Norway iron | [illegible] |
| Tire steel | [illegible] |
| Spring steel | [illegible] |
| Band steel, No. 10 gauge | [illegible] |
| Chequered floor plate, 3-16 in. | 13 20 |
| Chequered floor plate, ¼ in. | 12 00 |
| Staybolt iron | 8 50 |
| Bessemer rails, heavy, at mill | [illegible] |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel, hoops, Pittsburgh | [illegible] |

F.O.B., Toronto Warehouse

| | |
|---|---|
| Steel bars | 5 50 |
| Small shapes | 5 75 |

F.O.B. Chicago Warehouse

| | |
|---|---|
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 15 |

*Government prices.

### FREIGHT RATES

Pittsburgh to Following Points

| | Per 100 lbs. C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 35.1 | 45.5 |
| Halifax | 35.1 | 45.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

### METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $[illegible] 00 | $[illegible] 00 |
| Electro copper | 33 00 | 32 00 |
| Castings, copper | 32 00 | 31 00 |
| Tin | [illegible] 00 | [illegible] 00 |
| Spelter | 10 50 | 10 50 |
| Lead | [illegible] 75 | [illegible] 00 |
| Antimony | 18 00 | 18 00 |
| Aluminum | 60 00 | 62 00 |

Prices per 100 lbs.

### PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¼ to ½ | $13 00 | $12 00 |
| Heads | 13 30 | 12 30 |
| Tank plates, 3-16 in. | 13 10 | 12 10 |

### WROUGHT PIPE

Effective July 5, 1917.

| Size | Black Standard Buttweld Per 100 feet | Galvanized Standard Buttweld Per 100 feet |
|---|---|---|
| ⅛ in. | $5 00 | $6 50 |
| ¼ and ⅜ in. | 5 12 | 7 16 |
| ½ in. | 6 46 | 8 05 |
| ¾ in. | 8 17 | 10 29 |
| 1 in. | 12 07 | 15 22 |
| 1¼ in. | 16 33 | 20 59 |
| 1½ in. | 19 53 | 24 61 |
| 2 in. | 26 27 | 33 12 |
| 2½ in. | 42 12 | 52 94 |
| 3 in. | 55 08 | 69 23 |
| 3½ in. | 69 92 | 86 94 |
| 4 in. | 82 84 | 103 00 |

Standard Lap Weld

| | | |
|---|---|---|
| 2 in. | 29 23 | 35 71 |
| 2½ in. | 43 88 | 54 11 |
| 3 in. | [illegible] 28 | 70 [illegible] |
| 3½ ins. | 71 76 | 87 70 |
| 4 in. | 84 02 | [illegible] |
| 4½ in. | 96 52 | 121 29 |
| 5 in. | 112 50 | 141 34 |
| 6 in. | 145 90 | 183 36 |
| 7 in. | 190 40 | 238 00 |
| 8 L in. | 200 00 | 250 00 |
| 8 in. | 230 40 | 288 00 |
| 9 in. | 276 00 | 345 00 |
| 10 L in. | 256 00 | 320 00 |
| 10 in. | 329 60 | 412 00 |

Prices—Ontario, Quebec and Maritime Provinces

### WROUGHT NIPPLES

4" and under, 45%.

4½" and larger, 40%.

4" and under, running thread, 25%.

Standard couplings, 4" and under, 25%.

4½" and larger, 15%.

### OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $18 00 | $19 00 |
| Copper, crucible | 22 50 | 21 50 |
| Copper, heavy | 22 50 | 21 50 |
| Copper wire | 22 50 | 21 50 |
| No. 1 machine composition | 21 00 | 20 50 |
| New brass cuttings | 16 00 | 17 00 |
| No. 1 brass turnings | 14 00 | 15 75 |
| Light brass | 10 00 | 10 00 |
| Medium brass | 14 00 | 14 00 |
| Heavy brass | 15 00 | 16 00 |
| Heavy melting steel | 21 00 | 20 50 |
| Steel turnings | 12 60 | 8 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 23 00 | 18 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 20 50 |
| No. 1 machine cast iron | 25 00 | 25 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 15 00 | 9 00 |
| Car wheels, iron | 26 00 | 25 00 |
| Steel axles | 38 00 | 30 00 |
| Mach. shop turn'gs. | 9 00 | 8 50 |
| Cast borings | 12 00 | 8 50 |
| Stove plate | 19 00 | 19 00 |
| Scrap zinc | 5 50 | 6 50 |
| Heavy lead | 5 50 | 7 00 |
| Tea lead | 3 00 | 5 75 |
| Aluminum | 25 00 | 25 00 |

### BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, ⅜" and less. | 10 |
| Carriage bolts 7-16 and up. | net |
| Coach and lag screws | [illegible] |
| Stove bolts | [illegible] |
| Plate washers | List plus 20 |
| Elevator bolts | [illegible] |
| Machine bolts, 7-16 and over | net |
| Machine bolts, ⅜ and less. | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | 10 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | add 25 |
| Nuts, square blank | add $1 50 |
| Nuts, square, tapped | add [illegible] |
| Nuts, hex. blank | add 1 75 |
| Nuts, hex. tapped | add 2 00 |
| Copper rivets and burrs, list plus | [illegible] |
| Burrs only list plus | 50 |
| Iron rivets and burrs | 15 |
| Boiler rivets, base ¾-in. and larger | $8 [illegible] |
| Structural rivets, as above | 8 40 |
| Wood screws, F. H., bright | [illegible] |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 37½ |
| Wood screws, O. & R., brass | 32½ |
| Woodscrews, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

### MILLED PRODUCTS

| | Per cent. |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil Head Cap Screws | net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. and semi-fin. nuts, over 1 in., up to 1½ in. | [illegible] |
| Fin. and semi-fin. nuts over 1½ in., up to 2 in. | plus 10 |
| Studs | net |
| Taper pins | 40 |
| Coupling nuts, pins | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | list plus 20 |
| Collar screws | list plus 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | [illegible] |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add $7 00 |

### BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $47 [illegible] |
| Open-hearth billets | 47 50 |
| O.H. sheet bars | 51 [illegible] |
| Forging billets | 60 00 |
| Wire rods | 57 [illegible] |

Government prices.

F.O.B. Pittsburgh.

### NAILS AND SPIKES

| | |
|---|---|
| Wire nails | $5 50 $5 45 |
| Cut nails | [illegible] |
| Miscellaneous | [illegible] |
| Spikes, ⅜ in. and larger | $7 50 |
| Spikes, ¼ and 5-16 in. | 8 00 |

### MISCELLANEOUS

| | |
|---|---|
| Solder, [illegible] | 0 [illegible] |
| Solder, [illegible] | 0 [illegible] |
| Babbitt metal | [illegible] |
| Soldering coppers, lb. | 0 53 |
| Lead wool, per | 0 [illegible] |
| Putty, 100-lb. drums | 4 75 |
| White lead, pure, cwt. | 16 20 |
| Red dry lead, 100-lb. kegs, per | [illegible] |
| Glue, French | [illegible] |
| Tarred slater's paper, roll | 0 95 |
| Glue, [illegible] | [illegible] |
| Benzine, per gal., bulk | 0 30½ |
| Pure turpentine, single bbls., gal. | [illegible] |
| Linseed oil, raw, single bbls. | 1 36 |
| Linseed oil, boiled, single bbls. | 1 39 |
| Plaster of Paris, per bbl. | 2 50 |
| Sandpaper, B. & A. | list plus 20 |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| Borax crystal and granular | 0 15 |
| Wood alcohol, per gallon | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

### ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 41 |
| Plumbers' oakum, per lb. | 0 09 |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila Rope | 0 33 |
| New Zealand Hemp | 0 33 |
| Transmission rope, Manila | 0 45 |
| Cotton Rope, ¼-in. and up | 0 47 |

### POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

### CARBON DRILLS AND REAMERS

| | Per Cent. |
|---|---|
| S.S. drills, wire sizes up to 52 | 30 |
| S.S. drills, wire sizes, No. 53 to [illegible] | [illegible] |
| Standard drills to 1½ in. | 30 |
| Standard drills, over 1½ in. | 30 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 20 |
| Blacksmith [illegible] | [illegible] |
| Ratchet drills | 15 |
| S.S. drills for wood | 30 |
| Wood boring brace drills | 25 |
| Expansion [illegible] | [illegible] |
| Sockets | 40 |
| Sleeves | 40 |
| Taper pin reamers | net |
| Drills and countersinks | [illegible] |
| Bridge reamers | [illegible] |
| Centre reamers | [illegible] |
| Chucking reamers | [illegible] |
| Hand reamers | 10 |

### COLD ROLLED SHAFTING

At mill ..... list plus 40%

At warehouse ..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto

### IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 25% off list. Malleable bushings, [illegible] cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings: Class B black, 24½c lb.; Class C black, 15¾c lb.; galvanized, Class B, 34c lb.; Class C, 24½c lb. F.O.B. Toronto.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $9 50 | $ 8 [illegible] |
| Sheets, black, No. 10 | 12 00 | 12 00 |
| Canada plates, dull, 52 sheets | 12 00 | 12 [illegible] |
| Canada plates, all bright | 12 50 | 12 50 |
| Apollo brand, 10¾ oz. galvanized | 12 25 | 12 00 |
| Queen's Head, 28 B.W.G. | 11 75 | 10 75 |
| Fleur-de-Lis, 28 B.W.G. | 11 75 | 10 75 |
| Gorbal's Best, No. 28 | 12 00 | 10 25 |
| Colborne Crown, No. [illegible] | | 10 00 |
| Premier, No. 28 U.S. | 13 75 | 9 70 |
| Premier, 10¾ oz. | 13 85 | 10 00 |
| Zinc sheets | 20 00 | 20 00 |

### PROOF COIL CHAIN.

| | |
|---|---|
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| ⅜ in. | 11 50 |
| 7-16 in. | 10 90 |
| [illegible] | [illegible] |
| 9-16 in. | 11 20 |
| ⅝ in. | 11 10 |
| ¾ in. | 11 00 |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| Extra for B.B. Chain | 1 20 |
| Extra for B.B.B. Chain | 1 50 |

### ELECTRIC WELD COIL CHAIN B.B.

| | |
|---|---|
| ⅛ in. | $4 50 |
| [illegible] | 3 70 |
| ¼ in. | 3 40 |
| 5-16 in. | 7 40 |
| ⅜ in. | 6 85 |
| 7-16 in. | 6 35 |
| ½ in. | 6 35 |
| ⅝ in. | 6 35 |
| ¾ in. | 6 35 |

Prices per 100 lbs.

### FILES AND RASPS.

| | Per Cent. |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P H and Imperial | 50 |
| Nicholson | 40 |
| Black Diamond | 40 |
| J. Barton Smith, Eagle | 50 |
| McClelland Globe | 50 |
| Delta Files | 37½ |
| Disston | 50 |
| Whitman & Barnes | 50 |

### COAL AND COKE.

Solvay Foundry Coke
Connelsville Foundry Coke
Steam Lump Coal
Best Slack

Net ton f.o.b. Toronto.

### BOILER TUBES.

| Size. | Seamless | Lap-welded |
|---|---|---|
| 1 in. | $36 00 | $ .... |
| 1¼ in. | 40 00 | .... |
| 1½ in. | 43 00 | 36 00 |
| 1¾ in. | 43 00 | 36 00 |
| 2 in. | 50 00 | 36 00 |
| 2¼ in. | 53 00 | 38 00 |
| 2½ in. | 55 00 | 42 00 |
| 3 in. | 64 00 | 50 00 |
| 3¼ in. | .... | 58 00 |
| 3½ in. | 77 00 | 60 00 |
| 4 in. | 90 00 | 75 00 |

Prices per 100 feet, Montreal and Toronto.

### OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | 50 |
| Royalite, per gal., bulk | 16 |
| Palacine | 19 |
| Machine oil, per gal. | 26½ |
| Black oil, per gal. | 15 |
| Cylinder oil, Capital | 45½ |
| Cylinder oil, Acme | 36½ |
| Standard cutting compound, per lb. | 0 06 |
| Lard oil, per gal. | 2 50 |
| Union thread cutting oil antiseptic | 88 |
| Acme cutting oil antiseptic | 37½ |
| Imperial quenching oil | 39½ |
| Petroleum fuel oil | 12½ |

### BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30-5% |
| Standard | 40% |
| Cut leather lacing, No. 1 | 1 95 |
| Leather in sides | 1 75 |

### TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### WASTE.

| White. | Cents per lb. |
|---|---|
| XXX Extra | 20 |
| Peerless | 20 |
| Grand | 19 |
| Superior | 19 |
| X L C R | 18 |
| Atlas | 18 |
| X Empire | 18 |
| Ideal | 17 |
| X press | 16 |

**Colored.**

| | |
|---|---|
| Lion | 14½ |
| Standard | 13 |
| No. 1 | 13 |
| Popular | 11¾ |
| Keen | 10½ |

### WOOL PACKING.

| | |
|---|---|
| Arrow | 25 |
| Axle | 20 |
| Anvil | 15 |
| Anchor | 11 |

### WASHED WIPERS.

| | |
|---|---|
| Select White | 12 |
| Mixed colored | 10 |
| Dark colored | 09 |

**This list subject to trade discount for quantity.**

### RUBBER BELTING.

| | |
|---|---|
| Standard | 10% |
| Best grades | 15% |

### ANODES.

| | |
|---|---|
| Nickel | .50 to .54 |
| Cobalt | 1.75 to 2.00 |
| Copper | .41 to .46 |
| Tin | .49 to .56 |
| Zinc | .23 to .25 |

Prices Per Lb.

### COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | 55 00 | 48 00 |
| Copper wire, list plus 10. | | |
| Plain sheets, 14 oz., 14x60 in. | 55 00 | 48 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 60 00 | 54 25 |
| Copper sheet, planished, 16 oz. base | 64 00 | 49 00 |
| Braziers', in sheets, 6x4 base | 55 00 | 48 00 |

### BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 43 |
| Brass sheets, 24 gauge and heavier, base | 0 48 |
| Brass tubing, seamless | 0 55 |
| Copper tubing, seamless | 0 60 |

### PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 06 |
| Emery glue | 15 to 20 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 35 |

Prices Per Lb.

### LEAD SHEETS.

| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $18 00 | $18 00 |
| Sheets, 3½ lbs. sq. ft. | 18 00 | 18 00 |
| Sheets, 4 to 6 lbs. sq. ft. | 17 50 | 17 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS.

| | |
|---|---|
| Acid, boracic | $ .15 |
| Acid, hydrochloric | .05 |
| Acid, hydrofluoric | .14½ |
| Acid, nitric | .10 |
| Acid, sulphuric | .05 |
| Ammonia, aqua | .08 |
| Ammonium carbonate | .15 |
| Ammonium, chloride | .11 |
| Ammonium hydrosulphuret | .40 |
| Ammonium sulphate | .07 |
| Arsenic, white | .12 |
| Copper, carbonate, anhy. | .35 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .70 |
| Iron perchloride | .20 |
| Lead acetate | .16 |
| Nickel ammonium sulphate | .12 |
| Nickel carbonate | .35 |
| Nickel sulphate | .15 |
| Potassium carbonate | .75 |
| Potassium sulphide (substitute) | .20 |
| Silver chloride (per oz.) | .65 |
| Silver nitrate (per oz.) | .55 |
| Sodium bisulphite | .10 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .41 |
| Sodium hydrate | .04 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | .14 |
| Tin chloride | .60 |
| Zinc chloride | .60 |
| Zinc sulphate | .09 |

**Prices per lb. unless otherwise stated.**

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in order not to diminish unduly the length of holds, fewer bulkheads will be fitted and the draught reduced below the maximum. It will be some compensation for this reduction in draught if the registration societies allow the scantlings to be reduced.

In fixing the scantlings for a ship from the rules of a registration society reference is made only to the principal dimensions, and these take no account of the deck erections. On the other hand by the Load Line rules the greater the erections the greater can the maximum draught be. In considering Lloyd's rules, for instance, the midship scantlings for a ship with erections will be the same whatever the extent of these, provided the centre or bridge erection is not less than the minimum length given by Lloyd's Register for long bridges. Taking a particular ship, say, 510 ft. long, the load draught would be about 31 ft. 4 in. if the bridge was of the minimum length of 102 ft. If the length of the bridge were increased to 306 ft. and a poop and forecastle added, each 64 ft. in length, the load draught would be 33 ft. 1 in. Therefore, although the two ships would have the same strength amidships, the calculated forces brought to bear on the latter would be 5½ per cent. greater than on the first. If the three erections were now merged into one, that is, the ship made into an awning decker, the permissible load draught would be 34 ft. 1 in. Here again the midship scantlings would be unaltered, but the forces acting on the ship would be about 9 per cent. greater than in the first case. If the process of increasing the erections is still continued and a centre erection added on the awning deck the load draught must still remain the same, although in this case the strength would have been increased.

### Types and Freeboard

To fix the scantlings of a ship so that she may be suitable for her work and still fulfil the rules of the registration societies attention should be given to the relation between her draught and depth. An awning-deck vessel must run at a less draught than a similar vessel having an upper deck in the same position as the awning deck. In the first case the load draught is fixed from considerations of strength, but in the second from considerations of reserve buoyancy. The latter vessel, however, can have a greater draught than the former because she is a stronger ship. If the strength of the awning-deck ship is increased her draught can be increased in proportion. At least, this was the rule, but nowadays it is no uncommon thing to find awning-deck ships running at the same draught as full scantling or upper-deck ships. Shelter-deck vessels are of the same strength as awning-deck vessels, and it will be remembered that some time ago the Shipping Controller gave permission for these vessels to run at a load draught equal to that of a full scantling ship, provided certain rules were complied with. The carrying out of these rules, however, did not increase the strength of the vessels.

Perhaps the best illustration of how steel can be saved by careful attention to the relation between the draught and depth is given by the case of an awning-deck vessel having a complete deck added over her, the draught at which the vessel is required to run being that given by assessing the freeboard from the awning-deck. In the ordinary way the deck over the awning-deck—that is, the shade deck—would be taken as an awning deck. This would considerably increase the scantlings, as compared with the assumption that the second deck down is an awning-deck. The scantlings for the shade deck would then be the same as for an awning-deck. The awning-deck itself would be treated as a first deck, and so on. A further reduction in the scantlings would be brought about by the fact that the length to depth ratio can be taken to the shade deck, so that altogether an appreciable weight of steel would be saved.

It is quite clear from what has been said that there are many merchant vessels running at the present time of greater strength than they need be if existing knowledge on the subject were properly applied, and it may be anticipated that after the war a revision of the rules will be brought about which will effect considerable savings of steel.

# ANNOUNCEMENT

Our Service Department, realizing the necessity for securing equipment for the manufacture of shells owing to the difficulties attendant on the importation of Machine Tools from the United States, have purchased the Drawings, Patterns and jigs of the famous

## "Montreal Shell Lathe"

**FOR BORING AND TURNING 6" AND SMALLER SHELLS**

This Lathe was designed and developed by the Montreal Foundry & Machine Co., and has attained an unexcelled reputation among Munition Manufacturers on 6" Shell Operations.

We have completed arrangements for the manufacture of this Tool with a well known Canadian Machine Tool Manufacturer and expect to be making deliveries in the near future.

Our SERVICE DEPARTMENT will be pleased to send you specifications, prices and deliveries.

## A. R. Williams Machinery Co., Ltd.

**64-66 FRONT STREET W., TORONTO**

# Are you the man we need?

SOMEWHERE in Canada there's a man we would like to meet.

He may be a machinist, an office man, timekeeper or salesman. He may not be able to boast a college education, but so long as he has ambition and good judgment a lack of the higher education will not prove a handicap.

The man we want is a man whose fighting spirit would have carried him to France had he not been prevented. A man with energy and push and ambition and resourcefulness.

The work we have in mind for such a man might not be congenial at first (to a man lacking the qualities named) but it would prove the open door to splendid opportunities later (and not so very much later either, perhaps).

If you are not satisfied with your present outlook and feel, right down in your heart, that you could SELL (with proper direction), then write us.

If you are a hustler, prove it by replying promptly to this advertisement, and to prove you are thorough-going, give full particulars as to age, experience, present salary, etc. Replies will be considered strictly confidential.

Box 364,
CANADIAN MACHINERY.

# Steel FLUMES and PENSTOCKS

## For Water Powers

Send us your specifications and allow us to submit a price.

## Smoke Stacks

**Large or Small.**

We are prepared to build steel smoke stacks any size required. None too large or too small for our capacity. Prices reasonable.

## Steel Tanks

**Any Size or Shape.**

Hundreds of our steel tanks in use, and for nearly as many purposes. Made tight, and made right. No design too complicated or too simple for our experts. Let us figure on your requirements.

## Steel Piping

**Straight or Curved.**

Our shops have turned out some very difficult jobs of steel piping, and the many repeat orders furnish the best evidence of satisfaction to the buyers. Let us see your drawings and give you a price.

## MARSH & HENTHORN, Ltd.

**Belleville** **Ontario**

# INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

## ENGINEERING

**Cobalt, Ont.**—Contract has been let for the construction of a [illegible] at a [illegible] property near Amos, Que.

**Ingersoll, Ont.**—An explosion of mysterious origin in the plant of the Ingersoll Gas Co., on Jan. 2, has almost entirely destroyed the plant.

**Toronto, Ont.**—The City Architect has issued a permit to W. G. Bell to build a one-storey frame and iron workshop at the corner of Dufferin and Geary Avenues at a cost of $1,200.

**Dundas, Ont.**—The John Bertram & Sons Co. will build a new shop on the site of the old pattern shop. The building will be of brick and steel construction, 70 ft. by 300 ft., and will cost about $150,000. The contract has been let to Secord Co., of Brantford.

**Quebec, Que.**—Official announcement was received here from Ottawa recently that the Ross Rifle Factory will reopen shortly. For military reasons little is being said about the matter at Militia Headquarters, but it is understood that the factory will be engaged in making parts, in reconverting and, particularly, on certain work which has been secured from the United States Government for rifles to be used for training or other purposes.

**Chatham, Ont.**—Damage estimated at between $8,000 and $10,000 was caused to the plant of the Pittsburgh & Des Moines Steel Co. by fire which broke out on Sunday morning in the engine room at the plant. Heavy damage was done to the building and machinery. The roof at the west end of the building was demolished and the engine room was transformed into a mass of debris. The plant was formerly owned by the Chatham Bridge Co. and was recently taken over by the Pittsburgh & Des Moines Steel Co. as a Canadian branch.

**Niagara Falls, Ont.**—The Hydro-electric Power Commission of Ontario are going ahead with the construction of a new pipe line at Niagara Falls, running from the intake to the generating station, and paralleling those now in operation. It is expected this line will be completed by July, by which time also it is the intention to have extra turbine and generating equipment to the extent of some 25,000 h.p. ready for operation. Whether this will be in the form of two units similar to the latest additions to this power house, or whether one large unit will be installed, has not yet been determined.

**London, Ont.**—Sir Adam Beck announced here on Monday that he had awarded contracts for the construction of a 13½-foot wood stave flume with [illegible] for the development of an additional block of 50,000 horse-power at the plant of the Ontario Power Co. at Niagara Falls. Of this additional horse-power 20,000 will be available in August next and the remainder in October. It is estimated that it will next winter save the importation of more than three-quarters of a million tons of soft coal, which at from $8 to $10 a ton would represent an outlay of from $6,000,000 to $7,500,000.

## GENERAL

**Sydney, N.S.**—An explosion at the Cross Fertilizer Works on Dec. 30 started a fire which destroyed the main building.

**Quebec, Que.**—Price Bros. announce the closing down of their pulp mill at Kenogami owing to the shortage of cars.

## BUILDING

**Montreal, Que.**—Fire on Jan. 1 destroyed the Arena, St. Catherine West and Wood Ave. The loss is estimated at approximately $150,000, with $50,000 insurance. It may not be rebuilt.

**Toronto, Ont.**—The T. Eaton Co. are going ahead with their new mail order building on Harbor Square. The plans have been prepared for a building 200 feet by 400 feet, with an estimated cost of about $1,000,000, and the work of construction will start as soon as the weather permits.

**St. John, N.B.**—Fire on Jan. 2 destroyed a three-storey brick building and a three-storey wooden building, 459 to 463 Main Street, owned and occupied by Hamm Brothers, biscuit and confectionery manufacturers. The cause of the fire is unknown. The loss is estimated at from $75,000 to $100,000 largely covered by insurance.

**Ottawa, Ont.**—The Halifax Reconstruction Committee has accepted plans prepared by the Commission on Conservation for terrace-cottage types of dwellings for temporary homes for 1,500 families of that city. Thos. Adams is town-planning advisor of the Commission of Conservation. R. A. Robb, architect, prepared the sketches.

## MUNICIPAL

**Alliston, Ont.**—The Town Council propose electrifying the municipal pumping plant if the by-law passes.

**Toronto, Ont.**—The townships of Scarborough and Etobicoke propose to instal water distribution systems.

**Sherbrooke, Que.**—The City Council will build a dam at the civic power station and make permanent improvements at both power stations.

**Armagh, Que.**—Plans have been drawn for the town council for waterworks costing $40,000. Engineers, Gouvin and Beauchemin, Quebec, Que

**Burton Township, Ont.**—The Township Council propose spending $55,000 on the purchase of necessary material and equipment for instaling an electric light system.

**Sault Ste. Marie, Ont.**—The city of Sault Ste. Marie and town of Steelton merged into one municipality on New Year's Day, retaining the name of this city. On September 25 last the ratepayers of both municipalities voted in favor of amalgamation.

**Mimico, Ont.**—The council going in by acclamation left the only voting at Mimico in connection with a by-law to appoint a commission to take over the public utilities, the waterworks system and the Hydro. The by-law carried with a large majority. The members of the commission will not be voted on until next year.

**Oshawa, Ont.**—The Thornton Rubber Co. are acquiring the property formerly owned by the Ontario Malleable Steel Range Co. and will instal machinery for manufacturing rubberized textile goods. The company has an authorized capital of $45,000, all of which is to be invested in plant and machinery, and in addition to this a sum of from $10,000 to $15,000 is to be provided by two of the partners. The company is to have a fixed assessment for ten years of $5,000 per annum, and at the end of that time a cash bonus of $10,000 is to be paid by the town if the company has carried out all its agreements. The Town Council has appointed a committee to complete negotiations up to the point of submitting the by-law to the electorate.

**Windsor, Ont.**—The Essex Border Utilities Commission at a protracted session finally reached a complete understanding in the matter of an equitable apportionment of the cost of constructing a temporary sewerage system, which will discharge at a point below the Windsor and Walkerville water main intake pipes. The new arrangement means that Windsor will contribute $28,000 towards the cost of the new work, Walkerville $18,000, Ford $67,000, Sandwich $25,333.33, Sandwich West $28,333.33, and Ojibway $46,533.333. The assessments announced will now have to be submitted to the Councils of the various municipalities for ratification before going to the Ontario Railway and Municipal Board for final approval.

## PERSONAL

**H. D. Reid** has been appointed president of the Reid Newfoundland Railway in succession to Sir William D. Reid, who has resigned.

**J. D. Cumming,** formerly with the Canadian Copper Co., Copper Cliff, Ont., has accepted the position of assistant to

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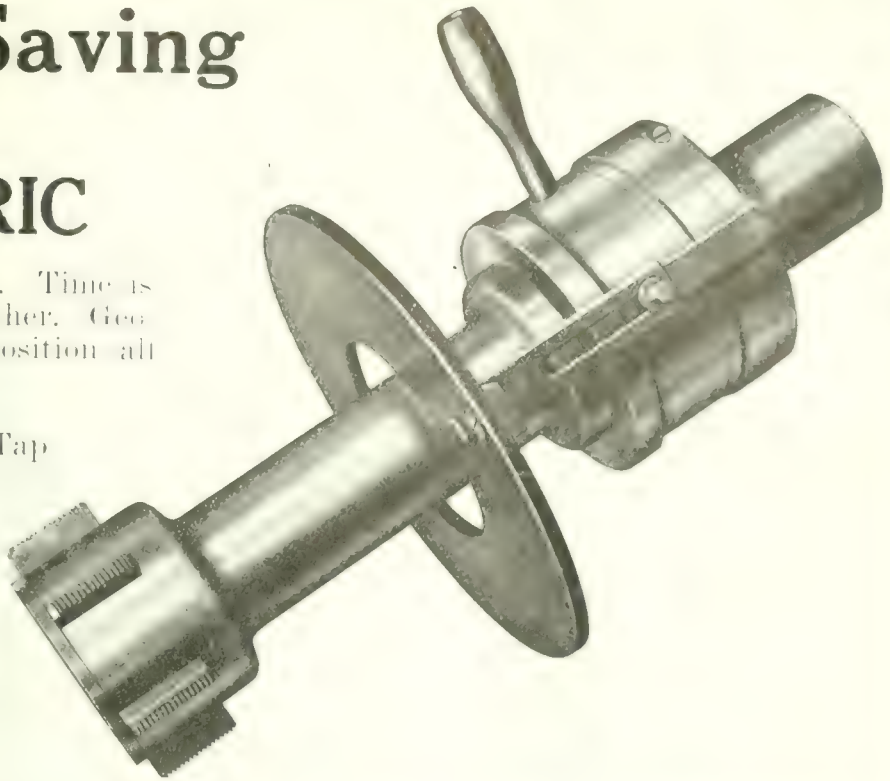
## with a
# GEOMETRIC

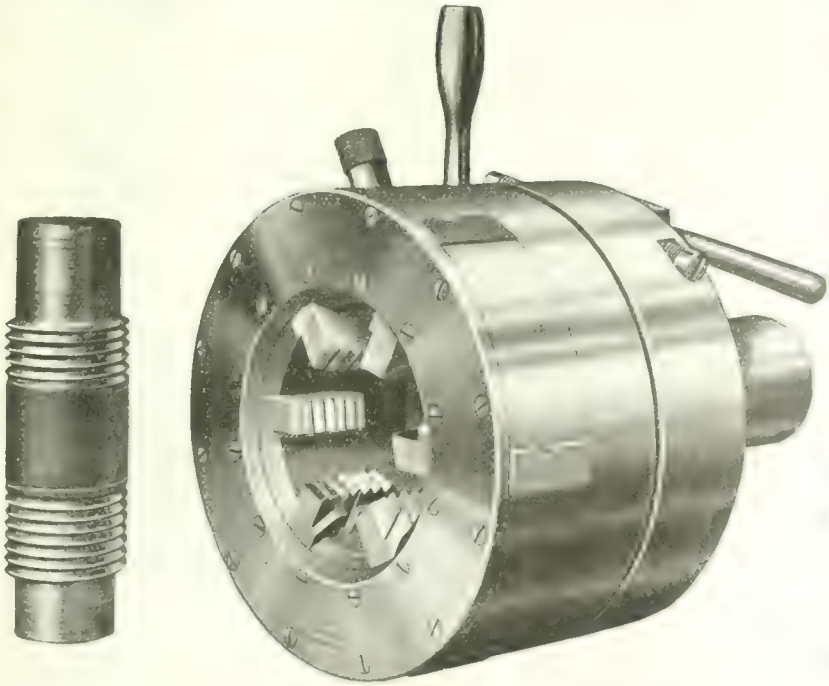
That is what it amounts to. Time is not the only thing saved, either. Geometrics are a saving proposition all around.

This Geometric Collapsing Tap is specially arranged for deep tapping in Projectile Caps.

All classes of thread tapping above 3¼-inch diameter are taken care of by Geometric Collapsing Taps.



***Twenty-five years of specializing in Screw Thread Cutting Tools has made the name GEOMETRIC stand for all that could be asked in Screw Thread Production.***



When it is an outside thread, Geometric Die Heads cut every style from 1/16-inch size up to greatest required diameter.

A U.S. Navy Yard is using this 4½-inch size Style "D" Geometric Die Head. United States Navy Yards accept no second quality.

Do your Screw Machines and Turret Lathes swing Geometrics?

You have as much right to Geometric benefits as any other manufacturer.

## The Geometric Tool Company, New Haven, Conn., U.S.A.

*Canadian Agents:*

**Williams & Wilson, Limited, Montreal. The A. R. Williams Machinery Company, Limited, Toronto, Winnipeg, St. John, N.B.**

works manager of the Westmount plant of P. Lyall & Sons Construction Co., Montreal.

**Robert Law Benson**, assistant city engineer of St. Boniface, Man., died at his home on Jan. 2, at the age of 53 years. Mr. Benson was a native of Hamilton, Ont., and had been in the Winnipeg vicinity nine years.

**Frederick Triebel** died at Montreal on Jan. 1. Mr. Triebel, who was born at Cohoes, N.Y., 67 years ago, came to Montreal and entered the service of the Ogilvie Flour Mills, where he was head mill wright for twelve years. He was also for thirteen years mechanical engineer for the Canadian Rubber Co.

**C. M. Carmichael**, formerly assistant works manager in charge of the electric furnace department of the Anniston Steel Co., Anniston, Ala., and later with the British Forgings, Ltd., Toronto, Ont., as superintendent of the steel plant, has accepted the position of assistant works manager, Electro Metals Co., Welland, Ont.

**William Earle, C. E.**, died last Saturday at the residence of his father-in-law, Senator Domville of Rothesay, near St. John, N.B. He had done engineering work with the C.P.R., was former manager of the St. John Street Railway, and latterly was District Engineer of Dominion Public Works in Manitoba.

**J. C. Broadnax**, who was connected with the electric furnace department of the Anniston Steel Co., Anniston, Ala., and more recently with the British Forgings, Ltd., Toronto, Ont., as assistant superintendent of the steel plant, has been appointed superintendent of the electric furnace department at the Watertown Arsenal, Watertown, Mass.

**John Henry Helm** died at Port Hope, Ont., on Sunday, after a brief illness. Mr. Helm was born in Cobourg in 1845, and was educated at Victoria College. When quite a young man he moved to Port Hope, and was engaged in the foundry and machine business with his father, the late John Helm, taking over the same when the latter retired.

## TRADE GOSSIP

**Galt Customs Collections.**—Customs Collector Peck announced that the returns for December were $14,858 less than for the same month last year, the total being $37,197. Smaller importations of coal, iron, wool and steel account for the decrease.

**Lake Superior Mines Ready for Big Season.**—Authorities say that mines in the Lake Superior district will be in position to produce and ship 70,000,000 tons of iron ore during the 1918 season. This would compare with a high record of 64,734,198 tons of ore shipped in the 1916 season.

**The Steel Company of Canada** will hold the annual general sales conference at Hamilton on Jan. 15 to 18 inclusive which will be attended by the entire sales force from Halifax to Vancouver. A feature of this conference will be a series of interesting papers read by various members of the staff, followed by discussions.

**The A. R. Williams Machinery Co.** have purchased the patterns, drawings and manufacturing rights of the "Montreal" rough turning and boring lathe. The machine has in the past been manufactured by the Montreal Foundry & Machine Co., at Montreal, Que., and has made quite a reputation among munition manufacturers on 6-inch shells.

**Trail Smelter Working.**—The Trail smelter is again operating and several hundred men have returned to work, the blast furnace is running as usual. A number of mines which are controlled by the Consolidated Co. are also making arrangements to re-open, while those mines which were shipping their zinc ores to the south will now have an outlet closer home.

**B. O. T. Journal.**—The St. John, N.B., Board of Trade has recently issued the December number of their journal which contains as usual a fund of interesting matter relative to the Port of St. John and to the province of New Brunswick generally. The journal features the strategic value of the port of St. John as a factor in the successful prosecution of the war and also in the industrial development in Canada.

**Toronto Fire Loss Decrease for 1917.**—The fire loss in Toronto for the year 1917 is estimated at $1,164,965, which is over $300,000 less than that estimated for the year previously. For the month of December the loss was given as over $200,000. The fire losses by months for 1917 are as follows:—January, $79,183; February, $103,399; March, $67,309; April, $42,501; May, $349,737; June, $6,284; July, $5,861; August, $16,376; September, $65,578; October, $35,975; November, $177,316; December, $214,946.

**The Jenckes Machine Co.** of Sherbrooke, Que., has secured large additional contracts, which will involve the employment of several hundred more men. Additional capital has been brought into the business through those interests which are identified with the Canadian Ingersoll Rand Co., another of Sherbrooke's large industries. At a recent meeting of shareholders of the Jenckes Machine Co. some changes were made in the personnel of the board, George Doubleday, of New York, becoming the new president, and E. W. Gilman, general manager.

**To Relieve Traffic Congestion.**—The Canadian Railway Board has stationed a traffic expert at the Niagara Frontier to supervise and expedite the movement of coal and other traffic, so that the freight each day is divided up among all the Canadian railways, irrespective of how the cars may have been routed. This is a precautionary step to make absolutely certain that the full capacity of the Canadian roads is used so as to prevent any possible congestion. Another order was made by which all the railway ferries plying between Detroit and Windsor will be pooled.

**Will Expedite Coal Shipments to Canada.**—C. A. Magrath, Dominion Fuel Controller, who has been in Washington and New York for some days in connection with the fuel situation, has succeeded in arranging for a number of emergency shipments of coal to Canada. This has been done despite the pressure coming from the consumers in the United States to limit the exportation from the country in order to relieve the acute situation across the border. While there is a shortage of coal in some districts, there must be a large supply in the country and the problem is largely one of transportation and distribution. This is accentuated both in connection with distribution in Canada and additional shipments from across the line, by war conditions.

## MARINE

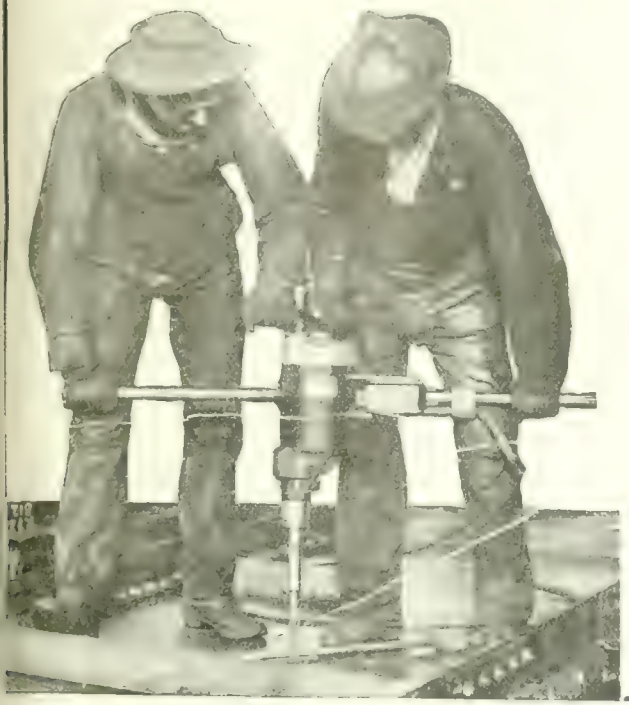
**Sarnia, Ont.**—Word has been received in this city that the Reid Wrecking and Towing Co. has received a contract to salvage the large steamer Curaca, which is sunk in the harbor at Halifax as a result of the recent explosion. Capt. J. T. Reid confirmed the report, and stated that this concern was shipping the outfit for the salvaging work. Wrecking operations will begin as soon as pumps and crews arrive at the scene.

**Victoria, B.C.**—The schooner Mary Barnard, which is now on the way to the Antipodes, is not equipped with engines, their arrival being delayed so long that the company decided to wait no longer, but to let the vessel make the passage as a straight windjammer. The Janet Carruthers left as an auxiliary schooner, but the engines gave trouble and she had to put into Honolulu recently, where the engines were disconnected and it proceeded under sail alone, calling at Samoa. The ship is now due at her destination any day.

**Victoria, B.C.**—The schooners Beatrice Castle and Jean Steedman, the last two vessels to be completed by the Cameron-Genoa Mills Co. to the order of the Canada West Coast Navigation Co., are still at the wharves in the inner harbor, being installed with semi-diesel Bolinder auxiliary engines, which recently arrived from Sweden. It was stated a few days ago that the work will probably be completed on both vessels by January 20, on or about which date they will go on berth to load lumber for offshore points. The Beatrice Castle will get its cargo at the Genoa Bay mills. Its destination is so far uncertain, but it will probably be either Adelaide or Sydney, Australia, while the Jean Steedman, after taking on timber at Chemainus, will clear for Sydney, Australia.

**Victoria, B.C.**—According to news received in Victoria recently, the auxiliary wooden schooner Mabel Stewart, one of the later vessels launched last summer at the North Vancouver plant of the Wallace Shipyards, arrived at Port Adelaide on December 20 with lumber from Genoa Bay and the Terminal City. The ship was under command of Captain Robinson, and made the voyage in the comparatively fast time of sixty-three days. The Mabel Stewart, which is the tenth vessel of the fleet of twelve built for the Canada West Coast Navigation Co. by British Columbia shipyards, was

They stay on the job so much longer and they work so much faster that they actually reduce manufacturing expense and labor costs from 25 to 80 per cent.



Van Dorn ELECTRIC TOOLS

Portable Electric DRILLS

Drill through anything of any size from 3-16 to 2 inches.

They're built by men who have spent 14 years manufacturing portable electric tools exclusively. They're built as an electric tool must be, to stand up to severe service indoors or out, and stay out of the repair shop.

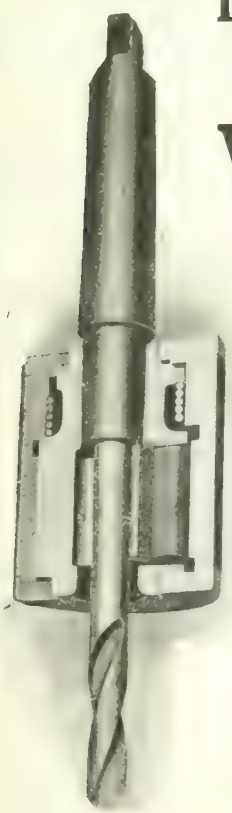
Van Dorn electric way is the cleanest, speediest and most economical. Write:

Aikenhead's

17, 19, 21 TEMPERANCE STREET
TORONTO - CANADA

Look at the Jaw Construction of This

WAHLSTROM Chuck



The cam action is such that the harder the jaws grip the shank.

The New Wahlstrom is the perfected Automatic Chuck famed for durability and the time and labor that it saves. It self-centers the tool, enabling the operator, while spindle is running, to change tools in two seconds.

Beyond doubt the strongest, quickest Automatic Chuck for drilling, reaming, counterboring and tapping is this New Wahlstrom. For all the interesting particulars write.

Even though old drills with broken tangs be used, the grip of this New Wahlstrom is always positive. Made in two styles —one for straight shank tools, the other for M.T. shank tools.

Aikenhead's

17, 19, 21 Temperance St., Toronto, Canada

launched at North Vancouver on August 11 and is equipped with auxiliary engines. It loaded 1,250,000 feet of lumber at the government dock in Vancouver and left there on October 11 for Genoa Bay to complete, clearing for Australia a week later.

# INCORPORATIONS

**H. Gray & Co.** has been incorporated at Ottawa with a capital of $150,000 to manufacture mill supplies, cotton waste, greases, etc., The head office is at Montreal and the incorporators are E. E. Howard, J. DeWitt and E. A. Rose, all of Montreal.

**Beaver Truck & Tractors Ltd.** has been incorporated at Ottawa by E. P. Brownell of Toronto, also C. J. Stodgell and H. P. Crocker of Walkerville, Ont., to manufacture tractors, motor trucks, aeroplanes, etc., at Walkerville, Ont., with capital of $500,000.

**Canadian Kodak Co.** has been incorporated at Ottawa with a capital of $5,000,000 to take over as a going concern the Canadian Kodak, an Ontario corporation, manufacturers of photographic supplies of all kinds. The factory is at Mount Dennis, near Toronto.

**Toronto Hardware Mfg. Co.** has been incorporated at Ottawa with a capital of $400,000 to carry on the business of manufacturers, ironfounders, boilermakers, machinists and mechanical engineers at Toronto. The incorporators are A. W. Langmuir, W. A. J. Case and W. M. Smith, all of Toronto, Ont.

# CONTRACTS

**Toronto, Ont.**—The contract for a new boiler house for the Swift Canadian Co., operate a faction in Toronto. Although Construction Co.

**Copper Cliff, Ont.**—The Canadian Copper Co. have let the contracts for a new converter and building to the Allis-Chalmers Co. and the Dominion Bridge Co. respectively.

**St. John, N.B.**—The contract for the boilers, piping, pumps and valves, etc., for the General Public Hospital has been let to F. S. Walker of this city, the contract price being $38,500.

**Toronto, Ont.**—Bennet & Wright, Ltd., have been awarded the contract for the heating and plumbing installations for the new addition which the Canadian Aeroplane Co. are building to their factory on Dufferin Street.

# TENDERS

**Stony Point, Ont.**—Tenders will be received by the undersigned up to January 15, 1918, for the sale of the plant of the Stony Point Canning Co., capacity 25,000 to 30,000 cases. John Watson, Inspector, Stony Point, Ont.

# RAILWAYS

**Chatham, Ont.**—Electrification of a section of the Chatham-Wallaceburg division of the C., W. and L. E., with the use of [illegible] current, is undertaken, and it is expected that [illegible] will be moved by the spring from Niagara for the first time shortly. Because of the shortage of fuel the company has found it impossible to generate sufficient power for the entire system, which reaches from Erie Beach to Wallaceburg.

# CATALOGUES

**Woodworking Lathe.**—Bulletin illustrating and describing No. 56 motor-driven speed lathe made by the Oliver Machinery Co., Grand Rapids, Mich. A complete specification covers the leading and other features of this lathe while particulars are also given of the attachments.

**The Unseen Loss** is the title of a folder recently isued by the Armstrong Cork Co., Pittsburgh, Pa., dealing with the "Nonpareil" cork covering for refrigeration plants. Copies of this folder have been sent to all owners of refrigerating machines in Canada and the United States. The company, however, will be glad to send a copy to any firm who has not received one if they will make application in writing.

**Drilling and Tapping Machines.**—The Langelier Manufacturing Co., Providence, R.I., have issued a new catalogue describing plain bearing belt and motor-driven drilling and tapping machines for general manufacturing use. A full line of machines for a large variety of purposes is dealt with in this catalogue, each machine being illustrated together with specifications giving full particulars of each type. A telegraphic code is included with each machine. A useful feature in the catalogue consists of a series of important notes for the guidance of inquirers and purchasers. The catalogue also describes a line of special precision machines for extra fine drilling. This is a well gotten up catalogue, both the illustrations and reading matter being well arranged.

## CANADA'S COAL PROBLEM

The *Monetary Times* this week publishes a four-page article by Arthur V. White on "Canada's Coal Problem." Mr. White is consulting engineer to the Conservation Commission, and has filled many important engineering appointments in Europe and America.

Canada at present imports annually from the United States 4,500,000 tons of anthracite and from ten to fourteen million tons of bituminous coal, the latter largely for power purposes. It is believed that the American anthracite fields—even at the pre-war rate of production—will be exhausted in a hundred years. The friendliness of the United States towards this country has recently been emphasized in this very question of the coal supply, but circumstances are conceivable in which our neighbor to the south might feel compelled, in the interests of her own population, to completely shut off the export of anthracite, and to barter her bituminous output for particularly necessary Canadian products, such as electrical power.

Canada now exports to the United States about 275,000 horse-power of electrical energy, which Mr. White calculates as equal to three million tons of coal, and goes on to estimate the developed electrical horse-power of Canada at 1,813,200, and the possible horse-power at 18,800,000. But by no means all of our water powers, he says, may be economically developed. He calls attention to the importance of conserving all of this horse-power and turning it to public uses.

## BUILDING SITUATION AT LETHBRIDGE

OWING to the high cost of materials and scarcity of labor there have not been many buildings erected at Lethbridge, Alta., this year, although the figures show an improvement over last year. The permits for 1916 were valued at $79,227, and for 1917, $94,628, in both cases up to the end of November. For both these years the work has been almost exclusively additions to existing buildings, but two new garages and two or three small business blocks have been built as well as a few residences. The shortage of accommodation as regards residences caused a few people to build. In addition to the above the City of Lethbridge has constructed a new water filtration plant, Robert's system, at a cost of $100,000.00. No great amount of activity is expected during 1918 owing to the excessive cost of building operations, although residences are still scarce.

## TRADE ENQUIRIES

THE following trade enquiries have been received by the Department of Trade and Commerce, Ottawa. Further particulars may be obtained on application to the Department.

1605. **Chemicals, colors, etc.**—A young man at Genoa would represent on commission manufacturers of chemicals, colors, etc., g.f.m.b.

1609. **Beltings, lubricant, engineering articles in general, small machinery, machine tools, ironmongery, steel, household articles, etc.**—A travelling representative would take up agencies for Italy and colonies for the foregoing a.g.v.

1611. **Machinery for steel works and rolling mills, machine tools for large engineering and shipbuilding works.**—An engineering office at Genoa would import for its own account or on commission the above-mentioned articles, g.f.s.a.

1616. **Iron bars (round and square), iron water and gas pipes, steel plates.**—An agent at Rome wishes to represent manufacturers of the foregoing articles, r.p.c.

1604. **Flexible metallic tubes for gas and accoustic purposes.**—A Taranto company wishes to import the above, t.g. s.l.p.

1618. **Bronze and aluminium powder.**—An agent in Turin is desirous of getting in touch with Canadian exporters of bronze and aluminium powder.

1619. **Saws, screws, files and nails.**—A house in Naples which furnishes the Royal Arsenals of Artillery and Marine

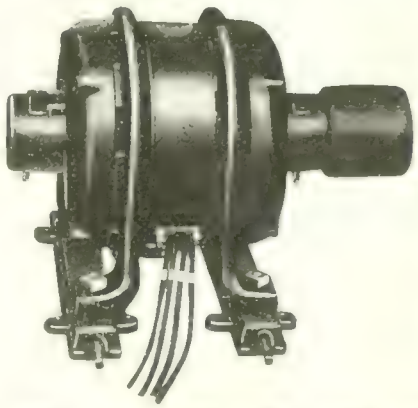
# USE Aikenhead's "AK" Motors

The quietest running motor on the market today is the "A.K." —a constant speed induction motor in 2 or 3 phase, 25, 30 and 60 cycles

Manufactured by the North Western Electric Company, of Chicago. Service beyond your highest expectations is warranted by this name

Aikenhead's carry the following "A.K." Motors in stock: 25 cycle in 1, 2, 3, 5 and 7½ H.P.: 1470 R.P.M.: 25 cycle in 1, 2, 3 and 5 H.P.: 735 R.P.M

*Write us for "A.K." Motor Facts.*



**Aikenhead Hardware Limited**

**17, 19, 21 Temperance Street TORONTO, CAN.**

# METAL STAMPINGS

We are manufacturers of stamped parts for other manufacturers.

We do any kind of sheet metal stamping that you require. Our improved presses and plating plant enable us to produce the finest quality of work in a surprisingly short time.

We can finish steel stamping in Nickel, Brass or Copper.

**Send us a sample order.**

**W. H. BANFIELD & SONS**

**372 Pape Avenue, Toronto, Can.**

**BERTRAMS LIMITED**

Engineers

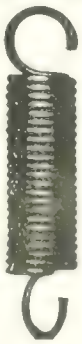
Sciennes, EDINBURGH

PAPER MILL MACHINERY

and

MACHINE TOOLS for IRON WORKERS

Catalogues offered to Purchasers.



## "Barnes-made" SPRINGS

are the result of over [illegible] years' experience in spring making, combined with [illegible] plant and the [illegible] help of men who have been with us [illegible] years.

**Write for booklet No. 7-T.**

Established 18[illegible]

THE WALLACE BARNES COMPANY

**218 South St., Bristol, Ct., U.S.A.**

Manufrs of "Barnes-made" Products

Springs Screw Machine Products Cold Rolled Steel

BLACK DIAMOND OVENS

## OVENS

Enameling and Varnishing Ovens heated by Gas, Electricity, Steam or Coal

Write for Booklet.

**Brantford Oven & Rack Co., Ltd.**

Brantford, Canada

BLACK DIAMOND OVENS

## Prompt Deliveries

on Gauges, Tools, Dies, Jigs and Fixtures.

## Special Machinery

CUT GEARS

**Contracting and Repairing Machinists**

*Quotations cheerfully submitted*

**Normac Machine Co.**

**55 Vine Street, St. Catharines, Ont.**

## The Cost is Trifling

It will cost you very little to adequately tell your wants in this section. Send in your copy to-day for next week's issue.

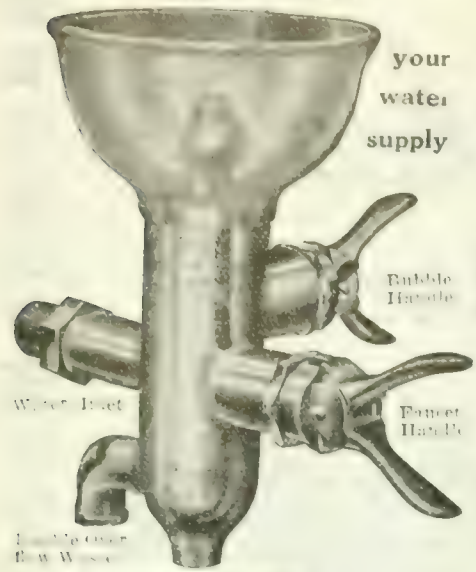
CANADIAN MACHINERY

*Classified Advertising Section*

143 University Avenue, Toronto

"PURO - FY"

MADE IN CANADA




Safe SANITARY Quickly
Simple Economical Attached

PURIFY YOUR WATER SUPPLY

PURO SANITARY DRINKING FOUNTAIN

TRADE MARK

147 University Ave. TORONTO, ONT

THE IRON WORKS LIMITED

Successors to

Owen Sound Iron Works

Owen Sound, Ont.

Engineers
Boiler-makers
Founders
Machinists

Tank Work
Smoke Stacks,
Grey Iron and
Brass Castings,
Special
Machinery
Made to
Order

1625. **Chemicals.**—A merchant and agent in Genoa handling chemical products such as sal-ammoniac, sulphate of soda, sulphate of copper, etc., is anxious to receive supplies from Canada.

1622. **Corundum.**—A firm in Turin asks for corundum from Canada.

1625. **Machinery for working wood and metals, saws (band and circular), files, etc.**—A Genoese house of agents would like to hear from Canadian manufacturers who are prepared either now or after the war to export to Italy all kinds of machinery and machine tools for working wood and metals, wood saws, band and circular, carpenters' planes, circular saws for iron, files, metals in sheets, bars and tubes and chemical products for industrial purposes.

1629. **Asbestos.**—A large importing house in Milan and Genoa with Canadian references will be pleased to negotiate with Canadian shippers of asbestos.

1630. **Mica and asbestos.**—A Genoese firm which handles metals, raw materials, chemicals, etc., would be pleased to place orders in Canada for mica and asbestos.

1631. **High-speed steel, saws, helices, mandrels, etc.**—A house of merchants and agents in Genoa requires high-speed steel, saws for metals, chisels of high-speed steel, helices, mandrels and band saws of every dimension.

1633. **Hardware, agricultural instruments and kitchenware.**—An old-established house in Milan, with travelling representatives in Italy, is desirous of getting in touch with Canadian manufacturers who handle agricultural instruments such as garden rakes, spades, shovels, scythes, also files and drills and general hardware products and kitchen utensils.

1640. **Wire nails.**—A Northampton firm is open to purchase wire nails.

## LACHINE CANAL TRAFFIC

STATISTICS available as to the freight shipped through the Lachine Canal for the season of 1917 show that 607 vessels made 7,936 trips this season of 294,773 tons. 1916 totalled 585 vessels 278,760 tons burthen with the vessels making 7,579 trips through the canal. In the year just closed there were more than 70,000 tons of grain and other merchandise, shipped above the amount in 1916. Of wheat there were 13,201,732 bushels, an increase of over 2,000,000 bushels.

There were 265,411 more tons of coal; 8,000 more cords of pulpwood; 24,000 more tons of pulp; 85,000 more sacks of flour; 38,000 more tons of sand and 165 more cargoes through the canal. The passenger list for the season totalled 69,910, a slight increase over 1916 figures. The total combined tonnage of all the ships through the canal amounted to 4,145,836 tons an increase of 144,663 tons. The cargo tonnage was 70,000 more than that the previous season's figures.

There was a big decrease in all grains with the exception of wheat. In corn, oats, barley, rye and flaxseed, the season of 1917 showed a falling off of 5,518,100 bushels. There were cargoes 25,168,452 in 1916, and 19,350,352, in 1917. Eggs, butter, cheese and apples, all showed big decrease in 1917. Flour of which, there was none shipped last year, passed through the canal this season in 85,800 sacks. In lumber there has been a decrease of 1,289,400 feet board measure brought down from Ottawa for United States ports by American canal boats.

## PUMPS WANTED IN FRANCE

THE "Official Bulletin" of the United States Government announces that the following cablegram has just been received from the Paris headquarters of the American Red Cross:—

"'Send us pumps,' is an appeal to-day from a Red Cross delegate in the devastated area. The retreating Germans left little untouched there last spring. Spokes were cut from wheels of farm carts, orchards were felled, farmhouses wrecked. In many cases pumps were destroyed, wells filled with rubbish and polluted.

"Of the few men and women who have managed to filter back to live in the one good corner of their wrecked buildings, to clear the fields of barbed wire and try to till them, none dares drink from the old wells which they had depended on all their lives unless they bear a sign reading 'Good water,' to show that they have been purified.

"To these safe wells people come from far and near with their jugs and pails. To make their already difficult life a little easier and to make it possible for more of them to come back to their devastated fields—all they have—as soon as pumps can be brought, ten will be sent to fill the need for them in this district. It is a real though slight contribution to the giant task of reconstruction."

## RAILWAY CARS BEING RETURNED

THE new centralized management of the United States railroads, with its pooling arrangement of rolling stock and economies of routing and motive power, is already helping to solve one of the main problems of the Canadian Railway Companies, namely, the more prompt return of Canadian rolling stock routed to United States points. Rolling stock shortage in Canada has been aggravated to a large extent by the delays in securing return of cars from the United States roads. Thousands of Candian box cars, coal cars, etc., have been kept across the line for months. The shortage of cars in the United States, the keenness of railway competition, and the lack of any central co-ordinating management, have

made the tracing and return of cars to Canada very difficult for a considerable time past. The Canadian Railway War Board is now taking advantage of the new United States system, and a general scheme is being worked out looking to reciprocal action for prompt return of cars, and the most economic methods of conserving and utilizing present rolling stock resources.

### CANADA'S WAR ORDERS

WAR orders valued at approximately $1,812,000,000 have been placed in Canada since the outbreak of war. This total has been arrived at by "The Monetary Times" as the result of three successive investigations and with the assistance of figures supplied by the Imperial Munitions Board, the British War Office Service in Canada, the Department of Agriculture, the Department of Trade and Commerce and the War Purchasing Commission, Ottawa. This vast sum represents an average annual expenditure in Canada of $604,000,000 on shells and general war supplies for three years of war, as little was supplied by us before the end of 1914.

More than half the orders received are represented by munitions. Since the outbreak of war to the end of September last, the orders placed by the Imperial Munitions Board were valued at $925,270,000. Since that date, approximately $75,000,000 of further orders have been placed, bringing the total value of munitions orders up to $1,000,270,000, to the end of 1917. In addition, shipbuilding orders of over $46,000,000 have been placed here.

### WILL INVESTIGATE GAS PROBLEM

THE serious condition existing throughout South-Western Ontario as a result of the shortage of natural gas is to be investigated at once by the Ontario Railway and Municipal Board. The board will be asked to enquire into a number of things that are causing a great deal of ill-feeling and controversy in the district. On one hand it is charged that the producing companies are not producing up to capacity in order to further plans for getting new contracts at higher rates. Another complaint is that while some municipalities are getting an adequate supply of gas others, in which contract prices are lower, are going without.

"Though this is regarded in civil life as a trivial matter in the army it is a very, very serious thing. I can quite understand you—a recruit—not realizing that, but I am obliged to punish you. However, I will be lenient with you. Seven days' C.B. And," continued the O.C. advisingly, "in future ply the game! Be a sport, Atkins! I am!"

"You are, sir?" queried Tommy, apparently amazed.

"Yes, I am," replied the O.C., waxing indignant.

"Well, then, sir," said Tommy earnestly "I'll toss you, fourteen days or nothing!"


"HAWK'D CHROME VANADIUM STEEL

Will Give You Exceptional

Shell Forging Production

WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat-treated and ready for use.

It does not stick to the work.

There are many cases where each punch has turned out over 2,000 shells.

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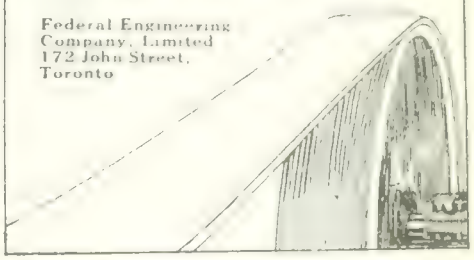

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*A weekly newspaper devoted to the machinery and manufacturing interests.*

Vol. XIX. TORONTO, JANUARY 17, 1918 No. 3


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# Notes Regarding Preparatory Work in Shell Production

By M. H. Potter

*A good start is half the battle and if more shell [illegible] preparatory work would be done very differently. Much waste effort was doubtless due to inexperience and urgency of requirements, but the advisability of thoroughly co-ordinated effort is fully recognized by successful producers. The writer's description of such work is timely and of proven interest.*

THIS article has been written in hope that the ideas will be of use to those who are confronted with similar problems or may undertake shell manufacturing in the future.

The problem for equipping for this work is in no way different from equipping for the manufacturing of any other machined article required in large quantities. While there is considerable rush required the various operations are comparatively few and not complicated.

### Executives Formulate Plans and Decide on Gauge Equipment

A conference was called of the heads of the departments, namely, the factory superintendent, the superintendent of equipment, the chief tool designer and the chief inspector. The planning of the sequence of operations, the methods of tooling, the system of gauging and the nature of the machine tool equipment was talked over and a preliminary decision reached.

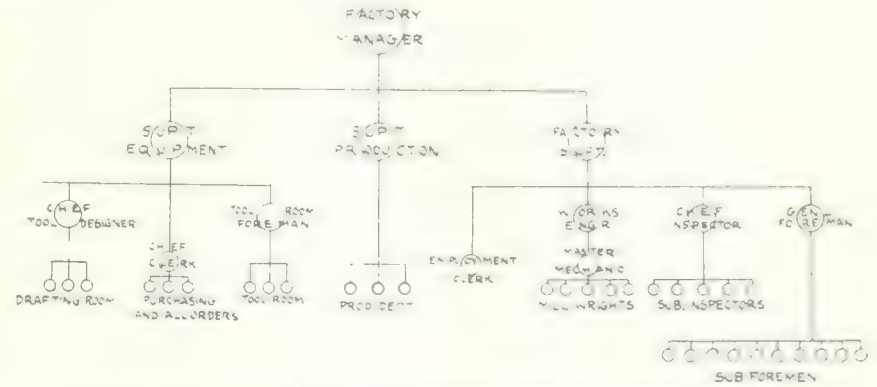
The superintendent of equipment with the aid of the chief tool designer fixed the design of the tools, jigs, fixtures and special labor-saving devices which enabled the drafting room to proceed. All designs, before being despatched to the toolroom, were finally approved by the factory superintendent. Consultation with the general foreman was necessitated in many instances as it was the idea of the factory manager that the design of special equipment should be passed upon by the executive who was to actually supervise the use of same.

Another conference was called, the superintendent of equipment, the chief inspector and chief tool designer taking part. The type and design of the gauges were determined. While this work was under way, the superintendent of production and a tool designer visited a number of the larger shell plants. All the assistance possible was sought. Upon their return another general conference was called, all the information gathered was presented and it was decided that certain changes would be made to conform to what the visited manufacturers were doing; that no experimenting would be done until production was partly under way.

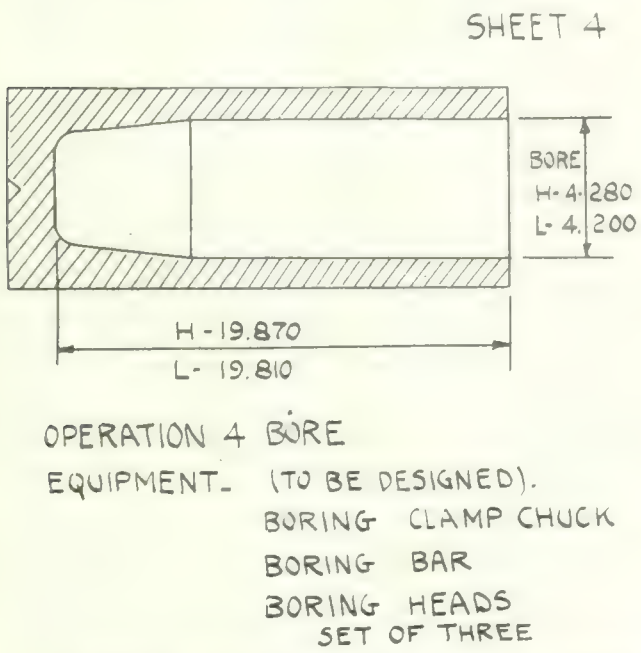
### Preliminary Steps Before Starting Production

From the decisions already arrived at the drafting department issued blue prints in booklet form of the sequence, one sheet being devoted to each operation and one to each gauging, operation 4 being illustrated herewith.

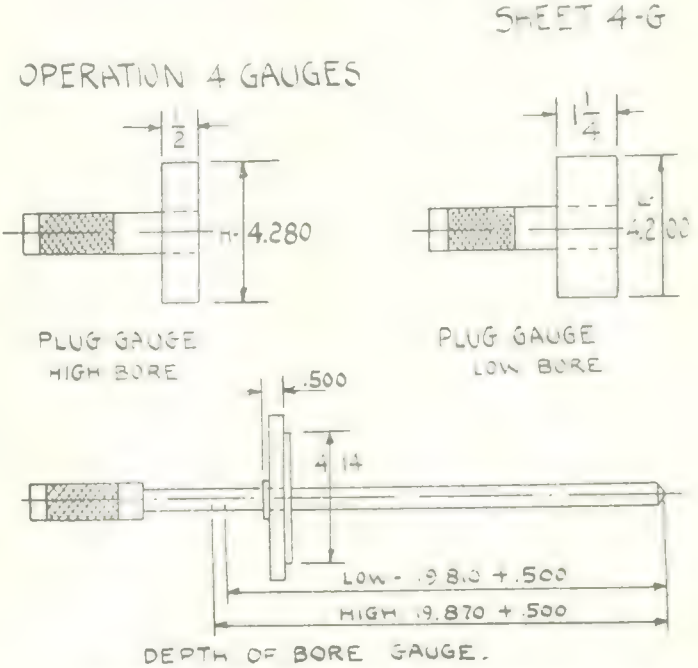
As the designs for the special tool equipment were approved and issued they were sent to the tool room, one only being ordered. When each component of equipment was installed the employment department hired the necessary operators. Necessary alterations were




ORGANIZATION DIAGRAM SHOWING DISTRIBUTION OF DUTIES AND RELATIONS OF VARIOUS DEPARTMENTS.




INDIVIDUAL OPERATION SHEET SHOWING DIMENSIONS AND EQUIPMENT.




INDIVIDUAL GAUGE SHEET SHOWING GAUGES REQUIRED FOR OPERATION 4.

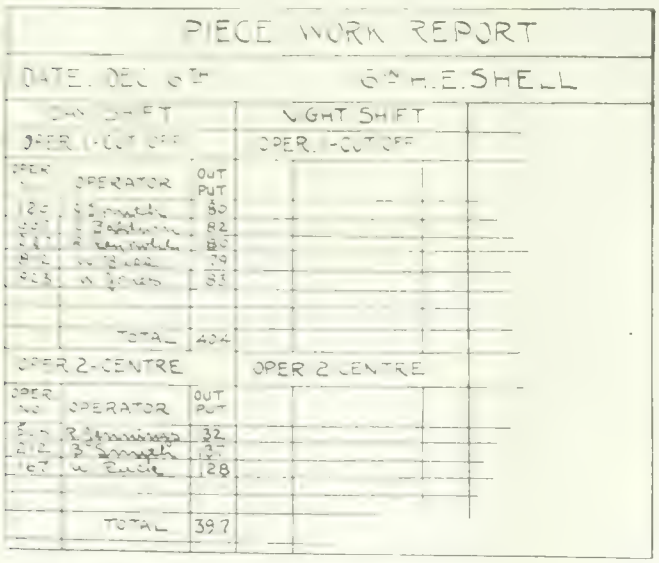
made in the designs by the drafting department and an order was then issued for the number required to equip each machine.

The first six shell forgings were closely inspected, the weights being taken after each operation. This precaution was necessary and furnished valuable data, it prevented light or heavy shells.

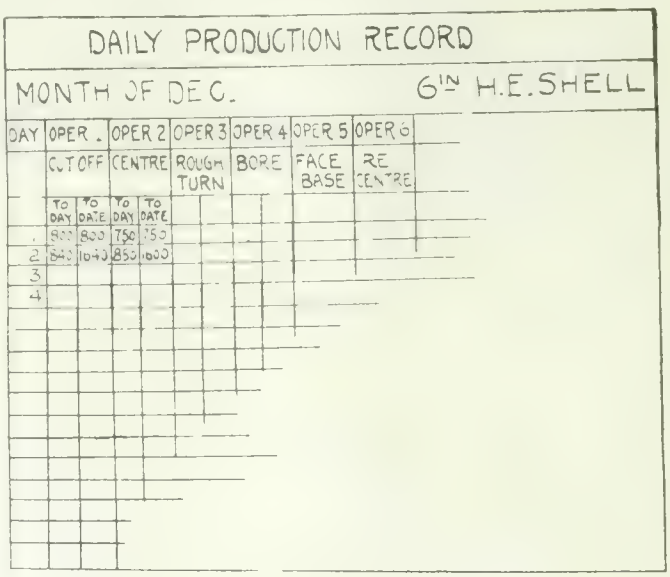
Special attention is called to the organization diagram; this is most important. It will be noted that the ordering and inspection department come under the direct supervision of the superintendent of equipment. He was therefore in a position to know exactly what was ordered, also when it was in place on the job.

### Speeding Up Production

After production was under way considerable trouble was experienced as follows: (1) The inspection following each operation, so as to insure the work being within the required limits. The prevailing method used was that should the work of any particular operation fail to pass either shop or government inspection that the operation must be halted at once. Under no conditions was work resumed until the general foreman and chief inspector located the fault. This precaution eliminated the necessity of subsequent rectification and prevented the possibility of general confusion in the shop. (2) The keeping of the necessary records to enable those in charge to know exactly how the work was proceeding. After considerable study and thought the production department issued a daily production sheet. (3) As the required production was reached the operators were placed on a piece work basis. No order to have a positive record and check of each operator's output a piece work report was maintained by the production department.




REPORT SHOWING PIECEWORK OUTPUT OF EACH OPERATOR AND OPERATION.




RECORD SHOWING DAILY TOTAL AND TOTAL TO DATE OF EACH OPERATION

—⚙—

Harry Bayne, Controller of Metals, has gone to Washington to discuss with American authorities the supply in the United States available for Canadian manufacturers.

## BRITISH PRACTICE IN WIRE-DRAWING*

By A. T. Adam.

IT is difficult to define clearly what a wire rod is, because plants are now in operation which are drawing or rolling cold bars in round, square or hexagon, etc., up to 2½ in. in diameter at least, probably more. In speaking of a wire rod, however, one generally means material which has been rolled hot to about ½ in. diameter and under.

### Necessity for Pickling

Before the rods can be drawn through a die they must be freed entirely from scale of oxide, otherwise the hole through which the wire is drawn will be torn out. The rods are, therefore, pickled in sulphuric or hydrochloric acid. When the coils are dipped in the pickling tank, it is usual to have a solution, containing anything from 2 to 8 per cent. of free acid, in which case the operation of cleaning takes about two hours. Slow cleaning is almost essential when the gauge of the wire is small. A strong solution can be used when the gauge is large or when the wire is drawn through the bath continuously instead of being dipped in the form of a coil.

The process of picking may be hastened by using a hot bath. The acid bath works best when it has been in operation a few days, or when the specific gravity has been increased by sulphate or chloride of iron. If the specific gravity be too high, however, the cleaning action will cease unless heat is used. Mr. Adam has found the percentage of free acid in a spent tank as high as in a freshly made up tank. The specific gravity of the former was 1.28 and of the latter 1.03. Mechanical means have been tried to assist the acid in cleaning the higher class wires, but without much success. This is unfortunate because acid is apt to make the wire brittle unless great care is taken to remove it completely.

### Washing

When all the scale has been removed from the wire it is thoroughly washed with water from a hose. The cheaper qualities of wire are then dipped in hot lime and dried, but with the higher grade wires, which have to receive several passes through the draw plate without annealing, it is necessary to give them a water coat. This is done by keeping the coils continuously under a spray of water until a brown rust is formed. During this operation they must not be allowed to become dry. The wire is limed to neutralize any acid remaining and to prevent corrosion. The coil is dried in a blueing oven at 100 deg. C., when the last traces of acid should be driven off. The wire is then ready for cold drawing. The cleaning operation has to be performed not only on the raw wire rod, but also on the drawn wire, each time it has been annealed to facilitate further drawing.

### Drawing

In drawing, the reduction effected at each pass through the die varies from 5 per cent. to 20 per cent. of the diameter, according to the nature of the material. The draw plates are made from self-hardening steels.

Some of the alloy steels are used nowadays for draw plates of special make; for example, one well-known make contains 14 per cent. chromium and 3 per cent. carbon. These elements form a very hard double carbide with the iron. The hole in the draw plate through which the wire passes is first punched hot, then sized and shaped correctly, when cold, with hardened and tempered tapered punches. Very fine wires are drawn through jeweled dies, diamonds and rubies being chiefly used. Before the wire enters the die it passes through tallow or olive oil soap, which acts as a lubricant.

Some wires are drawn wet, in which case a liquid lubricant is used. Various secret lubricants are in vogue for the wet process, sour beer being a favorite ingredient of most of them. When the wire is to be drawn wet it is polished to give a bright metallic surface, and is then

*Abstract of paper read before Edinburgh Section of the Society of Chemical Industry.

coated with copper by immersion in a bath of copper sulphate. The copper being softer than the steel, forms a kind of cushion between it and the die. It is drawn into the wire and gives it a yellow color. The process of drawing is repeated until the wire is finished or too hard to be drawn further without heat treatment.

### BRIEF SURVEY OF U. S. BUSINESS CONDITIONS

American business closed a difficult year with optimistic hopes for 1918. Manufacturers of essentials are far behind orders. Lumber mills and coal mines are operating to capacity.

New industries and expansions due to the war particularly in shipbuilding have opened new gates of employment while of out-of-works there is the smallest number in years.

With higher wages the country's buying power has increased tremendously so that business generally looks to the future with confidence. Drastic economy shown by the purchasing public has merely resulted in placing merchandising on a stable foundation while government regulation has eliminated speculation. The volume of business ahead promises to be normal, according to leaders in the commercial world to-day.

The results of the coming crops, of transportation remedies, and regulation of the manufacture of non-essentials were the only uncertain factors in the situation. The wheat and corn belts in 1917 enjoyed the greatest prosperity in years. Increased acreage of winter wheat, rye and oats foreshadow a promising output, encouraged by recent snows in Oklahoma and Kansas which saved much planting.

### SUBSTITUTE FOR PAPER

A NEW product for making paper has been found in zacaton grass, known also as broom-root grass and wire grass, from the fact that the roots are extensively used in the making of brooms and brushes. The tops, though, have hitherto gone to waste. Now it is discovered that these neglected tops make a fine grade of paper.

Zacaton grass extends from California and Texas southward to the Argentine Andes. It grows most profusely, however, in the mountain regions east and west of the city of Mexico, where it is harvested for the sake of its roots.

An acre of grass should yield at least three tons of tops. The plant is a perennial one, the growth being almost entirely from self-sown seed. Unless checked by fire, cultivation, or the harvesting of roots the grass will soon cover a field solidly, and it is not uncommon to find many square miles densely covered with the growth. The range can be profitably gone over for roots every third year.

Laboratory tests of this grass conducted by the United States Department of Agriculture show that it can be chemically reduced to paper stock by the soda process more easily and with less expense than is necessary to reduce poplar wood. The same processes and methods which are employed for the manufacture of pulp from poplar wood are quite suitable for the treatment of zacaton, but in place of the wood sawing, chipping, and screening machinery a grass duster is necessary.

The paper manufactured from the stock has proved as satisfactory in physical tests as a first-grade machine-finished printing paper. It has, moreover, a very satisfactory appearance and feeling.

### B.C. FUR TRADE PROSPEROUS

APPROXIMATELY two million dollars were realized by British Columbia trappers last season, according to figures tabulated by Provincial Game Warden Bryan Williams, who based his calculations on the returns made by the 947 of the 1,161 licensed trappers who have filled out and returned the forms demanded by law. These show a total fur value of $300,000, to which must be added $100,000 worth of coyote pelts, which come in under a separate heading in the classification. All licensed trappers are whites, but as there are at least six unlicensed Indian line runners for every white man, Mr. Williams is confident that his estimate of $2,000,000 is well within the mark.

During the season in British Columbia from November 1 to April 30 many trappers make over $2,000, and in rare instances is the fur harvest less than $1,000 for the six months' work. In 1917 the prices paid by local agents have been unusually high.

### NICKEL SILVER

THE war has killed the popular name of one of our most useful alloys—German silver. Even before the war the Alloys Nomenclature Committee of Britain had suggested its alteration, since the alloy was neither "German" nor "silver." As a matter of fact, the alloy was introduced from China, and is composed of copper, nickel, zinc. The higher the proportion of nickel (which ranges from 30 per cent. down to 7 per cent), the better the quality of the alloy. The copper is always over 50 per cent., and the zinc varies from 20 per cent. in the best mixtures, to 35 per cent., in "fourth." The alloy is thus really a nickel-brass, and may be so described with precision, but the name is hardly so attractive as nickel-silver, which is the one that will in all probability, except for scientific purposes take the name with the German sound. Nickel-silver in some text books is given the name of "pack-fong." Assuming this to be derived from Chinese, it is incorrect and should be "pack-tong" "pack" meaning white, and "tong" being the Chinese for copper.

### 1917 TOTAL TRADE REACHES MAXIMUM

INTERNATIONAL trade of 1917 will show a larger total than in any earlier year. This estimate, appearing in "The Americas," issued by the National Bank of New York, is the result of a careful review of all available figures of world trade for the year 1917. It includes eleven months' actual figures for the United States and United Kingdom, ten months for Canada, and somewhat shorter periods for the year to justify an estimate that the total international trade of the year will be the largest in history. In the case of the United States the total trade of the year is estimated at approximately nine billion dollars, against less than four billions in 1913. In Great Britain the total for the eleven months is over seven billion dollars, against five and three-quarter billion dollars in 1913.

Canada's total for ten months ending with October is over two billion dollars, against $88,000,000 in the same months of 1913, and Japan for the nine months ending with September, $914,000,000, against $507,000,000 in the corresponding months of 1913. For France no official figures are available for 1917, though the imports estimated by an examination of figures of export from other countries to France are apparently about 50 per cent. more than in 1913.

In the Central Powers no official figures are available, though it is known that their over-sea trade is, of course, cut off; they have imported very largely from adjacent neutral countries, and the exchanges between the countries forming the group now known as the "Central Powers" have also been very great. In the Allied countries a part of their trade, that conducted by or on behalf of the Government, has been omitted from the official figures.

#### Allied Figures

The largest change is that of the Allies. The total trade of Great Britain, France, Italy, Russia, United States, Canada and Japan in 1913 was a little more than eighteen billion dollars, while the figures thus far reported for the current year suggest that their total for 1917 may approximate twenty-five billion dollars.

Oriental trade of 1917 will somewhat exceed that of 1913. In Japan exports are double those of 1913, and imports show an increase of about 50 per cent. In China the imports show a decline, and while there is a good demand for her silks at high prices, the best markets for her tea have been difficult of access. India shows a decline in imports and a slight reduction of exports, due chiefly to lack of transportation. The great rubber plantations of Ceylon, the Malayan Peninsula and the Dutch East Indies, however, show large increases in their production and sales, and the sugar output of Java was larger and at higher prices than formerly.

The neutral countries of Europe show material increases in the value of their exports, but slight decreases in the value of their imports.

# PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

## DANGER-SIGNS

By [illegible]

DANGER SIGNS are silent sentinels which serve to warn workmen of a possible danger within the surroundings where these are placed. They may be considered as a temporary adaptation to prevent accidents, or for use in an emergency, while other means are being devised for safety purposes.

They should never be used as a permanent means for preventing accidents.

DANGER SIGN HOLDER AND SUGGESTED NOTICES FOR USE ON SAME

For in most cases where a danger-sign has been installed, a safeguard or some acident protective device is required.

In accident-prevention work, little thought has been given to a method for making danger-signs of standard dimensions nor for having them properly worded or of sufficient attractiveness to command one's attention. Except those issued by insurance and other accident liability companies, most danger-signs are but makeshift affairs at best.

Warning notices that are unintelligibly scrawled on boards or paper if not readable by all who approach them are of little worth as such. Then again, if a danger-notice has become torn or soiled, or even removed from position, while no one is responsible for its care or replacement, it follows that accidents are liable to happen.

The work of preparing danger-signs is a part of safety-engineering, equally important with devising safeguards. They should be of elaborate design, of neat appearance and properly placed so that workmen will in all circumstances heed their warning. The same degree of interest, care and attention should be given their design and arrangement as is expected of the workmen in observing precautions for avoiding bodily injuries. If a sign is carelessly made up, and indicates indifference in its preparation, [illegible] will show a similar carelessness and indifference to the sign or the place where [illegible]

The accompanying sketch shows a few [illegible] size and also a design of a sign-holder. Danger-signs, as a rule, are usually tacked up on walls or boards. When so placed, they do not always indicate where the danger lurks. The word "Danger" painted on a sign denotes no particular point or place where attention is required, and are almost valueless because of this omission.

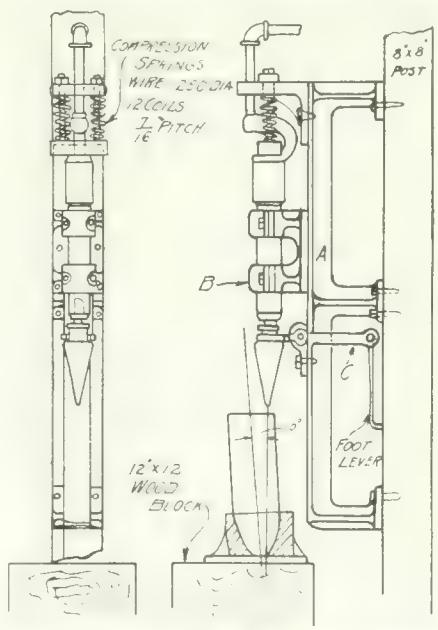
At the top of the rod of the holder is an arrow, that can be adjusted so as to point near, or directly to, the danger exposed. The holder, as seen, consists of an iron base having an upright rod to which is attached a sign-holder at the upper end. The base and holder rods are slit on the points for inserting the sign and arrow. These are held with pins or rivets.

The arrow strip should be about 12 or 14 inches long and of red color. The holder when placed about in zones of danger containing the arrow and sign will be found more serviceable than any devise now in use. Their novelty and attractiveness cannot fail to compel attention from the most indifferent workmen.

## HOW TO ADAPT AN AIR HAMMER TO SHELL WORK

By G. Barrett

A SIMPLE and convenient arrangement for supporting and working any make of air riveting hammer, for use on base




METHOD OF ADAPTING AN AIR HAMMER TO SHELL WORK

plates of 6-in. shells is shown in the accompanying sketch. I have designed this hammer in order to eliminate the necessity for holding the hammer by hand, which is a cumbersome method and hard on the operator.

The hammer is mounted on a bracket casting which allows it to be attached to a post. The barrel of the hammer is allowed to slide in bearings of bracket B, so that by putting pressure on the foot lever, the operator lifts up the hammer and puts the shell in the position shown in the sketch. The springs C are to keep the tension on the hammer while the piston is striking the blows, and all the operator has to do is to revolve the shell by hand.

## LAZINESS INDUCES EFFICIENCY

By D. Middleton

WILSON was a big overgrown youth who held his job because he was a pal of the boss's son. Wilson was lazy. The foreman tried to give the men the kind of work they liked as far as possible and in Wilson's case a job of countersinking the little butt shown was "it." The work was merely taking off the sharp corner and was done on a sensitive drill holding the pieces with a pair of pliers. Pretty soft for a big man but it suited Wilson until the day when the foreman was away when the exertion of reaching for the hand feed lever became too great. So all by himself he hunted up a piece of twine, tied it around the pinion shaft, and carried the ends down to the floor where they were made into a kind of stirrup for the size nine foot of the operator. But the point is that it worked and with his arms resting on the table, he had only to move his wrists to pick up a butt and it in the pliers; a back and forth movement of the foot brought the countersink to the work very neatly and the production was just about doubled.

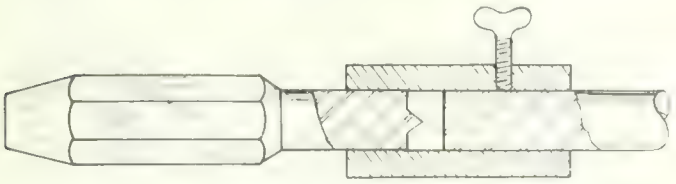
## MACHINE SHOP HINTS FOR BENCH HANDS

By J. Davies.

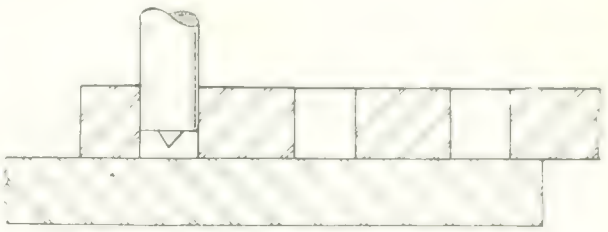
WHEN there is no centring machine or device for automatically finding the centre of shafts, etc., which is often the case, the following little tool will be found very useful, particularly on repetion jobs. Supposing there is a large number of pieces to be centred all the same size, first bore out a small piece of machinery steel to size of pieces to be centred; then turn up a centre punch to fit the bored hole, and put the bored piece on the shaft which is to be centred, leaving a portion sticking past the end to act as a guide for the centre punch (see Fig. 1, which indicates clearly the method of using). By having different sized bushes the outfit can be used for several sizes. In marking holes in boiler plates this rig is very handy owing to the impossibility of using centring devices even when available.

### Reducing the Bore of a Bush

If in finishing a hardened steel bush it should happen to be ground out a few thousandths too large, the size of the hole can be reduced enough to allow for regrinding by heating slowly to a nice cherry red, then placing a piece of asbestos over each end large enough to cover the hole; hold the asbestos tightly against the hole with a pair of tongs to prevent the water from getting into the hole and cool off.



SIMPLE ARRANGEMENT OF CENTERING TOOL FOR USE ON REPETITION WORK.



ROLLER PLATE ADJ

If cutting off flat stock, say, ½ in. x 2 in., with a power hack saw, place it edgeways in the vise and it will be cut through in half the time it would take to cut it flatwise. In cutting slots with a hand hack saw it is sometimes very convenient to place two blades in the frame to cut a slot the required width.

### Chipping Key Seats by Hand

In cutting a key seat by hand it is of prime importance to have it clearly and accurately marked out; after marking off with a box square or key seat rule, the sides should be marked out with a side-cutting chisel or an ordinary chisel ground quite thin and held at such an angle as to bring its cutting edge in line with the side of the intended key seat. This cut or deep mark will prevent the material from tearing out along the sides of the keyway while making the first cut with the chisel. If the key seat is a narrow one it may be cut with a chisel the required width. If the key seat is a wide one, take a narrow cut down each side with a cape chisel, then chip out the remaining metal from the centre. In some cases it is easier to drill a series of flat-bottomed holes along the length of the key seat, then remove the remaining metal by hand; of course, this only applies when no better conveniences are at hand.

In taking a cut off a very large surface by hand, first mark it off with a surface gauge all round the outside edge, then take a chamfering cut down to the depth; this will help the chisel to take a grip of the metal in starting the cut, and also prevent the metal from breaking away at the finish of the cut. Take a series of cuts across with a cape chisel, leaving the metal between the cuts a little narrower than an ordinary flat chisel; this materially lessens the work of the flat chisel, as the metal breaks away readily when it has no supporting edges. Don't use a hammer for steady chipping that is too heavy; use one you can swing easily from the end of the shaft, and don't have to get a strangle hold on it; it isn't the man with the biggest hammer that does the most work.

### Filing

Filing is at once the commonest and yet the most difficult art of the machine shop; the novice is at once proclaimed by the first few strokes of the file. Volumes have been written about it, yet it is as useless to expect to become proficient in the use of it by simply reading an article in a technical paper as it is to expect to become a good violinist by taking a correspondence course. The man that can wield the file well is just as much of an artist as the man that wields the violin bow, and for that reason I shall not attempt to give any detailed instruction, but merely point out a few facts.

When a novice is seen laboriously using a file he is often told as a joke to put some oil on it. In some cases this is actually beneficial. On cast iron or broad smooth surfaces oil should never be used, although it may be used to advantage when filing wrought iron if the surface is not too broad, as oil prevents the file from scratching and cutting too deep.

Chalk rubbed over the file tends to prevent the teeth from becoming choked up with filings or cats' paws, as they are often called. A new file should not be used on rough cast iron surfaces from which the sand and scale have not been removed.

To the uninitiated it would [illegible] a file with a perfectly flat surface would be preferable; this is not so, it would be extremely difficult to file perfectly flat with a flat file. The face of a file is made convex for three reasons: (1) To overcome the spring due to the pressure of the hands; (2) to prevent them changing their shape sufficiently during hardening to make them concave; (3) so that the file will not bear all over a wide surface, as it would then require a heavy pressure to make it cut.

To put a handle on a file, put the file in the vise with the tang protruding past the end of the vise, give the end of handle a slight blow with the hammer, then turn the handle round, continue the operation until you judge you can drive the handle well on to the tang without splitting it.

Frequently in counting the number of teeth in a gear wheel, after counting round the wheel you forget whether you counted the one you started with or not. Avoid this by always marking the gear opposite a space and then counting round.

Putting very small screws into an awkward place may be much simplified by having the end of the screwdriver loaded or magnetized. The screws will then adhere to the end of the screwdriver while being placed in position. Wood screws can be screwed home easier if they are smeared in heavy oil or tallow, and may be successfully screwed into the very hardest wood by the following method: Drill a hole equal in diameter to the size of the screw at the bottom of the thread, and take a screw the size to be used, file it to the form of a half-round bit, when it practically becomes a tap; screw this into the hole and it will form a thread which the screw to be used will readily follow.

## GRINDING THIN HIGH SPEED STEEL KNIVES

By Philip H. Clapp and George A. Parks*

THIN high speed steel knives range from ⅛ in. to ¼ in. in thickness, 1 in. to 2 in. in width and from 1 in. to 42 in. in length. Owing to their composition and the treatment given during manufacture, knives of this type are extremely hard and brittle. The only efficient method, therefore, of sharpening is by grinding.

#### The Grinding Wheel

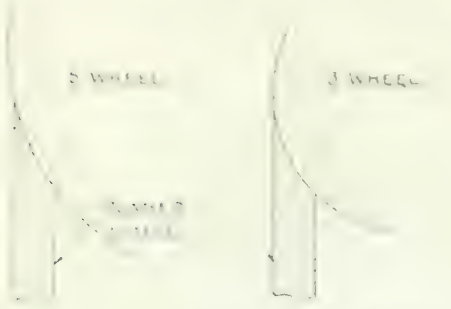
One of the most important factors in keeping the edges of high speed steel knives in good condition and in preserving the life of the knives is the selection of grinding wheels of the correct grain and grade. Many of the common troubles such as cracking and checking of the edges may be avoided if the right wheel is properly used.

The grinding wheel should be of a grain and grade which will cut freely and rapidly with very little dressing and yet maintain its shape. The speed should not exceed 5,000 s.f.p.m. A wheel operated at too high a speed acts hard and devolops the tendency toward glazing and dulling over.

On the modern knife grinding machines 2,630 or 2,636 grades J or K Alundum vitrified wheels will be found almost universally satisfactory. Very little dressing is required, and a cool, rapid cutting action is given, with a reasonable feed and traverse. Occasion-

soft as grade I or even H, but this is unusual.

slower wheel speeds and in most cases smaller wheels were used. 2646 J or K are sucessful. Here, too, softer wheels must sometimes be used, especially if



SHOWING DIFFERENCE IN BEVELS OF KNIVES GROUND ON IN AND IN DIA WHEELS

the knives are particularly hard or the contact between the knife and the wheel is exceptionally broad because of a long bevel.

Moulding knives and others of special design which are usually milled to original shape, are ground by hand to the required bevel on an ordinary bench grinding machine. For wheels ½ in. and thicker, 2636-M Alundum vitrified has been found successful. For wheels thinner than ½ in., 2646-M Alundum vitrified is most suitable. These moulding knives are afterwards jointed to the exact contour required, by means of a master form which controls the movement of the jointing stone.

### Methods of Grinding

Usually the planing machines are so constructed as to permit of the ready removal of the knives for grinding. Gradually the old type of knife grinding machines which required the constant attention of the operator is being replaced by the modern automatic machines. The traverse of the work carriage and the feed of the grinding wheel are both automatically controlled. By means of stops properly arranged the movement of the work carriage can be regulated to conform to the length of the knife or knives being ground. Several short knkives can be ground at a time, and this practice is usually followed as the knives are then almost certain to balance one another in weight.

The question of a properly balanced cylinder naturally depends mainly on the weight of the knives although their mounting in the cylinder should also be carefully watched.

In a majority of shops the grinding is done against the edge of the knife, the direction of the wheel being from the edge toward the back. This method reduces the burr or feather edge, which is always present along the knife edge after grinding; when grinding toward the edge from the back of the knife, this feather edge is much more pronounced and requires more honing with a fine abrasive stick or oil-stone before ready for use. The degree of sharpness produced by either method does not vary greatly.

Although the grinding in most of the present day shops is being done dry, it is by no means an established fact that this method is superior to the wet method. With a copious supply of clean lubricant which also serves as a cooling agent, the knives can be sharpened fully as satisfactorily as when grinding dry. The principal objection to the wet grinding method as tried in some of the shops, is the extremely small amount of lubricant applied to the point of contact between the knife and the wheel during the operation. An insufficient supply of lubricant is far worse than none at all. It is not enough to keep the edge cool while the grinding is being carried on, but rather tends to chill it suddenly after the wheel has passed. Therefore, the expansion caused by the heat generated while grinding is suddenly reduced and this abrupt reaction in itself is quite enough to cause checking of the knife edge.

The feed of the grinding wheel can be set for any desired limit and when a corresponding amount of material has been removed from the knife, the wheel feed automatically stops. A small allowance must be made for wheel wear if the knives are long and much stock is to be removed.

When grinding knives, light cuts should be taken so that the heat generated will be reduced to a minimum. The actual depth of the cut to be used with best results, depends on the type, thickness and kind of knife as well as on the bevel to be ground. A fairly slow carriage traverse, not over 15 feet per minute is also recommended so as to enable the wheel to remove the stock without being forced.

These facts are especially true when grinding a double bevelled knife as the wheels are cutting at almost the same place on the knife edge, thus causing noticeably more heat than when only a single or clearance bevel is being ground. No doubt they are working under severe conditions when in operation and this "rest" tends to relieve some of the internal strains which may have been set up while in use. Still others are of the opinion that this "rest" should take place after the grinding and before the knives are again mounted for use.

If the grinding is being properly performed and the wheel is of the correct hardness and fineness, there should be practically no additional stress set up by the grinding operation. It would see, therefore, that the greatest advantage would be derived by letting the knives "rest" before grinding and paying particular attention to the selection of the proper grinding wheel.

### Keeping Wheel in Condition

The usual method of dressing the grinding wheel is by means of a Crystolon stick about 16 grade S vitrified. The wheel face is touched lightly from time to time, the frequency depending upon the action of the wheel in use. The grinding wheel face is thus sharpened, or in other words the dull grains are removed and new sharp abrasive particles are presented which in turn give more satisfactory results. It is possible also for a skilful operator to restore the shape of the wheel face with one of these Crystolon sticks.

One of the greatest objections to some of the old types of knife grinding machines was the use of a wheel with too small a diameter. Each shop or mill usually has a certain standard length of bevel, depending upon the wood to be cut, which is measured by a gauge, and the knives must be ground accordingly. When the grinding wheel had worn an inch or more in size, the bevel produced on the knives naturally became so concaved as to weaken the cutting edge considerably. This is illustrated in figure 1 showing the bevels ground by a 5 in. and 3 in. wheel respectively. This condition is being eliminated in the modern machines through the use of larger wheels.

### Causes of Cracking, Checking, Etc.

It is needless to say that upon the grinding depends largely the efficiency of the knife. Complaints have been made to knife manufacturers, alleging that their knives crack and break. Investigations in some cases have revealed that the fault is not in the knife itself, but rather in improper or abusive grinding. Improper grinding will injure the best high speed steel knife ever made.

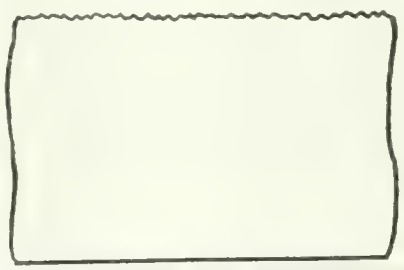


FIG. 2. MAGNIFIED EDGE OF SOUND KNIFE WHICH HAS BEEN CAREFULLY GROUND.

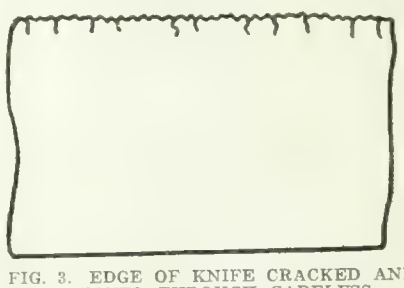
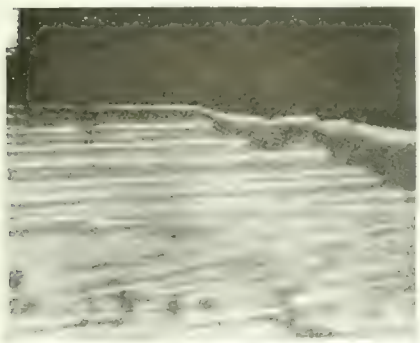


FIG. 3. EDGE OF KNIFE CRACKED AND CHECKED THROUGH CARELESS GRINDING.

There are several causes which contribute toward shortening the life of a high speed steel knife by making frequent truing and grinding necessary. Vibration, especially that which may be caused by excessive cylinder speeds, light foundation or machine construction, loose boxes or any other poor conditions is to be avoided in so far as possible. The service given by the knives between grindings is not only materially shortened by this factor but

the cutting efficiency of the machine is seriously decreased.

Under the impression that time is money, some operators hurry the grinding by taking excessively heavy cuts. This is absolutely wrong and should not be allowed under any condition. The edge of the knife is burned and checked, and naturally when it is placed in



DULLED EDGE OF A PLANER KNIFE

Magnified 50 diameters

EDGE OF [illegible] KNIFE GROUND [illegible]

Magnified 50 diameters

[illegible] OF KNIFE GROUND [illegible]

[illegible] 50 diameters

operation, pieces break out or the edge may even break down altogether, depending upon the extent to which it has been injured. This practice of taking too deep a cut is being automatically discouraged through the use of very light belts on the modern grinding machines. This will cause the wheel to stall, rather than cut under the excessive pressure.

Then again, checking is frequently produced by too hard or too fine wheels which glaze over on the cutting face after being used for a short time. A glazed wheel is not a cool cutting wheel because the cutting points are dulled over and naturally greater friction occurs between the work and [illegible] than is the case where a clean, sharp wheel face is maintained. Obviously, more heat is generated.

The edge of a knife, greatly magnified, resembles figure 2. The heat generated during abusive grinding is usually sufficient to cause cracking or checking as shown in figure 3.

The cracks are caused by the rapid expansion of the steel due directly to the excesive heat concentrated on the knife edge. This unequal expansion, due to the heating which is applied only to a small portion of the edge at a time, causes internal strains in the knife which are oftentimes severe enough to cause checking.

Although the cracks may not be of sufficient size to cause breakage after the first grinding they are aggravated by each subsequent grinding until the edge of the knife is so weakened that the first knot in the lumber breaks out a piece. Even if checking does not actually occur during the improper grinding, the resultant stress existing in the steel will sometimes find relief through this channel, while the knife is being used.

Sometimes, too, pieces will break out from the edge during grinding because some machines are equipped with a device for truing the knives while they are in motion so that they will revolve in a true circle. This equipment is nothing more nor less than a means of holding an abrasive stick rigidly, and moving it along parallel with the edges of the knives. The abrasive stick reduces any of the protruding knife edges until all of them are operating in a true circle. The cylinder is then ready for use in planing lumber and each knife will perform an equal share of the work. The jointing must be done at the same speed as the cylinder is to be operated when in use, as the paths of the knives depend directly on the peripheral speed.

The most satisfactory results in jointing have been obtained by using machines especially built for this work. For special shapes such as moulding knives, master forms of exactly the same shape as the finished knives may be inserted to guide the jointing stone back and forth across the edges of the knives [illegible] of an improper contour.

A series of knives may be jointed a number of times before it becomes the wood and the efficiency of the knife from that point until the bevel is reground decreases rapidly. This particular feature is closely watched in most of the woodworking shops, because the speed of cutting is reduced rapidly and the additional strain on the knives and machine is to be avoided.

For jointing, some operators prefer to use a wide stone while others select a narrow stone and hardly any two types of machines seem to agree on the shape. It is essential, however, that the jointing stone be narrow at the point of contact with the knife edge and that light cuts be taken so as to avoid burning.

For the [illegible] or N Crystolon vitrified has proven most satisfactory. Occasionally, an operator prefers a [illegible]

### Jointing

Because there is some distortion of the cylinder and knives when working under actual operating conditions and because the knives cannot be ground and re-set perfectly in the cylinder, of the incorrect conditions under which the operation is being carried on.

necessary to remove them from the machines for regrinding. The width of the heel, caused by the jointing, which can be reached before grinding is necessary, must not greatly exceed 1-32 in. However, this depends somewhat on the kind of material being cut.

When the heel produced by jointing becomes too wide, the rear edge strikes

and on his personal opinion.

### GERMAN ECONOMY IN LUBRICATING OIL

Notices are displayed in German machine shops, giving hints on economy in lubricants which should be valuable in any country. These are:—

Use only closed oil cans, with spouts that will deliver drops, or at most only a thin stream.

Use all lubricating apparatus strictly according to the instructions, and put the oil only where it will actually lubricate. If a machine has automatic droppers, shut off the supply while machine is standing.

Do not use cylinder oil on shafting or elsewhere when cheaper oil will answer.

Keep all rubbing surfaces in good condition. Rough surfaces and too-tight boxes consume more oil. Worn and leaky bearing waste oil.

Always use drip pans and arrange to filter and cleanse the oil so caught. It is as good as new.

Collect all greasy waste and wiping cloths, so that the oil may be recovered. Never burn them.

Be careful about using lubricating oil for cooling a bearing. Water will often do as well.

[illegible] ing and polishing. Never clean the hands with oil. A greasy cloth will do as well.

Toronto Harbor Development [illegible] not proposed to stop work on the Toronto Harbor improvements, certain necessary work will be continued. The eastern ship channel is to be gone on with and completed, as well as the 900-foot dock extending out from the marginal way. The sea wall in Ashbridge's [illegible] is all in the east end. In the west end a section of the uncompleted breakwater [illegible] be completed.

# EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

### SHOP GEOGRAPHY

THE instruction of the men in a factory seldom goes beyond that of the actual work upon which they are engaged. The advantages that are to be derived from the workman becoming more familiar with the plant layout are worthy of more consideration on the part of shop officials than might be generally supposed. One very important factor in connection with shop geography is the advisability of identifying the numerous piping installations that are now so common in the average manufacturing establishments. In addition to classifying different lines of piping by means of some color arrangement, charts should be made and placed in conspicuous locations about the shop, so as the employees may be able to act in case of emergency to avoid loss or destruction of life and material.

A few years ago while the writer was working in a large sheet metal plant an experience met with emphasized the extreme advantages that would result from the workmen having a better knowledge of shop conditions and current developments. For several weeks prior to the time in question, pipe fitters had been engaged in installing a new sprinkler system throughout the various departments. The climax came one night when four or five tool makers were working overtime. The day before the water had been turned on in the system to test the piping, and apparently everything was satisfactory. This night, however, while one of the men happened to be in a comparatively isolated portion of the factory, he noticed water dripping from the ceiling above; upon advising the foreman the latter investigated and going to the floor above found a large area of the floor already covered with water, which was now flowing freely in many places from the second storey ceiling. Continuing up to the third floor he discovered a section virtually flooded to a depth of three or four inches and a stream of water running from a large drying kiln. The foreman immediately endeavored to stop the flow from the released sprinkler but the force of the vortex prevented him from stopping the opening.

It is just here where the absence of shop geography resulted in considerable damage to much of the finished tinware and wire articles that covered the floors in the vicinity of the "blow out." The few men then on the premises did not know where to shut off the source of this water supply, and telephone communication was necessary to bring the superintendent to the scene before the yard valve could be closed; while during the interval the several tool makers were baling water from the floor and pouring the same into nearby sinks. The cause of the "break" was the placing of a "185 degree" sprinkler in a kiln that very often was raised to a temperature of nearly 200 degrees. If the men working at the time had known the locations of the different valves, much time and loss would have been avoided.

### WANTED—INITIATIVE ABILITY

By R. Hamilton

INTELLIGENT application of the elementary principles of mathematics and mechanics is not only a factor in the education of the engineering apprentice, but a conscientious study of the theoretical part of his work is essential to the attainment of an end that every young man should strive for. As the "boy is father to the man" so also is the apprentice father to the engineer. No other trade or profession is more exacting than that of the mechanical engineer; the rapid strides and remarkable achievements of science and industry during the past decade has only been possible through the concentrated efforts of those men responsible for its accomplishment. It is true that the dominating feature that characterizes the production of materials at the present time—particularly in metal working establishments—is largely a physical one, but it is equally true that without the modern equipment now in use the efforts of the man would be more or less fruitless.

Developments of machinery, both in the way of improvement and invention, have enabled manufacturing to progress with almost miraculous rapidity, as has been amply demonstrated during the past three years. Present methods of shell production have not been the result of any one man's efforts, or even of any particular class of men, but are rather the evolution of numerous ideas, many of which had their origin in the ordinary practice of pre-war activity. This evolution, and in some respects revolution, of production methods is really due to those men who were mentally responsible for the initial development of those devices, special attachments, and single purpose machines, which have been largely instrumental in the success of the industry.

The efficiency of a plant and the quality of its product are practically dependent upon the efficiency of the individual. The executive possibilities of the organization may count for naught unless the full co-operation of the workmen is given to the solution of the problems that are part of the routine work of every establishment. Every workman, even though in the most humble position, should not only realize his own personal responsibilities, but should seize the opportunities that are constantly open to him to advance his own interests. Trivial and apparently insignificant details should form the basis of developing the initiative of an employee; not only should these details be regularly and conscientiously performed, but they should be studied with the purpose of improving the manner in which they are accomplished, eliminating wherever possible any unnecessary waste of effort. Some may imagine that "it is theirs to do and not to think," this latter being the duty of the man higher up, and while invariably this is the case it is quite obvious that the "boss" did not attain his prominence through the too prevalent spirit of human indifference.

Through the force of circumstances the young man of to-morrow will be compelled to take larger responsibilities than ever before and it will be necessary, therefore, that they should so school themselves that the future will not find them lacking in a sphere where originality, initiative and a thorough knowledge of elementary principles are the fundamental and dominating factors.

### THE DANGER IN FLYWHEEL AND PULLEY WORK.

By D. A. Hampson

MOST of us look upon the beautiful curved arms to be seen in the large pulleys of thirty years ago as the work of designers who were architects rather than engineers and a relic of the days when time was not at a premium and iron was cheap. In reality those curved arms served a purpose and did it well. The foundry art had not reached its present high state of development and the curved arms were a protection against contraction strains, and against the cracks that we find, even to-day, where the arm joins the rim. The curve being elastic to a certain extent, was not as rigid as is the straight arm of to-day, and if the arm cooled last, its shape allowed it to give and not break. If the rim was extra heavy and the arm cooled first, the contraction due to the drawing away from the rim simply straightened out a little of the curve and all was safe.

But even with our present experience, the thin rim and the straight arm of to-day continue to give trouble in the shop if a sound casting is not properly handled. Flywheels, with their heavy rim mass and relatively light arms, are hard to cast and easily broken in the shop processes. The trouble occurs where the arms and rim join. If an arbor is forced in or out of the hole or a key driven home or any driving in the direction of the axis, there should be sufficient resis-

tance applied to the hub to take all of the thrust and also the rim supported so it cannot vibrate. To press in an arbor with the pulley resting on the rim and the hub free is only to court breakage. To drive on an arm or the rim is as bad. The iron is already under a strain and the shock of the blow causes even greater strains to be set up and fracture occurs.

The writer saw a key and shaft being fitted to the flywheel of an air compressor. The wheel weighed about a thousand pounds and was stood upright on the floor with a chain hoist to steady the top so it couldn't fall over. The shaft and the key were made a driving fit—both driven home with a 16 lb. sledge and it would have been a dandy job if the hub had been rigidly supported against the blows and the rim had had a positive means of steadying, which the chain did not give. The machine was assembled and started up but no sooner had it reached speed than with a loud report, two of the arms snapped. The wheel had been perfectly sound when machined and while it may have been jarred in handling, the true solution is that the hammering it got in the shop was the cause of breakage.

## USES OF COAL-TAR PRODUCTS

By O.C.

WOOD, when exposed to moisture or set in water, may decay through the action of different organisms or fungi, or it may be destroyed by insects. To prevent this the timber is soaked in some chemical which will act as a poison to such enemies. Mercuric chloride, copper sulphate, and zinc chloride are examples of suitable poisons, and of these the last named is widely used. They are, however, all soluble in water, and may be rather quickly washed out by rain, etc. Creasote oil, on the other hand, is an efficient preservative which is insoluble in water, and consequently is more permanent in its action. It gradually evaporates, but if a heavy oil be chosen, the rate of evaporation is very slow. Creosote oil is the most suitable material for timber preservation, and is most used in Canada. Coal tar, also insoluble in water, is often used, but its penetrating power is very small.

The wood to be preserved by creosote is put in iron tanks, which are then closed and evacuated; the heated oil is now run in and the wood allowed to remain immersed under pressure for some time to ensure the complete filling of the pores. The preservative, to be effective, should contain high-boiling oils; for general purposes not more than 50 per cent. of it should distil below more than 315c. But for wood paving blocks not more than 55 per cent. should distil below that temperature. Economy of creosote oil can be obtained by the use of an inferior oil, which would be mixed hot, in the proportion of 80 parts oil to 20 parts of coke-oven tar, the latter containing not more than 5 per cent. to 6 per cent. of free carbon. The penetration of such a mixture is not less than [illegible] of the creosote oil, if the time for which the timber is kept under pressure be slightly increased.

### Annual Oil Consumption

On the American continent the demand for creosote oil is much greater than the supply. In 1913 the United States consumed, for timber preservation, over 90 million gallons (Imperial) of the oil, and of this 62 per cent. was imported from Europe. Between 60 per cent. and 70 per cent. of the total quantity of oil consumed was used for the treatment of railway ties, some 25 million being thus treated. In Canada, 19 million cross ties are used annually, and only about 10 per cent. of these are creosoted; but even for this comparatively small number Canada does not produce sufficient creosote oil. If all the tar produced in gas and coke-oven works in Great Britain were distilled, the home supply of creosote oil would still be quite unequal to the demand, and tar distillers would therefore be certain of a sale for one of their most important products.

Raw tar is sometimes used in the making of roads, but it is better to employ the prepared or dehydrated tar. This is generally poured or sprayed on existing roads. In dry weather it serves to keep the surface free from dust, and in wet weather it protects the road material from the distinegrating effects of water. In the actual construction of roads, coal-tar pitch and asphalt are much used instead of tar. Coal-tar asphalt is made by mixing pitch with suitable quantities of creosote and anthracene oils; and although it cannot entirely replace the natural asphalt [illegible] very good substitute. For making sidewalk, a mixture of coal-tar [illegible] natural asphalt is often employed, sandy material being ground up with the mixture, which is then melted and mixed with gravel. The use of pitch, etc., in the making of roads is increasing rapidly, and even at the present time there is a good demand for this residual material from the distillation of coal-tar.

### Other Products

Carbolic acid, another coal-tar product, in its pure crystallised state, is used for medicinal purposes as an antiseptic, etc., but it has a much wider application in the crude state for disinfectant purposes generally. The impure carbolic acid has a strong unpleasant smell. It becomes partially liquid on standing, and in this state is much used for disinfecting sewers, stables, etc. Various preparations [illegible] made to render the application of the disinfectant more convenient. The most important preparations are those in which the phenols are combined with soap; but carbolic-acid powders, which are mixtures of carbolic acid and lime, etc., are extensively used. Naphthalene sometimes replaces carbolic acid, as a disinfectant, being used in sick rooms, etc., and is often preferable to carbolic acid for the dressing of wounds. It also acts as a preventive against all kinds of moths, etc.

## VARIABLE SPEED TRANSMISSION DEVICES

IT is curious to note how after a century or more of intense mechanical development some of our most widely used machines and mechanical devices are of a type that appears to outrage every mechanical principle. The picking motion of the loom is one such device, the combination of motor cycles and side car is another, the sliding gear variable speed device for power driving road vehicles and other machines is a third. A study of some of these apparently barbaric suvivals leads to the conclusion that their practical advantages outweigh fundamentally their technical deficiences, and suggests that they are not likely to be superseded by more "correct" devices that will better satisfy the mechanical sense. They may be all wrong, but they give more for a dollar than any alternative arrangement. But in other cases they appear to owe their continued existence to the fact that being early established as a standard device, a hundred times more effort has been given to their improvements than to the development of any radically different and, perhaps better method, so that the competition continues to be between an actual much improved bad thing and a prospective ill-developed good thing.

Whether the sliding change speed gear now employed on the overwhelming majority of road motors belongs to the first or second of these arrangement classes it is as yet too early to say, but the arrangement is too crude to go for a long time unchallenged. R. E. Phillips in a paper on variable speed gears, read some time ago before the Institute of Mechanical Engineers, admits that although from an engineer's point of view it is theoretically an embodiment of everything that is wrong, it has been developed by the perfection to which its design has been brought, by the high standard of workmanship employed in its manufacture and by the use of the highest grade of materials into a completely satisfactory piece of mechanism. In practice it has proved to be "not so bad as it looks," and it has managed to hold its own for nearly 20 years against many other gears which theoretically should give better results. This condition of things has attributed, however, partly to the factor above mentioned, that nothing like the same attention has been devoted to other transmission devices as to this, and partly to the fact that the motors now used are of such a high horse power that at least 75 per cent. of the running is now done on the direct drive.

The amount of effort that has been given to the improvement of the side meshing type of change-speed gear is [illegible] been catalogued by M. Rutishauser, an eminent French engineer, into no fewer than 9 main divisions and 20 sub-divisions. The most frequent aim of the inventor has been to prevent undue wear

and tear on the teeth of the wheels due to the clash engagement, and the problem has been tackled in many ways. The side mesher action can, of course, be altogether at a price. All that is necessary is to keep the several trains of gears constantly in mesh, and bring into action the particular train required by means of some of some form of clutch. This method, though theoretically attractive, has in practice three weighty drawbacks; it increases the length and weight of the gear box; it adds greatly to the complexity and cost and it means that all the wheels are running all the time. A happy compromise is that in which the sliding wheels are mounted loosely on their shafts, and are brought into mesh with the respective corresponding wheels of their trains before they became coupled to the shaft on which they are mounted.

## EXTREME DUTY OF AEROPLANE PROPELLERS

TO be trustworthy an aeroplane propeller must be one of the strongest things in the world. Not only are they subjected to gunfire, but their normal action makes heavy demands on their strength. The very speed of their revolutions tends to disrupt them. In a test run of propellers made of wood which had been dried to the lowest possible moisture content, or bone dry, as they say in the forest products laboratory, the ends of the blades actually exuded sap, which was forced out by the centrifugal action. In tests, at least, it has been possible to speed the propellers up to such a pitch that the outer end of the blade on an 8-foot propeller travels at the rate of 400 miles an hour, says "The American Foresty Magazine," of Washington.

Some air-machine engines run at 1,700 revolutions a minute, and can be geared up to 2,000. An engine of this power would use a 9-foot 6-inch propeller, and the speed of the blade ends would be in the neighborhood of 600 miles an hour A good many thousands of pounds of pressure per square inch are generated by this action alone, and propellers have been known to split at the centre and fly apart. Even the smallest lack of balance between the two blades is very serious, since the pull of one must counterbalance that of the other.

### Wood Must Be Perfect

In addition there is the gyroscopic force which tends to keep the blades rotating in the same plane. At high speed this force is hard to overcome, and the cross strains it introduces when there is a change of direction, either up, down or sidewise, are enormous.

Yet under conditions of modern warfare, when an aviator has to "loop the loop" or plunge, or ascend sharply in manoeuvring to bring down, or escape from an enemy, the machine has to meet and withstand these unusual tests.

Wood for aeroplane manufacture must be 100 per cent. perfect. In other articles there may be a slight margin of [illegible] recognized in lumber grading rules. In aeroplanes, however, the safety of the aviator and army demands entire freedom from flaws. Even with Sitka spruce, the favorite wood for aeroplane construction, there is difficulty in obtaining the very highest grades. The United States Forest Service estimates that only 13 per cent. approximately is available for plane construction. Of Port Orford cedar, 10 per cent. is about all that can be counted on as good enough for planes; about 8 per cent. can be used from the spruce of Virginia and West Virginia, and only about 5 per cent. from the smaller trees of Maine. A member of the Curtiss firm is reported to have said that only 167 board feet on an average goes into planes from each 1,000 board feet.

### Wastage is Very High

The quantity of wood needed for each 'plane varies, of course, with the size of the machine; few of the present-day types contain less than 250 feet, and it may take 2,000 feet in the rough to furnish this amount. One Washington lumberman is making sure of getting only the straightest of straight-grained stuff by splitting it out of the log instead of sawing it. He gets quality at the expense of considerable waste in riving out choice white oak cooperage stock or hickory for spokes. But the resultant product is sure to have straightness of grain. There is no place where this is more important than in 'planes.

There has been an actual dearth of the kind of Sitka spruce that must be had, but the North-western loggers and mill men, in spite of labor troubles, said to have been fomented by our enemies, have begun to catch up with the demand. Before long they should be able to keep up a sufficient and constant supply.

### Woods for Propellers

For propeller blades ash and white oak are used in considerable quantities, while some are made of mahogany, alternate layers of mahogany and spruce or mahogany and ash. Black walnut has been used in place of mahogany, because this wood does not splinter when hit by a projectile. Maple, birch and cherry have found some place in propeller manufacture. Douglas fir has been used in making frames.

## ENGLISH DEMAND FOR LEATHER BELTING INCREASES

BEFORE the war there was little opportunity for the sale of American belting in the Birmingham district. The trade was very carefully looked after by British manufacturers, who claimed that their product was the best in the world. They had the advantage of being on the spot, kept a large stock of their belts always on hand, and covered the country with active salesmen. Conditions now have materially changed. Government factories, munition factories and other establishments, not only in this country but also in France and other allied countries, are demanding greatly increased quantities of leather machine belting for their work, so that belting of this kind has come into great prominence in spite of the high price of raw material. The market demands belts of the very best quality, such as will do the work called for efficiently and without requiring too much attention. The best British belts fulfil these conditions.

### Effective Way to Sell Goods

The business should be placed in the hands of some one in close touch with the machinery industry who could give his whole attention to such products. The ideal way for an American firm would be to have its own representative over here to make a study of British terms and customs and carry a large stock. If a firm is not prepared to go to this expense, which, of course, would be considerable, then an agent should be selected from among the firms on the list that is forwarded. It might be advisable to provide for such a representative an allowance for advertising. It may be that London would be a better centre from which to work. In any event, there is a big opening in the United Kingdom for leather belts.

## MINERAL WEALTH OF ALSACE-LORRAINE

Frequent reference is made to the mineral wealth of Alsace-Lorraine, it being known that the invention of Thomas and Gilchrist turned that country into a vast gold mine, by rendering its iron ore useful and valuable. The German ambition is to secure also the great iron basin of Briey, the richest and most extensive of all Europe, estimated to contain from 3 to 4 thousand million tons of ore. Thirty miles away Nature has deposited 10,000 million tons of coal in the basin of the Sarre; east of Nancy, partly in France and partly in Lorraine, is one of the largest salt beds in the world; farther east, at Pechelbronn, is an oil district where 30,000 tons of mineral oil are extracted yearly; and finally, more to the south, near Mulhausen, is a wonderful deposit of potash, rivalling that of Stassfurt. Germany before the war was very poorly off for iron. In her own territory she had only 710,000,000 tons in sight. Her conquest of 1871 gave her a reserve of over two thousand million tons in Lorraine, but in spite of this she was lately obliged to import 12 million tons from Sweden, Spain, and Algeria, and was looking to Morocco to aid her supply, whence the "Agadir affair."

## SUPPLIES OF GASOLINE

IN 1915, Canada consumed over 43,000,000 gallons of gasoline. Of this amount about 5 per cent. was produced from Canadian crude, while the remainder was either imported direct or produced from imported crude. This fact shows the dependence of Canada upon supplies of gasoline and petroleum from United States and strengthens the argument used in a previous issue wherein it was stated that 20 per cent. of the gasoline used in Canada was produced from Canadian crude oil.

# Modern Economies in Pickling Steel*

y J. H. Snyder **

*Increased costs in labor and materials have been so continuous and widespread that few branches of engineering industry have not been compelled to devote more than ordinary attention to every opportunity for effecting economies. Increased use of machinery and care in the choice and strength of acids to insure uniform and reliable work are advocated.*

DURING the last five years, and more especially the last two years, on account of the rapid rise in the cost of labor and acid, practically all the larger plants and many of the smaller ones have made efficient changes in their pickling department to reduce labor and acid consumption, increase output and get a more uniformly pickled product. Experiments have been made with solutions of potash, Wyandotte cleaner, etc., to eliminate oils and grease preparatory to the acid bath, thereby saving a large percentage of acid.

### Increased Use of Machinery

Conveying machinery, trucks, cars cranes, etc., have recently been installed to increase output. Wire is now frequently sent from the mills to the cleaning departments on an endless chain conveyor, with hooks spaced at suitable intervals for holding the wire coils. Ordinary factory trucks are often used to transfer sheets, tin plate, forgings, pipe, castings, etc. Sometimes, where conditions are suitable, tracks are laid throughout the plant with switches and turntables and cars convey the material over these tracks to the different departments. In large plants electric cranes are used for carrying material to and from the cleaning department. Devices are attached to the crane hooks for carrying each particular product, thereby effecting an efficient means of transfer.

Electric hoists, air hoists and jib cranes assist the men to place and remove material being cleaned in the vats, and also to shift this material in the acid solution to obtain better results in cleaning. In many cases large electric cranes, used in the transfer of the production from one department to another, are used for this purpose. This method, used in several plants with more or less favor, has the following objections: The acid fumes constantly rise and come in contact with the electrical apparatus, causing increased maintenance cost and delays in operation; the objects lie motionless nearly all the time in the acid solution, which, on account of little or no agitation, is of varying density from bottom to top, so that certain portions of the objects are overpickled and other portions contain unpickled spots.

### Types of Pickling Machines

Many companies have installed pickling machines to take the place of electric cranes and reduce the labor. These machines are to a great extent acid proof, simple in design and fool proof in operation. The surging or plunger type, which has been in use a number of years, forces the acid up through the material being pickled by means of a plunger. This keeps the density of the acid throughout the vat constant. The machine is installed where an extremely large tonnage is desired and seems a great improvement over former methods, but since the material is not agitated the greatest economy is not reached.

A machine made by the Mesta Machine Co. agitates the material as well as the acid by moving the load up and down through the different solutions and is being used for almost every kind of product that is being pickled or cleaned. The machine is operated by steam or air from a central plunger carrying horizontal arms from which are suspended acid proof crates. The number of arms is governed by the number of baths required.

Pickling, rinsing and loading are all done simultaneously. Sudden admission of steam or air in the cylinder at the end of the down stroke of the plunger causes a snap which tends to separate and shift the material so as to remove the scale or sand, scour the material and mechanically aid the chemical action of the acid. The advantages of this machine are: Crane service can be eliminated; labor can be materially reduced; acid required per ton pickled can be reduced; it is simple in design and fool-proof in operation; exhaust steam can be used for heating the vats; maintenance cost is low, and small floor space is required.

### Acids and Pickling Compounds

To have ideal pickling the scale and oxides should be removed without any chemical action on the metal directly beneath them and great care should be exercised in the choice and strength of acids so a maximum cleaning action may be obtained with a minimum solvent action on the metal.

Acids used for pickling are sulphuric, muriatic or hydrochloric and hydrofluoric. Various compounds are also used. Sulphuric acid 60 deg. and 66 deg. Baume is most generally used in this country. It is generally admitted that sulphuric acid solutions clean metal as well as other acid solutions if made strong enough to remove all scale with sufficient rapidity not to allow any part of the material to become overpickled, or combined carbon to precipitate and form a graphite coat on the surface.

The proper percentage of sulphuric acid necessary is governed by experience and is controlled by the character of the material to be pickled. According to Comey (Dictionary of Chemical Solubilities) the rate of corrosion increases with concentration of acid up to a certain point, after which the rate of corrosion decreases. This variation is sometimes very irregular with different materials. The action of acids also increases by raising the temperature. Most men mixing solutions guess the amount of acid necessary; some test with the hydrometer, others tell by taste the strength of a solution.

Many companies change the sulphuric acid solution every 24 hr. When work is begun in the morning a solution of about 8 per cent. sulphuric acid by volume is put into the vat and the proper amount of water is mixed with the acid. Throughout the day sufficient acid to keep the necessary strength is added. The vat which contains scale and ferrous salts is cleaned out completely and a new solution made for the next 24 hr. This is done where large tonnages are pickled. In most of the plants acid is added for two or three days, or even much longer than this, and from time to time the scale is cleaned out and some of the weakened acid solution drawn off.

### Use of Potash

Where the material to be pickled is covered with oil or grease potash solutions are used to clean the surfaces. Potash is very expensive and a substitute known as Wyandotte Cleanser is used. It is claimed that 50 per cent. sulphuric acid is saved by proper cleaning of material preparatory to the acid bath.

Some substitutes used in place of sulphuric acid and in connection with it are Edis Compound, Kleanrite, Nitre Cake, etc. Edis Compound is manufactured in dry cakes which are soluble in water. The temperature of the solution is kept about the same as with acid. Kleanrite is a powdered compound, and is ordinarily used in a solution made up of 1 lb. of Kleanrite to 4 or 5 lb. of water. This solution may be varied to suit the character of the material. Nitre Cake is also used in a similar way. About 1 lb. is used per gal. of water. The substitutes have met with favor in some plants and it is said that they do not emit disagreeable fumes, such as is the case when pickling with sulphuric acid.

The amount of sulphuric acid per ton of steel pickled varies with the character of material and with the chemical analysis of the acid. It ranges from 60 lb. to 200 lb. per ton of steel. Arsenic is very detrimental in sulphuric acid, and if one-tenth of one per cent. is contained in the acid, pickling is hindered to a considerable extent. A great deal more acid

*A paper read before the American Drop Forge Association

[illegible] sulphuric acid and there is a tendency to more acidity in the former [illegible] Hot water, one contains per [illegible] with 66 deg. Baume acid. Considering the low cost of this acid this should be used as fast and for the same cost per ton as with 66 deg.

### Correct Temperatures

The temperature of the sulphuric acid solution should be kept as near the boiling point as possible. In various plants the temperature varies from 75 deg. F. to 212 deg. F. For hand pickling the temperature is generally preferred low on account of the danger of having a hot open acid vat into which workmen may fall. Usually where this method is used ventilation is very poor and laborers cannot work efficiently because of the steam. The temperature of the bath frequently is obtained by connecting a steam pipe to the vats from the low pressure boiler used for heating the office buildings, shop offices, etc. This necessitates long steam lines and the vats usually get what is left when all other requirements are provided for.

The usual practice in plants of ordinary size is to pipe live steam into the acid solution. In this case a great saving can be effected when pickling with a steam-operated machine by piping the exhaust steam through an oil separator into the vats. In some cases, especially in smaller plants, anti-acid coils are used to which steam is admitted, and in this way the solution of acid is not weakened by condensation of steam.

High temperature has a remarkable effect on the efficiency of the chemical action of the acid and it is extremely detrimental to good work, as well as extravagant in acid consumption, to use a lukewarm solution of sulphuric acid. On the other hand, it is claimed that when the bath is kept too hot a large amount of finely divided acid is carried up in the vapor which corrodes the structural steel of the building and, in time, may cause serious trouble.

The temperature of water in the vats is a problem which everyone must work out for himself, being governed entirely by the kind of material to be washed. Certain materials require cold water, while others require it as hot as possible. For instance, enameled ware is immersed in cold water, while sheets in heavy gages are rinsed in very hot water and allowed to dry from the heat thus absorbed. But [illegible] gage sheets must be put through a drying furnace to prevent rusting.

The following table shows the varying amounts of sulphuric acid by volume and the time necessary for successful pickling, together with the method used as a basis for the figures given:

| | | Average Pickling Time in Minutes | Method |
|---|---|---|---|
| [illegible] | [illegible] | 6-10 | Machine |
| [illegible] | [illegible] | 10-20 | Hand |
| [illegible] | [illegible] | 8-12 | Machine |
| [illegible] | [illegible] | 10-20 | Hand |
| [illegible] | [illegible] | 15-30 | Machine |
| [illegible] | [illegible] | 25-50 | Hand |
| [illegible] | [illegible] | 10-15 | Machine |
| [illegible] | [illegible] | 20-25 | Hand |
| [illegible] | [illegible] | 12-15 | Machine |
| Cold rolled steel . | 10-15 | 20-25 | Hard |
| Stamping | [illegible] | [illegible] | Machine |
| [illegible] | [illegible] | 8-10 | 15-18 | Machine |
| [illegible] | [illegible] | 15-20 | 20-30 | Hand |
| Enameled ware .. | 10-15 | 15-20 | Machine |
| [illegible] | [illegible] | 10-15 | 25-8 | Hand |
| Alloy forgings ... | 8-10 | 20-30 | Machine |
| [illegible] | [illegible] | 8-10 | 30-45 | Hand |

After the material is properly pickled it is transferred to the water bath, where the acids and ferrous salts are completely washed off.

### Vat Construction

Vats used for pickling solutions are made of white pine, cypress, California fir, birch, concrete, anti-acid tile brick and other material.

The most preferable material at present is No. 1 white pine, although it is somewhat expensive and difficult to get. When a vat is properly constructed from this material an average life of from two to four years is obtained. There are companies using concrete vats lead lined, wooden vats lead lined, and anti-acid tile brick with success. However, the cost of a vat made in this way is more than that of the ordinary wooden vat, and it is a question whether the added life justifies the extra cost.

A good construction of a wooden vat is to use 6x6's or 6x8's or 8x8's, painted with thick white lead and rabbeted together with copper bolts put down through the center. A false lining on the walls and the bottom of the inside of the vat is made of 1-in. match white pine. Guards made of 2x4's or 2x6's are placed up and down in the vat at different points to protect the lining. This lining is the only part of the vat that must be removed and repaired.

In the use of concrete tanks it is best to lead line them to keep the acid from being continually in contact with the concrete. Also, concrete chips very easily when struck by the crates while handling the material.

### Features of Ventilation

An important factor in the pickling department is proper ventilation of the pickling room. The suggestion usually made is to construct a high building with a ventilator on top containing a double row of windows. This, however, is not the best method. When volumes of vapor rise in winter weather they are met with a strong current of air from the windows above, since cold air rushes into the room instead of allowing the warm vapor to wend its way out.

A well ventilated pickling room, not over 15 ft. high, has a single row of windows on one side of the building, slightly higher than the top of the vats. A small fan placed in the window opposite each acid vat induces a continuous volume of vapor and acid fumes, coming directly from the surface of the acid vat, to pass through it. Thus practically no vapors or fumes are left in the pickling room. The temperature of the room is about 60 deg. Fahr. and it is important to keep it at least this high. It is customary in many plants to provide little heat to the pickling room and in winter workmen are forced to grope about amid clouds of vapor at almost a freezing temperature.

Another excellent method of ventilation is to take in cold air through a series of hot steam pipes and then force it up into a large horizontal pipe which runs along the pickling room about 15 ft. above floor level. In this horizontal pipe are several down comers, through which the hot air passes. The temperature is maintained at from 60 deg. to 70 deg. to prevent the formation of vapor. The fumes are forced up by the warm air and pass out of the building through a single row of windaws at the top. Another system forces air up through pipes placed near the floor level at an agle of about 45 deg. on the opposite side of the room from the vats. By this method, not only is the room heated in winter and cooled in summer, but the rising fumes are caught, taken up by the blast of air and carried out of the ventilator.

When a pickling department must be laid out in a large building containing machinery, a very good method is to build semi-circular brick walls around the vats, which tend to carry the fumes up 20 or 30 ft. A fan placed in a ventilator above will conduct them out with comparatively little damage.

### Pickling Versus Sand Blasting

In the drop forge industry, pickling, tumbling and sand blasting are the three principal methods used in the cleaning department. Pickling is preferable if the acids and salts are thoroughly washed from the surfaces of the forgings.

Information received from one of the largest companies in the country shows there is no favorable comparison between pickling and sand blasting. In the former method all surfaces are cleaned thoroughly from oxides or foreign substances which are detrimental to the machining operation, while in the method of tumbling and sand blasting, small forgings, tumbling together, hammer fine sand into their surfaces. The resulting cost of machining is 300 to 400 per cent. more than that of pickled forgings. Furthermore, drop forgings containing small bores or indentations are not cleaned properly by sand blasting. The same authorities claim that all companies in the drop forging business eventually would pickle their product, as the additional cost is more than offset in machining.

In this connection the reclamation of waste acids for the manufacture of copperas is important. In one instance a company allowed waste acid to flow down the river for years and later reclaimed it with a net profit of $60 per day. Comparatively few companies are doing this at present and these only experimentally. Within the next decade this by-product will be generally made throughout the country.

## FUEL RESEARCH IN BRITAIN—I.

FOR some time the Department of Scientific and Industrial Research has been conducting an investigation through its Fuel Research Board into the coal situation in Great Britain. They had in view two main lines of research:—(1) A survey and classification of the coal seams in the various mining districts by means of chemical and physical tests in the laboratory, and (2) an investigation of

the practical problems which must be solved if any large proportion of the raw coal at present burned in its natural state is to be replaced by the various forms of fuel obtainable from coal by processes of carbonization and gasification.

The first report to be published by the board was made public recently. It is signed by Sir George Beilby, Director of Fuel Research, and describes the scheme of work which has been adopted and the plans which have been drawn up for the establishment of a fuel research station on an industrial scale at East Greenwich. At one time it was thought that the first line of inquiry could be proceeded with in advance of the second, but further consideration has shown them to be so interdependent that they can be most satisfactorily dealt with side by side. However, in preparation for the organization of the first line of inquiry, an experimental study of standard methods for the examination of coal in the laboratory has been made, and as the result of work carried out for the board in the Fuel Laboratory of the Imperial College of Science a test has been elaborated which, by direct weighing and measurement, gives the yields of gas, oil, water, and carbonaceous residue that result from carbonization at any definite temperature.

As regards the collection and registration of samples from different coal-mining districts the representatives of the coal owners have shown every disposition to co-operate; but it is not proposed to start any extensive organization for this purpose until the preparations for the second line of inquiry are further advanced, since the accumulation of large numbers of samples would serve no useful purpose at present and would be decidedly inconvenient.

### Problems of Carbonization

Various influences during the last eight or ten years have led up to the second line of inquiry, including demands for cheaper and more ample supplies of electrical energy, for home supplies of fuel oil for the navy and of motor spirit for the transport and air services, and for smokeless domestic fuel. The only development that would satisfy all these needs simultaneously would be the replacement of a large proportion of the raw coal which is at present burned in boilers, furnaces, and domestic fires by manufactured fuels prepared from raw coal by submitting it to distillation. A certain amount of knowledge and experience is in the possession of experts, who might be able with its aid to organize and direct schemes for replacing raw coal by manufactured fuel in certain directions and on a fairly large scale, but no really comprehensive scheme can be formulated until certain perfectly definite problems in coal distillation have been solved.

The gas retort and the coke oven have become highly developed appliances for the carbonization of coal at temperatures ranging from 900 to 1,200 deg. C.; accordingly, for such high temperature methods of carbonization a great amount of experience is available, and trustworthy data on which to base the calculation of the economic possibilities are in existence. But for the carbonization at lower temperatures there is no corresponding body of experience, and very few properly accredited data are available; for, although the low temperature distillation of oil shales for the production of mineral oils, paraffin wax, and ammonia is a highly developed industry, the oil shales are totally unlike coal in their nature and the products they yield, and experience gained in that industry is only indirectly useful so far as coal is concerned. Of the experience gained in low temperature carbonization of coal by individual inventors and syndicates only portions have been disclosed, but enough is known to justify the conclusion that much still remains to be done in devising the special forms of apparatus required for carrying out this type of carbonization. The way is obviously open for a serious attempt to determine whether economical and efficient apparatus can be devised for this purpose, and whether, by using properly selected coals in such apparatus, products will be obtained of a collective value greater than that of the original coal plus the cost of carbonization and handling.

### Questions to be Answered

The solution of these fundamental problems will supply a new base from which to attack such questions as the following:—

(1) Can the 35 to 40 million tons of raw coal used every year for domestic heating be replaced wholly or partially by smokeless fuel, solid or gaseous, prepared by the carbonization of this coal?

(2) Can adequate supplies of fuel oil for the navy be obtained by carbonizing the coal at present used in its raw form for industrial and domestic purposes?

(3) Can supplies of town gas be obtained more economically and conveniently by methods of carbonization and gasification other than those now used in gas works?

(4) Can electric power be obtained more cheaply if the coal used for steam raising is first subjected to processes of carbonization and gasification?

(5) Will the more scientific development of the preparation and use of fuel, which would be implied in the successful working out of the foregoing questions, enable the peat deposits of the United Kingdom to take a serious place as economic sources of fuel for industrial purposes?

(6) Can the use of gaseous fuel in industrial operations be forwarded by the development of more scientific methods of combustion in the furnaces, muffles, and ovens used in metallurgical, ceramic, and chemical operations?

Answers to these questions, the report points out, will be obtained only by coordinated research carried out on the lines of a broad and well-considered scheme; but at the same time the Fuel Research Board think it is to be expected that solutions of some of the problems will be supplied by workers in the industries, and they would regard it as a great misfortune were the establishment of a Government organization for fuel research to result in discouraging or in any way limiting the activities of outside workers or organizations.

### Disposal of Products

Even if an efficient method of low temperature carbonization is evolved it will be valueless in the wider sense unless profitable outlets for all the important products can be developed; and the Fuel Research Board, being in official touch with the Admiralty, the Ministry of Munitions, the Board of Trade, and other public departments, is exceptionally well placed for the furtherance of schemes that entail the finding of large outlets for products new and old. For instance, since the Admiralty attach great importance to the development of supplies of fuel oil from home sources, this requirement alone would absorb all the oil which could be produced by the carbonization of tens of millions of tons per annum. This fact alone gives an entirely new aspect to the extension of carbonization in hitherto untried directions, but while it will undoubtedly help on the economic side of the problem, it does not relieve the pressure on the technical side. In a way, moreover, it accentuates the problem of the profitable disposal of the coke which is left when the volatile products have been distilled off the coal. On the average it may be taken that each ton of coal carbonized will give 15 cwt. of coke; hence from the 20 million tons of coal which would have to be carbonized in order to obtain one million tons of fuel oil for the navy 15 million tons of coke would be produced.

The disposal of this large quantity of coke at a profitable price must be regarded as the vital question if low temperature carbonization is to be established on a sound economic basis. The research scheme must, therefore, include a very complete inquiry on the use and value of this coke for the direct firing of steam boilers, its gasification in producers for the manufacture of low-grade fuel gas and the recovery of its nitrogen as ammonia, and its use for industrial and domestic heating, either directly as it comes from the retorts or after conversion into briquettes. The second of these inquiries will involve the development of a special form of gas producer and auxiliary plant if the best results are to be obtained, and also of a system of boiler firing in which fuel gas of low calorific value can be burned at least as efficiently as coal, both as regards thermal efficiency and the effective evaporation per square foot of heating surface.

The use of the lower grade of fuel gas, though successfully carried out in certain directions, is very imperfectly understood in the majority of industries in which gas might be used for heating and power purposes, and here there is scope for much useful work, both in research and in the education of experts and consumers. Again, though the use of town gas as a fuel for industrial purposes has made great strides during the past few years, actual practice still lags a long way behind the ideals of economy and efficiency.

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## MULTI-MACHINE OPERATION

TEN or fifteen years ago extensive controversy existed respecting the ability, possibility or advisability of one workman operating more than one machine. By this method it was proposed—often successfully—to reduce the labor cost of manufacturing. It was, however, the cause of considerable contention and lengthy discussion, particularly on the part of organized labor, this dissension seldom affording a fair trial for the two-machine-per-man idea. It is therefore interesting to note the change that has come about between then and the present time, where, with the exception of automatic and semi-automatic machines, the manipulation of metal working tools is invariably limited to one machine to each operator. This condition has resulted more from the development and improvement of the equipment and the cutting tools rather than the failure of the system and its possibilities. Under the former labor-saving idea it was practicable to so arrange two or more machines (millers, planers, lathes, etc.), that the workman could conveniently and economically operate such tools to good advantage, having complete control of the mechanism by merely turning around, or taking a few steps.

The factor that has been largely responsible for the gradual elimination of the multi-machine practice is the development of high speed cutting steel, supplemented by the corresponding evolution and improvement in machine tools to meet the requirements demanded by the heavier cuts and feeds that are possible by the use of modern high speed steel. It is not that the tool steel or machine tool evolution is the actual cause of the change noted, but the relation that these factors have to the cycle of operations. The achievement of high speed steel has altered the ratio between the setting-up and actual cutting times, the former in a great number of instances being the same as always, while the latter has been reduced to the minimum. In former days it was possible to utilize the time occupied in taking a cut over the work in setting-up a similar job in another machine, the setting-up occupying about the same period as the machining of the work. The heavier feeds and greater speeds of recent years have enabled the actual cutting of the metal to be performed in much shorter time, so that it is now seldom possible for an operator to leave the work long enough to set up a job on another machine. With the constant advancement in the design of machine tools—other than those of the automatic variety—and the corresponding development of cutting tools, the future possibilities of multi-machine operation are small.

## CONSERVATION OF FUEL

PROMINENT among the many problems with which manufacturers have to contend at the present time, under the stress of economic production, is that of the conservation of fuel owing to the failing of the immediate supply available for industrial and domestic purposes. Existing conditions make it almost imperative that every possible means be adopted to avoid unnecessary consumption or waste of fuel. Measures may be taken, however, to minimize the use of coal to the detriment of other vital and equally important factors of shop or factory operation. Under present circumstances, with a very evident scarcity of fuel, manufacturers may be tempted to forego the heating of their plants during the idle period over the week-end and a corresponding reduction each night. It may seem ridiculous to maintain a fairly warm temperature in a shop from which the workmen are absent for a period of from 24 to 36 hours. While the fuel saving from such a practice would undoubtedly be of considerable importance, it might be well to give more than passing attention to the possible consequences incidental to the unavoidable fluctuation of working temperature.

In many factories or workshops the heating is accomplished by the circulation of the exhaust steam from the engine; in others, the system may be supplied from the live steam from the boilers, or by means of forced hot water or hot air circulation. In any case it is often found that the closing hour is not only a signal to the workmen to knock off, but may also indicate the closing—in whole or in part—of the valves that control the passage of the heating medium from the source to the different "unoccupied" portions of the plant. It is, however, considered advisable, particularly in very cold weather, to always permit sufficient steam or hot water to pass through the pipes to prevent the possibility of freezing. This invariably eliminates piping troubles but creates other contingencies having vital bearing, although seemingly unimportant relation, on the output of the shop.

Early on Monday morning—sometimes after the men have started work—steam is forced through the heating system to warm up the shop, and after a period ranging from ten minutes to perhaps a couple of hours the atmosphere is quite comfortable; but what of the equipment? Metal machinery, especially of a bulky character scattered about a spacious shop, will seldom attain a very high temperature, even in summer weather, unless subjected to the heat of an adjoining furnace or other radiating unit. When the workmen leave a factory and the heat is partly or entirely shut off the proportionately large volume of metal rapidly absorbs the heat from the atmosphere, and then continues to fall until the return of the men in the morning, when the machines are like so many blocks of ice. This order of things is not conducive to an early start, as the men seldom show any great desire to freely handle the cold equipment.

Apart from the evident inconvenience to the operators, the fact that unavoidable delay may be necessary in getting a machine into action, a cold shop is a thing to be avoided. Where accuracy is a feature of the work, and rigid inspection is adopted, it is essential that extreme variations in shop temperature be avoided as far as possible. Under these conditions normal temperature is a very important and necessary factor. Even confining the question to the actual saving of fuel, the result may be open to discussion, owing to the additional initial firing that is necessary to disseminate sufficient heat to meet the shop requirements.

# INDUSTRIAL NOTABILITIES

# Traffic Congestion and Severe Weather Reduce Production

*Weather Conditions Intensify Difficulties Due to Railroad Congestion—Iron and Steel Situation Continues—Prices Are Firm With Unsettled Outlook*

TRADE has been demoralized by the severe weather which tied the railways up and rendered the movement of freight almost impossible for two or three days. The most serious aspect of the situation is the shortage of coal and coke which is worse owing to the delay in moving cars from the border. Industrial activity is being hampered by the scarcity of coal and little relief may be looked for until the weather moderates for a long enough period to permit sufficient coal to be transported. The steel plants have suffered severely by the stormy weather which has not only made operating conditions very difficult but has also prevented the shipment of coke and other raw materials to the mills, so urgently required. No further announcement has been made in regard to the Dominion Government's contemplated action in regard to increasing the production of iron and steel. Plans are doubtless being prepared and some definite announcement will likely be made in the near future. In the meantime the shortage of iron and steel is becoming more acute, with little prospect of immediate relief. Steel prices generally are holding firm, although Canada plates and galvanized sheets have declined. Pig-iron prices are firm and unchanged but the outlook in the market is unsettled owing to the coke situation. In the non-ferrous metal markets lead has advanced following a strong situation for some weeks. The fixed prices of copper have been extended for an indefinite period. Tin continues in short supply and prices are entirely nominal. Solders have advanced. Prices of machine shop supplies are firm and some advances have been made affecting coal oil, fuel oil, castor oil and cotton waste. The machine tool business is more active, the demand being mostly for equipment for shell production.

MONTREAL, Que., Jan. 14, 1918.—Industries generally have been hard hit during the past week by the extreme stormy weather that has been prevailing and still continues throughout a large area of Canada and the United States. Railroads are unable to cope with the situation, and traffic is practically suspended in various sections, and in consequence business has been very much demoralized by the non-delivery of much needed materials, which in many instances has necessitated the closing down of plants until these conditions are relieved. Many factories in this district have been badly hit by recent storms, and have had to curtail production in order to conserve their already declining supply of fuel, a condition that may be further emphasized in the very near future. An encouraging note is sounded in the attitude of the Canadian Government towards the increasing difficulty that is apparent in the steel situation, and steps have been taken to investigate the possibilities of increasing the present available supply of steel, particularly ship plates, by construction of additional facilities for the manufacture of this and other essential steel products.

### Pig Iron

In common with all other industries the pig iron furnaces are suffering through the inability to obtain sufficient fuel and other raw materials to operate at capacity, with the inevitable result that banking of furnaces has been necessary, consequently curtailing the output. This condition is general both here and in the States, the severe weather making it almost impossible to get shipment over the railroads that have been affected by prevailing storms. Negotiations are now in progress between the Canadian and American Governments in an effort to get additional pig iron into Canada to relieve the situation that threatens to become very acute. Canadian producers are virtually out of the market and little local iron is available; dealers here are not quoting, as the market is a nominal one.

### Steel

It has been practically settled that no immediate or early revision will be made in the prices now ruling in the primary markets. While many have looked for some further action on the part of the American Government in this connection, the consensus of opinion appears to be that the production and sale of steel products are now carried on under a basis satisfactory to all. Manufacturing conditions have recently been handicapped owing to the continued unfavorable weather that has been prevailing throughout those sections of the country where the greater portion of the steel trade is carried on. Railroads in general are fighting the heavy snowstorms and transportation facilities are insufficient to cope with the difficulties of the situation, with the result that much needed materials are delayed in transit, and consequently creating serious conditions in many industries. The situation in the States has become increasingly acute owing to the utter impossibility of obtaining delivery of necessary supplies; many furnaces have been banked, and mills have been forced to close down temporarily until milder weather releases the freight that is tied up in all sections of the country. Recent storms have materially increased the congestion that has been more or less pronounced for many weeks. A notable feature at present is the crowded condition of many of the Eastern seaports owing to the inability to obtain ample cargo capacity for the export of materials. Everything possible is being done to conserve the available supply of coal so that essential industries will not be seriously affected.

The Canadian situation is virtually a counterpart of that prevailing in the States, as manufacturers here are dependent upon American mills for the bulk of their material; with very few exceptions all imports of iron and steel products must be made under license, and practically no non-essential material is obtainable under any circumstances. Weather conditions have added to the difficulties of the situation here, as the recent heavy storms in the great lakes territory have greatly demoralized railroad and industrial business, with the result that the situation now is more acute than ever before. While consideration is being given by the Canadian Government, with a view of relieving the iron and steel scarcity here, particularly in connection with the ship plate situation, any action in this connection would necessarily require some time, so that the immediate future offers little improvement over prevailing conditions. Dealers here report little or no change, and price quotations are nominally unchanged but firm at figures previously quoted.

### High-Speed Steel

Business of considerable volume is still being done in high-speed steels, and the difficulty appears to be to get sufficient of the better grades to supply the demand. The importance of this branch of the steel industry is reflected in the announcement of one local dealer, who has orders on his books for thousands of dollars' worth of high-speed steel at a price of $2.40 per lb., but is unable to fill them owing to the impossibility of getting permits to ship the same from the English works. This firm, or rather the Canadian agency, are able to secure steel of a lower grade from American manufacturers, but which is not suitable for the same purposes as the high-speed steel. The general demand for high-speed steel continues to be of an encouraging character, the price ranging from $2 to $2.50 per lb.

### Metals

With the exception of tin, the metal market is featureless owing to the unsettled condition that seems to prevail regarding the possible action of the Am-

erican Government in reference to further price fixing. Weather conditions have materially affected the delivery of metal to many points, but supplies in stock have invariably been sufficient to carry over any temporary difficulty like that of the past week or so. Copper continues firm at regulation prices. Tin has again become the centre of interest following the sharp return of strength on the London market, which has created a nervous condition on this side. Spelter is quiet and unchanged. Lead is unsettled, but relatively firm. Antimony remains quiet, with quotations firm. Aluminum is unchanged, but stronger in tone.

**Copper.**—Satisfactory conditions appear to prevail throughout the copper markets and the supply seems to be sufficient to cover the requirements of all those consumers that are engaged on essential war work. Some fears have been expressed that production may necessarily have to be curtailed owing to the great difficulty that now exists in maintaining the regular delivery of materials necessary for the continuous operation of the refineries. So far, however, no serious effect has been apparent, and it is hoped that relief in this direction will be given before conditions become acute. Jobbers continue to do a good business on the concession granted for the disposal of small lots of metal. The general situation is harmonious in character, and little is now heard of further revision of the regulation price. Dealers here report an active market, with quotations firm at 32c and 33c per lb.

**Tin.**—With the London market reacting again to higher position the tendency has been to resume the nervousness experienced before the British decline. With the sharp falling off noted last week in London the tone of the New York market was decidedly easier although few sales were recorded at prices below the nominal figure of about 85 cents per lb. Nothing definite has been given out as to the actual cause for the sudden reaction but it is thought that certain regulations in connection with the permit problem is primarily responsible. Owing to the marked shortage of Straits tin considerable business has been done in Chinese and Banca. The New York market is very unsettled and nothing reliable can be obtained as to the future of this metal. Under the present difficulty that surrounds ocean transportation the market on this side will continue very strong. Local dealers report a good demand and a return to last week's quotation of 77 cents per lb., an advance over the recent price of one cent per lb.

**Spelter.**—Nothing of interest to report and the market is comparatively quiet, more so than a week ago. Business is dull in New York and the market is inclined to be weaker. The situation here is practically unchanged but price quotations are fairly well maintained; dealers are asking 10½ cents per lb.

**Lead.**—The recent strength that was announced on the New York market was more for the purpose of making the situation more uniform than actual strength of general conditions. An unseen and equally unexplainable conflict appears to characterize the transactions in lead and under such conditions the market is more or less unsettled and will continue so unless the Government takes steps to put this metal on a basis with others now under certain regulations. The American market is firm at last week's quotation; the situation here is unchanged but showing an easier tendency; prices are unsteady at 9¾ cents per lb.

**Antimony.**—Some little interest has been shown on the American market over the announcement of considerable buying on the part of the Government but it has failed to develop any strength that would be reflected in the price quoted on the open market. On the contrary, the situation has a tone of weakness with the market slightly lower. The local market is quiet with quotations unchanged at 18 cents per lb.

**Aluminum.**—This metal is in steady demand and the market appears to be developing strength but the local quotation of 60 cents per lb. is firm and unchanged.

**CANADIAN GOVERNMENT PURCHASING COMMISSION**

**The following gentlemen constitute the War Purchasing Commission appointed by the Canadian Government: Hormidas Laporte, Montreal, chairman; George F. Galt, Winnipeg; William P. Gundy, Toronto. Thomas Hillier is secretary, and the Commission headquarters are at Ottawa.**

### Machine Tools and Supplies

While the local machine tool business is still comparatively quiet the activity in general equipment has shown a little improvement; these inquiries and sales have been more for shapers, millers and drilles than for lathes. One local dealer, however, reports that he has had several inquiries for machinery suitable for shell making, both for the six inch and the smaller sizes; it might be mentioned that these prospective purchasers are trying to obtain second-hand tools that are in fairly good condition and that can be obtained at a reasonable price. The continued demand for all class of equipment in the States makes it very difficult for Canadian dealers or users to obtain delivery of machinery under six to eight months, unless such tools are not in general demand. Canadian tool builders are quite active and are taking up new lines of needed machinery.

### Scrap

The situation in respect to old materials in the States has shown some improvement following the action of the Government in permitting the dealers to charge a commission of 3½ per cent. This has resulted in making the situation more settled as consumers are relieved from the anxiety of locating supplies and securing cars in which to transport the material from the source to the destination. Recent weather conditions have prevented the free delivery of scrap in many portions of the country, but locally the market has not been greatly effected as available stocks have been ample to satisfy the immediate demand. The market here is dull and business is light; machine cast iron and wrought iron pipe are both stronger, an advance of $2 per ton being noted in each case, the respective quotations being $27 and $17 per ton. Stove plate is easier by $2, the price asked here being $17 per ton.

## Toronto

TORONTO, Ont., Jan. 15.—The worst storm in years which passed over this district paralyzed the railways and as a result many factories and all steel plants have suffered much inconvenience. The shortage of fuel is particularly serious and many factories in this province are running on short time or closed down. It will be some time before the operating schedules on the railways can be restored to normal and in the meantime many industries will suffer.

### Steel

The volume of orders for iron and steel products is showing some improvement after the quiet period around the holidays but trade has been badly dislocated by the storm. For some days it was almost impossible to move any freight which aggravated the already acute situation in regard to the supplies of fuel. Work at the mills has also been hampered by the severe weather and the output will be curtailed as a result. There has been no further development in regard to the government proposals to increase the production of steel but it is understood that investigations are being made and plans prepared for some definite action on the part of the authorities at Ottawa. In due time some announcement will doubtless be made stating what the government propose doing. In the meantime all the available supplies of steel are going into consumption and the best is being made of a difficult situation. The tentative announcement issued in the first instance indicates a very ambitious scheme which will be difficult to accomplish. It is possible to increase the production of steel without much delay but the installation of rail mills and plate mills is a different proposition owing to the heavy cost and length of time that would elapse before the necessary equipment could be constructed and installed. The first thing that should be done is to ensure that the steel plants are provided with full supplies of raw materials, so that production may be kept up near the maximum [illegible] possible. Until this can be attained it is not [illegible] are enlarging steel plants for the new plants could not be operated

Canada plates and galvanized sheets, and discounts, but the result of the change does not show much material difference in the net prices prevailing previously. A readjustment has been over the previous list is an increase of $1 on ⅛ inch standard buttweld black, and an increase of $1.50 in galvanized standard buttweld of same size. Black ¼ inch and 2 8 inch standard buttweld have been reduced 2c per 100 feet, while the galvanized on same sizes has been advanced 7c per 100 feet. In regard to prices the market is very steady and will likely remain so for some considerable time in view of the ever increasing demand for steel which is tending to keep prices up. The situation in the United States in regard to supplies of steel has become more acute which will further tend to keep prices from declining. Across the line the exceptionally severe weather has tied up the railroads and prevented the shipment of raw materials urgently needed at the mills with the result that operations have been seriously curtailed and the trade demoralized. The unfilled orders on the books of the U.S. Steel Corporation on Dec. 21 amounted to 9,381,718 tons, an increase of 484,616 tons compared with the orders on Nov. 30. This is the first time that the monthly figures have shown an increase since April, 1917, when they were 12,183,083 tons, the cor-

### Pig Iron

Operating conditions at the furnaces have been most unfavorable this week on account of the severe weather and production has been seriously curtailed as a result. It has been almost impossible to bring coke in from the States and the shortage of fuel is more acute because of this. The Dominion Government has been urged by consumers to help in relieving the coke situation but in view of conditions in the States it is difficult to see what can be done. More furnaces have been banked in the States and others have gone out of blast. As an instance of this, only nine of the U.S. Steel Corporation's furnaces in the Chicago district are in operation out of 29. Conditions are about as bad in the Pittsburgh district.

### Scrap

The old material market continues dull and featureless and like every other industry has been affected by the tie up on the railways. Prices of scrap steel

tically all old materials are light, partly due to scarcity and also to the dealers' desire not to carry too heavy stocks on account of the unsettled state of mar-

### Machine Tools

business in the machine tool trade has brightened up a bit and the outlook is more promising. A number of shell plants have been buying equipment to balance up and to increase production. It is understood that the Imperial Munitions Board contemplate an expenditure of approximately $30,000,000 per month for several months which is about the same rate of expenditure that has prevailed during the last three or four months. Generally speaking the firms have had repeat orders but have not had the size of the orders increased. There are of course exceptions to this rule. One local firm is preparing to largely increase its production. The Dominion Shipbuilding Co., a new concern, is preparing plans for a five berth shipyard here. Considerable equipment will be required when the shops have been built. The Toronto Harbor Commission is interested in the construction of the plant. It is understood that contract for the buildings will be let shortly.

### Supplies

Business continued good and prices on a number of lines of machine shop supplies have advanced. A new price list for cotton waste has been issued showing an advance ranging from ½c to 1c per pound according to grades. Some lines are unchanged. An advance of 1c a gallon has been made in coal oil, Royalite being now quoted at 17c and Palacine 20c per gallon in bulk. Fuel oil is also up 1c and is now 13½c per gallon. Castor oil is now quoted at 52c, being an advance of 2c per lb. Cordage prices are very firm and an advance is expected in some lines on account of the situation in the raw material markets.

### Metals

An advance in the price of lead, extension of copper prices and more acute scarcity of tin are the principal features to note this week in the non-ferrous metal markets. The lead market has been gaining strength for some weeks which resulted in an advance in the primary market last week followed by an advance locally this week. The shortage of tin has become a serious matter for manufacturers who in many cases have been obliged to curtail production on account of their inability to obtain tin. There is no sign of improvement in the situation. News comes from Washington that the established prices of copper have been extended for an indefinite period. The announcement has had no effect on the market as it had been fully expected. Prices of solders have advanced owing to the high cost of tin and lead. Prices of the other metals are unchanged and quiet.

**Copper.**—It is understood that the established price of copper will be continued at 23½c New York for some time to come. While it was thought in some quarters that the arrangement between the Government and producers would continue until April 1, the more general conception of the program was that no definite time limit exists. The news did not occasion any surprise, as it had been forecast for more than a fortnight. The position of the copper market is unaffected by the news, and continues its routine course. Locally, lake and electrolytic copper are quoted at 32c and castings at 31c per pound.

**Tin.**—The tin situation has become more serious owing to the depletion of spot supplies and uncertainty in regard to futures. All tin afloat has already been sold and will at once pass into consumption upon arrival. Unless relief comes soon, some consumers will have to close down their factories, some having already had to curtail production. Prices are entirely nominal at 80c per pound.

**Lead.**—The lead situation continued strong and as a result the price has advanced ½c per pound. U.S. Government lead requirements are heavy but no information is being given out in regard to the purchases, and as a result there is some uncertainty in the market, although the undertone is firm. Lead is now quoted at 9c per pound.

**Spelter.**— The market continues quiet and more or less neglected, but producers are not anxious to make further concessions. Spelter is quoted locally at 10½c per pound.

**Antimony.**—The market is easy and prices are unchanged. The demand is light and supply sufficient for all requirements. Local price 18c per pound.

**Aluminum.**—The market is quiet and situation unchanged. Local price 62c per pound.

**Solders.**—Prices of solders have advanced in line with the high cost of tin and lead. Guaranteed is now quoted at 43c and strictly at 39c per pound.

## Sydney

SYDNEY, N.S., Jan. 11.—In the matter of the wage dispute between the Dominion Coal Company and the Amalgamated Mine Workers of Nova Scotia, upon the settlement of which dispute there admittedly hangs an adjustment of wage rates at all other Nova Scotian collieries, the Minister of Labor has despatched Senator Robertson and Mr. J. C. Watters as a Committee of Enquiry, and at the time of writing these gentlemen are in consultation with the leaders of the Amalgamated Mine Workers and expect to meet the representatives of the Dominion Coal Company. There appears to be some possibility of a compromise, and a Board of Conciliation may not be required.

### Company's Contention

The contention of the Dominion Coal Company is that there exists between itself and its workmen a wage contract which does not expire until the end of 1918. The company admits the necessity for an equitable adjustment of wage rates to meet the increase in the cost of living since the last adjustment in

May, 1917, and is of the opinion that the Commission which made the last-named adjustment should again be convened to review their previous findings. The Amalgamated Mine Workers for some reason do not apparently favor the reconvening of the previous commission, and have asked for a Conciliation Board. The visit of Messrs. Robertson and Watters is preliminary to the decision of the Minister of Labor as to the form of tribunal that is necessary to adjust the differences that exist. The increase which the Dominion Coal Company offered has gone into effect from the 1st of January, irrespective of the fact that no actual settlement has yet been agreed upon.

Production was badly affected by the snowstorms in Cape Breton at the New Year. For a week the Glace Bay Collieries of the Dominion Coal Company were idle or partially idle through the paralysing of transportation. The Inverness Collieries were similarly affected. The heavy snowfall was followed by heavy rains which caused numerous freshets and washouts, but had the favorable effect of clearing the railway lines more quickly than had appeared possible.

### Increased Production Impossible

It is stated the Fuel Controller intends to send a committee to Cape Breton to investigate the possibility of materially increasing the coal production. There is nothing that such a committee can do. A year ago much was possible, but the representations of the coal operators were not heeded. The fall of the Nova Scotia coal industry is to-day like that of Humpty Dumpty. Not all the King's horses nor all the King's men, nor all the Fuel Controllers in the world—and there seem to be quite a few—can restore the coal production of Nova Scotia during the further duration of the war. More than that, it is very doubtful if any action that the Government can take will even maintain present rates of production. Further diminution of coal production in Nova Scotia extending over a long period of future time is inevitable as sunrise.

## New York

NEW YORK, Jan. 12.—Conditions in the iron industry are deplorable. Fuel shortage, traffic congestion and railroad embargoes have caused demoralization at producing centers. Since Jan. 1, the industry as a whole has been operating scarcely more than 70 per cent. of capacity. In Eastern Pennsylvania eleven blast furnaces have blown out and six others are banked because of an inadequate supply of coke. Current production is scarcely 50 per cent. of capacity and productive costs at some furnaces have risen 20 per cent. above the selling price fixed by the Government. At Youngstown, Ohio, pig iron output is scarcely 50 per cent. of capacity and merchant furnaces in other sections are operating about 60 per cent. At steel plants, operation of blast furnaces is intermittent and as practically no supplies of pig metal are available in the open market the output of steel has been cut sharply. Even the U.S. Steel Corp. on some days has been operating only 60 per cent. of ingot capacity but improvement in the Pittsburg district is reported although there is still much irregularity at various subsidiary plants. The National Tube Co. last month operated only about 50 per cent. of capacity The corporation as a whole operated close to 80 per cent. of capacity in December, according to reports received on the 10th when the December statement was issued showing that shipments have been about 500,000 tons less than the new orders booked.

### Rolled Steel Demands

Buying of rolled steel products, thus far in 1918, has been confined almost entirely to Government orders placed on behalf of the Allies as well as to supply the needs of the United States army and navy. A most interesting development was the notification of the Government to the steel companies having bar mills capable of rolling sizes required in the manufacture of projectiles that almost their entire capacity will be needed for war purposes during the first half of this year. This is equivalent to stating that the mills will be required to roll 3,000,000 tons of shell bars by July 1. As half of this tonnage has already been ordered for the United States Government it is evident that 1,500,000 tons are required for export to Great Britain, France and Italy.

In the Central West, numerous additional orders have been placed for six and nine inch shells and other similar contracts are dependent upon manufacturers being able to secure the necessary shop equipment. The machinery industry at Cleveland, Chicago and Cincinnati, has taken orders for turret lathes and other tools for the manufacture of war munitions. Three manufacturers in Indiana, and two in Wisconsin have been awarded contracts for fuse parts and the tools needed have been purchased in the Chicago district.

### Record Crane Contract

Less business has been done in the Metropolitan district possibly because of delayed mails as many inquiries are coming by wire and a fair volume of business is being transacted. The Ordnance Department has placed a contract for hydraulic jacks for 9.5-inch guns with the Watson-Stillman Co. and the latter has purchased $100,000 worth of machine tools. There are also large inquiries in the market for lathes while the machinery division of the War Industries Board is asking Cleveland manufacturers for bids on 165 sixteen to twenty-four in. turret lathes to be shipped by April 1.

An official contract has been finally awarded to the McMyler-Interstate Co. by the Navy Dep't. for a 350 ton fitting-out crane to be installed at the Brooklyn navy yard. This will be the largest crane of this type ever built and the contract price is close to $800,000. The department is negotiating for two cranes of the same type for other navy yards. Following the placing of the contract for 8,000 tons of structural steel for the Government nitrate plant at Mussel Shoals, Ala., the Air Nitrates Corporation of N.Y., on behalf of the Government, has received bids on 15 cranes for this plant.

## Pittsburgh

PITTSBURGH, Pa., Jan. 12.—During the past ten days the Pennsylvania, Baltimore & Ohio and New York Central lines have declared more or less complete embargoes, refusing to accept freight for many points, excepting Government material, blast furnace raw material and perishable freight.

These embargoes almost completely prevent the Pittsburgh district from shipping its product, while the Youngstown district has only the Erie road to depend on, and it is partly embargoed. No statement is vouchsafed in railroad circles as to how long the embargoes will be kept on. They are strictly an emergency measure, calculated to relieve congestion, and are not directly an outcome of the Government having taken over the roads.

### Embargoes Affect Steel Mills

The steel mills cannot stock their product for any length of time, and within a week, if the embargoes continue, some curtailment of operations at finishing plants will be forced. Hitherto the iron and steel industry has felt results from the insufficiency of transportation facilities only in respect to receipts of coke and coal. The restriction in coke movement was such that pig iron production in the country dropped from a rate of 39,400,000 tons a year in November to a rate of 34,300,000 tons in December. The loss in production was chiefly in the Pittsburgh, Youngstown and lake front districts, which depend largely upon Connellsville coke, and the restriction in these districts has at times been as high

Strenuous efforts have been made along individual lines to improve conditions. Blast furnaces have employed many experts to work in the Connellsville region, routing shipments and frequently following them through to furnaces, also in discovering coke stalled en route and getting it started moving again. The railroads, by means of embargoes and otherwise, have sought to relieve the general congestion.

In this and other work that has been done there has been no co-ordination. Each interest has striven merely to improve conditions with respect to its own

over the railroads, at the close of December, there does not seem to be any comprehensive plan under consideration for utilizing the facilities of the railroads for various services in the order of their

doubt being done intelligently, is to relieve the congestion in general, whereby

[There will be a free movement of freight ... general.]

**Maximum Production Desirable**

The practical point is that full production by the iron and steel industry would pave the way for lower selling prices, if indeed it would not produce lower prices naturally by the operation of the law of supply and demand. Washington, it is well known, desires lower prices, the set prices now in force being the result of a voluntary agreement between the War Industries Board and the producers, Sept. 21, 1917, and being regarded as temporary. Originally they were set to run to the end of the year and when, late in December, it was decreed they were to continue to March 31 next, the postponement of revision was regarded as a necessity arising out of the circumstances and not as a particularly desirable thing in itself. With co-ordination between those in Washington who desire to see lower prices for iron and steel and the railroad system the way could be cleared for lower prices. Production costs would decrease and there would be more material to sell.

At the present time the whole situation as to production, prices and consumption is an extremely confusing one. Some plants are running full, some are running at restricted rates, and some are closed entirely, while there are changes from day to day.

**Steel Corporation Activities**

As to prices, the set prices govern, in nearly all instances, when there are transactions, but to all appearances the market is stagnant. Producers do not report making any sales to speak of, except to observe that they are receiving Government orders, and details of these are witheld, according to Washington's request months ago. This week, however, has come the puzzling fact of the United States Steel Corporation reporting an increase of 484,612 tons during December in its unfilled obligations. During the seven months preceding the Corporation had been reporting decreases, averaging nearly 500,000 tons a month. Shipments in December were curtailed by only 100,000 or 200,000 tons a month, and where the heavy bookings indicated came from is a mystery. Possibly the Corporation sprang a [illegible] and quietly booked some large tonnages with industrial consumers. If so, it must have offered inducements. A fact to remember in this connection is that in the Government's announcement of Dec. 29 that the set prices were to continue to March 31 there was a decree to the effect that any contracts made meanwhile should provide for price readjustment on any material delivered April 1 or later to any price that might subsequently be named by a Government agency. The Steel Corporation's December bookings would not be subject to that proviso, and buyers might find it [illegible] the matter of priority of deliveries, to have contracts

(Continued on page 72.)

# Enlarged Canadian Trade Intelligence Service

**Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.**

CHILE—Valparaiso, British Consul General.

COLOMBIA—Bogota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT—Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General..

INDIA—Calcutta, Director-General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul. Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA—Caracas, British Vice-Consul.

BRAZIL—Bahia, British Consul. Rio de Janeira, British Consul General.

# Canadian Commercial Intelligence Service

**The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.**

**CANADIAN TRADE COMMISSIONERS.**

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address, Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, 73 Basinghall Street, London, E.C.2, England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Anne's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Cantracom.

**CANADIAN COMMERCIAL AGENTS.**

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—C. E. Sontum, Grubbegd No. 4 Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

**CANADIAN HIGH COMMISSIONER'S OFFICE.**

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

### PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $52 75 |
| Lake Superior, charcoal, Chicago | [illegible] |
| Standard low phos., Philadelphia | [illegible] |
| Bessemer, Pittsburgh | [illegible] |
| Basic, Valley furnace | [illegible] |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | [illegible] | |
| Victoria | 50 00 | |

### FINISHED IRON AND STEEL

| Per lb. to Large Buyers | Cents |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in. base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 7 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 7 75 |
| Chequered floor plate, 3/16 in. | 13 20 |
| Chequered floor plate, ¼ in. | 13 00 |
| Staybolt iron | 8 50 |
| Bessemer rails, heavy, at mill | [illegible] |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | 3 50 |

F.O.B., Toronto Warehouse

| | |
|---|---|
| Steel bars | 5 50 |
| Small shapes | 5 75 |

F.O.B. Chicago Warehouse

| | |
|---|---|
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

### FREIGHT RATES

Pittsburgh to Following Points

| | Per 100 lbs. C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 35.1 | 45.5 |
| Halifax | 35.1 | 45.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

### METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | [illegible] | [illegible] |
| Electro copper | 33 00 | 32 00 |
| Castings, copper | 32 00 | 31 00 |
| Tin | 77 00 | [illegible] |
| Spelter | 10 50 | 10 50 |
| Lead | 9 75 | 9 00 |
| Antimony | 18 00 | 18 00 |
| Aluminum | 60 00 | 62 00 |

Prices per 100 lbs.

### PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¼ to ½ | $13 00 | $12 00 |
| Heads | 13 30 | 12 30 |
| Tank plates, 3-16 in. | 13 10 | 12 10 |

### WROUGHT PIPE

Effective Jan. 7, 1918.

Standard Buttweld.

| Size | Black per 100 feet | Galvanized per 100 feet |
|---|---|---|
| ⅛ in. | $ 6 00 | $ 8 00 |
| ¼ in. | 5 10 | 7 23 |
| ⅜ in. | 5 10 | 7 23 |
| ½ in. | 6 46 | 8 03 |
| ¾ in. | 8 17 | 10 29 |
| 1 in. | 12 07 | 15 22 |
| 1¼ in. | 16 33 | 20 59 |
| 1½ in. | 19 53 | 24 61 |
| 2 in. | 26 27 | 33 12 |
| 2½ in. | 42 12 | 52 94 |
| 3 in. | [illegible] | [illegible] |
| 3½ in. | 69 92 | 86 94 |
| 4 in. | 82 84 | 103 00 |

Standard Lapweld.

| | | |
|---|---|---|
| 2 in. | [illegible] | [illegible] |
| 2½ in. | 43 88 | 54 11 |
| 3 in. | 57 38 | 70 76 |
| 3½ in. | [illegible] | [illegible] |
| 4 in. | 85 02 | 106 28 |
| 4½ in. | 96 52 | 121 29 |
| 5 in. | 112 50 | 141 34 |
| 6 in. | 145 90 | 183 36 |
| 7 in. | 190 40 | 238 00 |
| 8 L in. | 200 00 | 250 00 |
| 8 in. | 230 40 | 288 00 |
| 9 in. | 276 00 | 345 00 |
| 10 L in. | 256 00 | 320 00 |
| 10 in. | 329 60 | 412 00 |

**Prices—Ontario, Quebec and Maritime Provinces**

### WROUGHT NIPPLES

4" and under, 45%.

4½" and larger, 40%.

4" and under, running thread, 25%.

Standard couplings, 4" and under, 35%.

4½" and larger, 15%.

### OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 21 50 |
| Copper, heavy | [illegible] | 21 50 |
| Copper wire | 22 50 | 21 50 |
| No. 1 machine composition | 21 00 | 20 50 |
| New brass cuttings | 16 00 | 15 00 |
| No. 1 brass turnings | 14 00 | 15 75 |
| Light brass | 10 00 | 10 00 |
| Medium brass | 14 00 | 14 00 |
| Heavy brass | 15 00 | 16 00 |
| Heavy melting steel | 21 00 | 20 50 |
| Steel turnings | 12 60 | 8 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 23 00 | 18 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 20 50 |
| No. 1 machine cast iron | 27 00 | 25 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 15 00 | 9 00 |
| Car wheels, iron | 26 00 | 25 00 |
| Steel axles | 38 00 | 30 00 |
| Mach. shop turnings | 9 00 | 8 50 |
| Cast boring | 12 00 | 8 50 |
| Stove plate | 17 00 | 19 00 |
| Scrap zinc | 5 50 | 6 50 |
| Heavy lead | 5 50 | 7 00 |
| Tea lead | 5 00 | 5 75 |
| Aluminum | 25 00 | 25 00 |

### BOLTS, NUTS AND SCREWS

| | Per Cent |
|---|---|
| Carriage bolts, ⅜" and less. | 10 |
| Carriage bolts 7-16 and up. | net |
| Coach and lag screws | 25 |
| Stove bolts | 50 |
| Plate washers | List plus 20 |
| Elevator bolts | 5 |
| Machine bolts, 7-16 and over | net |
| Machine bolts, ⅜ and less. | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd. steel | 27½ |
| Machine screws, o. and fil. hd., steel | 10 |
| Machine screws, fl. and rd. hd. brass | add 20 |
| Machine screws, o. and fil. hd. brass | add 25 |
| Nuts, square blank | add $1 50 |
| Nuts, square tapped | add 1 75 |
| Nuts, hex. blank | add 1 75 |
| Nuts hex tapped | add 2 00 |
| Copper rivets and burrs, list plus | [illegible] |
| Burrs only list plus | 50 |
| Iron rivets and burrs | 15 |
| Boiler rivets, base ¾-in. and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, fl. & R., bright | [illegible] |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 37½ |
| Wood screws, O. & R., brass | 32½ |
| Woodscrews, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

### MILLED PRODUCTS

| | Per cent. |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil Head Cap Screws | net |
| Flat ⅞ But. Hd. Cap Screws plus | net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. and semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and semi-fin. nuts over 1½ in., up to 2 in. | plus 10 |
| Studs | net |
| Taper pins | 40 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | list plus 20 |
| Collar screws | list plus 30, 10 |
| Thumb screws | 20 |
| Thumb nut | 6 |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add $7 00 |

### BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $47 50 |
| Open hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.

F.O.B. Pittsburgh.

### NAILS AND SPIKES

| | | |
|---|---|---|
| Wire nails | $5 50 | $5 45 |
| Cut nails | 5 70 | 5 65 |
| Miscellaneous wire nails | 60% | |
| Spikes, ⅜ in. and larger | $7 50 | |
| Spikes, ¼ and 5-16 in. | 8 00 | |

### MISCELLANEOUS

| | |
|---|---|
| Sash cord | [illegible] |
| Sash chain | [illegible] |
| Babbitt metal | [illegible] |
| Soldering coppers, lb. | 0 53 |
| Lead wool, per lb. | 0 15 |
| Putty | [illegible] |
| White lead, pure, cwt. | 15 20 |
| Red dry lead, 100-lb kegs, per cwt. | [illegible] |
| Glue, English | 0 38 |
| Tarred slater's paper, roll | 0 95 |
| Graphite | [illegible] |
| Red rope | [illegible] |
| Pure turpentine, single bbls. | [illegible] |
| Linseed oil, raw, single bbls. | 1 36 |
| Linseed oil, boiled, single bbls. | [illegible] |
| Plaster of Paris, per bbl. | 2 50 |
| Sandpaper, B. & A. | list plus 20 |
| Emery cloth | list plus 20 |
| Emery wheels | [illegible] |
| Sulphur, rolls | 0 05 |
| Sulphur, flour | [illegible] |
| Rosin "D," per lb. | 0 03 |
| Rosin "G," per lb. | 0 03½ |
| Borax crystal and granular | 0 15 |
| Wood alcohol, per gallon | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

### ROPE AND PACKINGS

| | |
|---|---|
| Jute rope | [illegible] |
| Plumbers' oakum, per lb. | 0 09 |
| Packing, square braided | 0 34 |
| Hemp packing | [illegible] |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| Braided Manila Rope | [illegible] |
| New Zealand Hemp | [illegible] |
| Transmission rope, Manila | 0 45 |
| Cotton Rope, ¼-in. and up | 0 47 |

### POLISHED DRILL ROD

Discount off list, Montreal and Toronto net

### CARBON DRILLS AND REAMERS

| | Per Cent. |
|---|---|
| S.S. drills, wire sizes up to 52 | 30 |
| S.S. drills, wire sizes, No. 53 to 80 | [illegible] |
| Standard drills to 1½ in. | 30 |
| Standard drills, over 1½ in. | 30 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 20 |
| Bit stock | [illegible] |
| Ratchet drills | 15 |
| S.S. drills for wood | 30 |
| Wood boring brace drills | 25 |
| Expansion bits | [illegible] |
| Screwdrivers | [illegible] |
| Sleeves | 40 |
| Taper pin reamers | net |
| Drills and countersinks | list plus 30 |
| Bridge reamers | [illegible] |
| Centre reamers | 10 |
| Chucking reamers | net |
| Hand reamers | 10 |

### COLD ROLLED SHAFTING

| | |
|---|---|
| At mill | list plus 40% |
| At warehouse | list plus 50% |

Discounts off new list. Warehouse price at Montreal and Toronto

### IRON PIPE FITTINGS

Malleable fittings on list; class B and C, net list. Cast iron fittings, 25% off list. Malleable bushings, plugs, 20% off list. Net prices malleable fittings: Class B black, 24½c lb.; Class C black, 15¾c lb.; galvanized, Class B, 34c lb.; Class C, 24½c lb. F.O.B. Toronto.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | [illegible] | $ 8 50 |
| Sheets, black, No. 10 | 12 00 | 12 00 |
| Canada plates, dull, 52 | [illegible] | |
| Canada plates, all | [illegible] | |
| Box | [illegible] | |
| Iron | [illegible] | |
| B.W.G. | [illegible] | |
| Steel | [illegible] | |
| G. | [illegible] | |
| Copper | [illegible] | |
| Brass | [illegible] | |
| Premier, No. 28 U.S. | 9 45 | 9 45 |
| Apollo | [illegible] | |
| Zinc sheets | 20 00 | 20 00 |

### PROOF COIL CHAIN.

| B | |
|---|---|
| ¼ in. | $12 35 |
| 5-16 in. | 11 85 |
| ⅜ in. | 11 50 |
| 7-16 in. | 10 90 |
| ½ in. | [illegible] |
| ⅝ in. | 11 10 |
| ¾ in. | 11 00 |
| ⅞ in. | 10 90 |
| 1 in. | [illegible] |
| Extra for B.B. Chain | 1 20 |
| Extra for B.B.B. Chain | 1 80 |

ELECTRIC WELD COIL CHAIN B.B.

| | |
|---|---|
| 5-16 in. | |
| ¾ in. | |
| ⅞ in. | |
| 1 in. | |

HOES AND RASPS

| | Per Cent |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |

COAL AND COKE

Net ton f.o.b. Toronto.

BOILER TUBES.

| | Seam- | Lap- |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| 3 in. | 64 00 | 50 00 |
| | | |
| | | |
| 4 in. | 90 00 | 75 00 |

OILS AND COMPOUNDS.

| | |
|---|---|
| | |
| | |
| | |
| Standard cutting compound, per lb. | 0 06 |
| | |
| | |
| | |
| Acme cutting oil, antiseptic | 37½ |
| Imperial quenching oil | 39½ |

BELTING, NO. 1 OAK TANNED

| | |
|---|---|
| | |
| | |
| | |
| | |
| Leather in sides | 1 75 |

TAPES.

| | |
|---|---|
| | |
| | |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| | |
| | |
| | |

WASTE.

| White. | Cents per lb. |
|---|---|
| XXX Extra | 21 |
| | |
| | |
| | |
| X L C B | |
| | |
| | |
| | |
| X press | 16 |

Colored.

| | |
|---|---|
| | |
| | |
| | |
| | |
| | |

Wool Packing.

| | |
|---|---|
| | |
| Axle | 20 |
| | |
| | |

Washed Wipers.

| | |
|---|---|
| Select White | |
| Mixed assorted | 10 |
| Dark assorted | 09 |

This list subject to trade discount for quantity.

RUBBER BELTING.

| | |
|---|---|
| | |
| | |

ANODES.

| | |
|---|---|
| Nickel | .50 to .51 |
| Cobalt | 1.75 to 2.00 |
| | |
| | |
| | |

Prices Per Lb.

COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| | | |
| Copper wire, list plus 10. | | |
| | | |
| Copper sheet, tinned, 14x60, 14 oz. | 60 00 | 54 25 |
| | | |
| | | |

BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 | |
| | 0 17 |
| Brass tubes, 24 gauge and heavier base | 0 1 |
| Brass tubing, seamless | 0 50 |
| Copper tubing, seamless | 0 60 |

PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 0 2 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in bags, American | 07 |
| Pumice, ground | 06 |
| Emery cake | 15 to 20 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to |

| | |
|---|---|
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 35 |

Prices Per Lb.

LEAD SHEETS.

| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $18 00 | $18 00 |
| Sheets, [illegible] lbs. sq. ft. | 18 00 | 18 00 |
| Sheets, 4 to 6 lbs. sq. ft. | 17 50 | 17 00 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

| | |
|---|---|
| Acid, hydrochloric | |
| Acid, hydrofluoric | |
| Acid, nitric | .10 |
| Acid, sulphuric | |
| Ammonia, aqua | |
| Ammonium carbonate | |
| Ammonium, chloride | .11 |
| Ammonium hydrosulphuret | .40 |
| Ammonium sulphate | .07 |
| Arsenic, white | |
| Copper, carbonate, anhy. | .35 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | |
| Iron, perchloride | .20 |
| Lead acetate | 16 |
| Nickel ammonium sulphate | .12 |
| Nickel, carbonate | |
| Nickel sulphate | |
| Potassium carbonate | |
| Potassium sulphide (substitute) | .0 |
| Silver chloride (per oz.) | .65 |
| Silver nitrate (per oz.) | .55 |
| Sodium bisulphite | 10 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .41 |
| Sodium hydrate | 04 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | |
| Tin, chloride | 60 |
| Zinc chloride | .60 |
| Zinc sulphate | .09 |

Prices per lb. unless otherwise stated.

(Continued from page 70.)

at above the Government prices ruling later.

There is practically no market to report at this time and the whole interest of the trade is as to what is going to

definite color. Deliveries on current contracts are behindhand in nearly all cases, and there is naturally no particular occasion for producers and consumers to enter into additional contracts. The striking fact is that, although production has been additionally restricted for several weeks past, there is no evidence that consumers are proportionately incom-

At no time for a twelvemonth or more has the industry operated at capacity, and the existing capacity, in both pig iron and steel, is much greater than the production has ever been. At the present time pig iron production is at the rate of about 33,500,000 tons a year, or approximately 9,000,000 tons less than the capacity, while production of steel ingots is at the rate of about 38,000,000 tons a year, or 10,000,000 to 12,000,000

The question is, what would occur if transportation conditions should be made such as to permit full production. The improvement in traffic conditions might conceivably increase greatly the consumptive requirements, but it would seem rather more probable that steel

## LIGNITE BRIQUETTES

THAT lignite coal briquettes can be laid down at many points in the Prairie Provinces, but more particularly in Manitoba, Saskatchewan, at a lower cost than anthracite, is the finding of the committee on minerals of the Commission of Conservation just made public. The report was prepared by W. J. Dick, mining engineer to the Commission, as the result of an investigation made by him into the possibilities of the lignite coal fields of Western Canada as a source of coal supply for domestic purposes.

Mr. Dick gives the following estimate of the saving which would result from the use of carbonized briquettes instead of anthracite in certain cities and towns in Manitoba, and points out incidentally that the price of anthracite is certain to increase. Portage la Prairie, nothing to 45c; Carberry, 80c to $1.30; Brandon, 85c to $1.10; Virden, 95c to $2.30; Moosomin, 95c to $2.20; Wolseley, $1.45 to $1.70; [illegible] to $2.50.

The estimated cost of laying briquettes down at Winnipeg is $10.50 per ton, or slightly more than the cost of anthracite.

## BRITAIN CUTS OFF EXPORT LICENSES

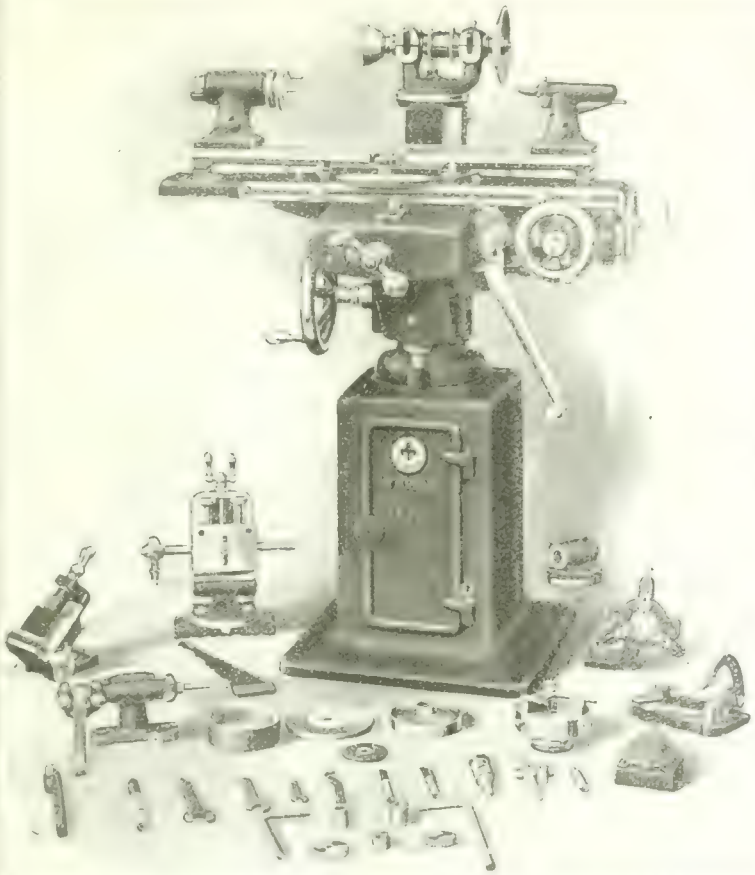
A FAR-REACHING announcement has been made by the representatives of the Imperial Government, having charge of the exportation to Canada of raw materials. It was stated recently that no more licenses will be granted for the exportation of raw materials from Britain. Those licenses issued up to November 30 hold good. The reason for this decision is given in the shortage of noils and woollens of all kinds for war purposes.

This decision will have a tremendous effect upon Canadian trade because of its great dependence placed upon shipments of wools and other raw materials from Great Britain. Whether this affects shipments from Australasia or not is not yet known. Canada has been receiving a lot of wool from the Antipodes, which have been the chief source of supply, and if this is cut off Canadian industries doing war and domestic work will be made to suffer a great deal.

## U.S. TO CONTROL FUEL OIL

THE United States Government will probably take over supervision of the nation's fuel oil supply within a short time, through the agency of the Federal Fuel Administration. Plans are now being prepared for the organization of an oil division of the Fuel Administration, and it will work out the scheme of control. No decision has been made as yet concerning the advisability of fixing prices, a step which was taken in connection with the Government control of coal contracts and coal distribution.

The situation as regards fuel oil has become acute within the past few weeks due to the heavy demands of the navies of the United States and Great Britain



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## IS ALSO

a Cylindrical Grinder
a Surface Grinder
an Internal Grinder

The B. & S. Universal Tool and Cutter Grinder is a complete tool room in itself. It will sharpen all kinds of cutters, including spiral mills and saws.

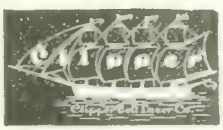
The AUTOMATIC TABLE FEED enables the operator to grind straight and taper cylindrical, internal and surface work with the least fatigue.

### SPECIFICATIONS:

| | | | |
|---|---|---|---|
| Swing | | | 8" dia. x 17" between centers |
| Table, working surface | | | 29" x 5¼" |
| Longitudinal feed, automatic | | | 15" |
| Vertical feed | 7¾" | Grinds cutters to | 18" dia. |
| Cross feed | 6¼" | Grinds saws to | 26" dia. |

**IN STOCK TORONTO** *Send for catalog describing this machine.*

**The A. R. Williams Mach'y Co.**
Limited
64 Front St. W. Toronto



THE real cost of an article is not the price, but the use. To-day the value of things is based on what they can do, not on their purchase price.

The adaptability of the "Clipper" Belt Lacer to nearly every belt in your plant renders the "Clipper" invaluable to you.

Three minutes is the maximum time required to "Clipper" lace a belt.

**Clipper Belt Lacer Company**
976 Front Avenue Grand Rapids, Mich.

# NOSING DIES

profits occasioned by spoiled shells, lost

Lest Nosing Dies.

harder than the best tempered steel, and the best material yet discovered for this

Chilled Iron Dies last Longer than steel dies in actual service. They will nose

**MARSH & HENTHORN, Ltd.**
Belleville Ontario

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# INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

## ENGINEERING

Owen Sound, Ont.—William Kennedy & Sons are making structural alterations to the steel foundry and machine shop.

**Lachine, Que.**—The Rapid Tool & Machine Co.'s plant has been destroyed by fire, the loss being estimated at $65,000.

**Toronto, Ont.**—The City Architect has issued a permit to the Bond Engineering Works for an addition to their factory at the foot of Cherry Street, to cost $8,000.

**Toronto, Ont.**—City Architect Pearse has issued a building permit to the Canadian Allis-Chalmers Co. for a $2,000 addition to their factory on Lansdowne Avenue.

**Banff, Alta.**—The Alberta Electro-Chemical Co. contemplate installing machinery for the manufacture of carbide in their plant at Kananaskis Falls.

**Hamilton, Ont.**—The cooperage department of the Steel Company of Canada on Wellington street north, was destroyed by fire recently, with a loss of $10,000.

**Gananoque, Ont.**—The hammer shop in the axle department of the plant of the Ontario Steel Products Co. here was damaged to the extent of several thousand dollars on Monday morning. The company expects to be in full operation again in about ten days, as reconstruction necessary will be undertaken immediately.

**Halifax, N.S.**—L. M. Trask of this city, who recently purchased the Milton Foundry at Yarmouth, has purchased the Bridgetown Foundry, which is located in the centre of the town near the river front. With his foundries and machine shops connected therewith, Mr. Trask expects to manufacture stoves, ships' castings, hoists and winches, and a complete line of fuel oil engines up to 200 h.p. suitable for vessels of all kinds. He will also make a specialty of traction engines.

**Toronto, Ont.**—The Bond Engineering Works, Ltd., which took over the Queen City Foundry, will build an addition to the foundry, the contract having been let to Chas. W. Wood & Son of Toronto. The building is to be single storey, with monitor solid brick walls, roof of standard slow-burning construction. Despite unfavorable weather the work is progressing rapidly. The Bond Engineering Works is a subsidiary of the well-known transmission manufacturers, the Bond Foundry & Machine Co., Mannheim, Pa.

**Toronto, Ont.**—The contract for building of a stave pipe line through Niagara Park, which will carry a third water supply for the development of hydro-electric power at Niagara, while the Chippawa work is under construction, has been let to the Pacific Coast Wood-Stave Pipe Co. The same concern installed a pipe line at Eugenia Falls for the Commission. When the new generator is installed at the Ontario Power Co's. plant it will give the Hydro-Electric Commission an additional 50,000 h.p. It is estimated that the pipe line and equipment will cost about $1,800,000. The work will be completed by Nov. 1.

## ELECTRICAL

**Thorold, Ont.**—The Hydro-Electric by-law was carried here at the recent municipal elections.

**Stratford, Ont.**—Owing to the shortage of power the local commission has issued an order to cut down consumption. Power for the factories will not be switched on until 8 a.m. and will be turned off at 5 p.m. each day. This means that factories which are now running from 7 a.m. to 6 p.m. will lose two hours daily.

## GENERAL

**Lindsay, Ont.**—The Allen & Hanburys Co., will build a factory here to cost about $100,000.

**Brantford, Ont.**—The flour mill at Norwich, owned by T. L. Wood was totally destroyed on Sunday morning.

**Montreal, Que.**—One of the buildings of the Montreal abattoirs, Delorimier avenue, was recently damaged by fire.

**Baden, Ont.**—The large woollen mills of Elias A. Brudacher were destroyed by fire here on Jan. 9, the building and contents being entirely burned. The cause of the fire is unknown.

**Brantford, Ont.**—When fire broke out in the three-storey plant of the Watson Manufacturing Co. here on Jan. 8, the sprinkler system held the blaze under control until the arrival of the Central Fire Department. The building itself suffered little, but the damage done to the machinery will involve considerable loss.

**Montreal, Que.**—The Arena, which was destroyed by fire recently, will not be rebuilt until after the war, so President Ed. Sheppard of the Arena Co. announced. The company owns the land on which the Arena stood, and will hold it. The ice plant adjoining the Arena was little damaged, and will be running again shortly.

## MUNICIPAL

**Lethbridge, Alta.**—The City Council propose installing additional power plant equipment.

**Owen Sound, Ont.**—The by-law to guarantee $39,000 bonds of the King Shoe Co. was carried by 51 over necessary two-thirds.

**Forest, Ont.**—The by-law to sanction the purchase of a fire engine and other apparatus at a cost of $8,500 was carried by a small majority.

**Tillsonburg, Ont.**—At the recent elections, the by-law to grant a fixed assessment of $25,000 to the Maple Leaf Harvest Tool Co. was carried by 312 majority.

**Galt, Ont.**—The by-laws for the amalgamation of the Hydro and waterworks departments and for extensions to the water works system carried by large majorities.

**Belleville, Ont.**—The by-law to grant $28,000 for the purchase of a site for the proposed new Albert College building was carried, the vote being 748 for and 242 against.

**Windsor, Ont.**—At the recent municipal elections the by-law to spend $17,000 for the erection of a municipal garage was defeated, 1,288 votes being cast against it, and only 404 in favor of the scheme.

**Swift Current, Sask.**—The work of preparation for installing the new power plant machinery is progressing in a satisfactory manner. Some of the equipment has already arrived and the erection work will begin shortly.

**Windsor, Ont.**—The ratepayers have voted in favor of the city taking over the street railway system and having it operated by the Hydro-Electrical Commission. The by-law in favor of the city building trackage was also carried.

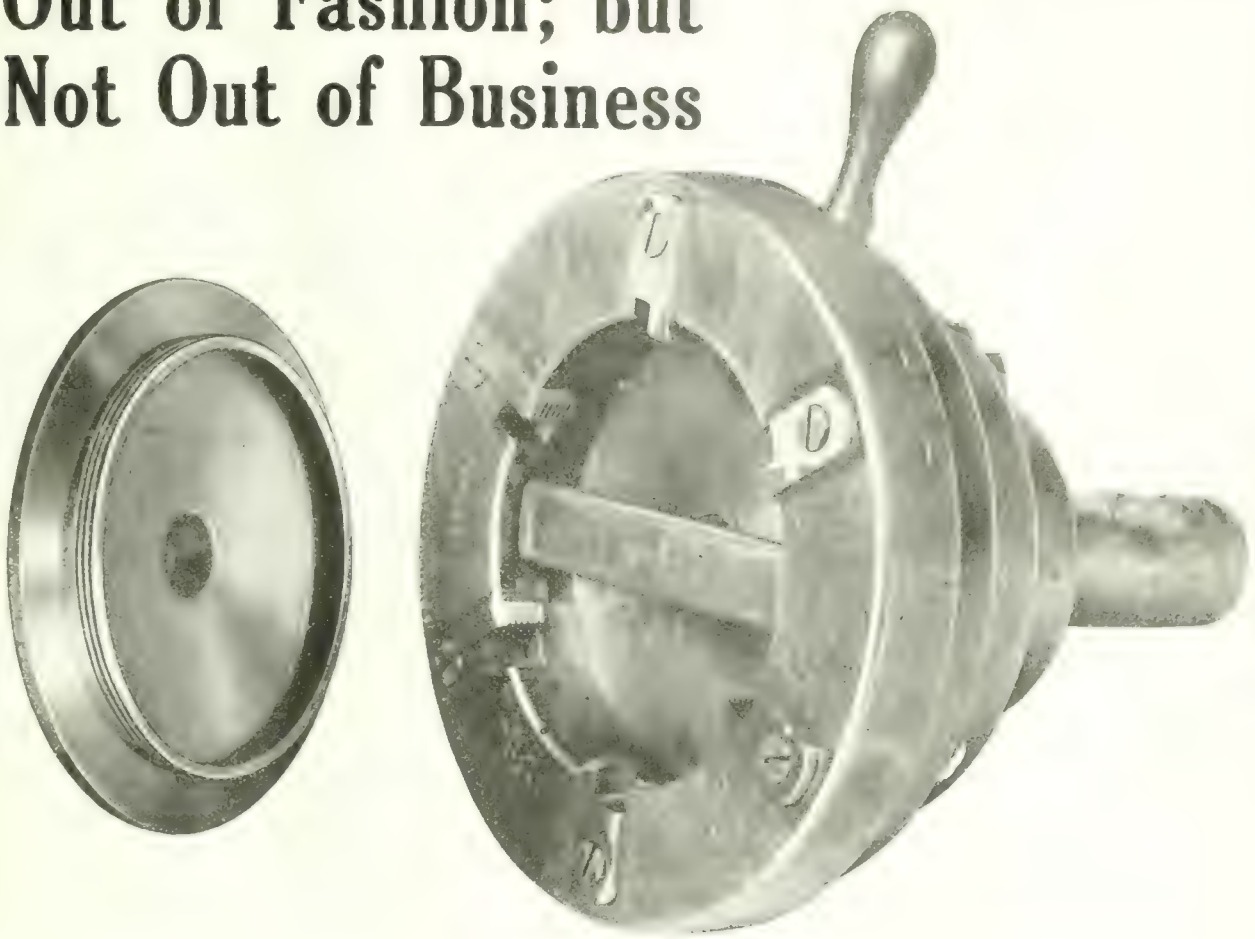
## PERSONAL

**Lieut. Harry C. Walkem, M.C.,** son of J. B. Walkem, K.C., of Kingston, has been retired from the Royal Engineers and appointed by the War Office in charge of steel contracts.

**Frank Wilton Baillie,** president of the Canadian Aeroplanes, Ltd., Toronto, and a director of the Aviation Department of the Imperial Munitions Board, has been created a Knight Commander of the Order of the British Empire.

**George A. Morrow** of Toronto has been named as an Officer of the Order of the British Empire, in recognition of his services as a member of the Aviation Department of the Imperial Munitions Board.

# Out of Fashion; but Not Out of Business



This old "war horse" of a Geometric Die Head has been cutting Screw Threads for a Chicago concern for seventeen years. It was recently sent back to the Geometric Factory for overhauling, and has gone again to Chicago, for possibly seventeen years more of duty.

A Geometric Collapsing Tap, purchased by the same people seventeen years ago, is still cutting the inside threads to match. Can you match that?

Geometric Thread Cutting Tools of to-day can surpass it. What thread cutting method are you using? Learn the Geometric way. It is a path others have trod for the past twenty-five years. Geometric experience has smoothed the path of thread cutting for many. What will you let it do for you?

*We could help you by us.*

## THE GEOMETRIC TOOL COMPANY

NEW HAVEN, CONNECTICUT, U.S.A.

*Canadian Agents:* WILLIAMS & WILSON, LIMITED, MONTREAL. THE A. R. WILLIAMS MACHINERY COMPANY, LIMITED, TORONTO, WINNIPEG AND ST. JOHN, N.B.

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Bertrand C. Root, [illegible] shell manufacturers expect to erect in the United States.

W. B. Fortune, one of the engineers in charge of construction of the Quebec [illegible] can International Corporation to an important position in connection with ship construction at the yard at Philadelphia, Pa.

F. F. Backus, general manager of the Toronto, Hamilton & Buffalo Railway, with headquarters at Hamilton, has been appointed railway traffic expert in charge of traffic at the Canadian terminals on the Niagara frontier. The position has been created by the Canadian Railway War Board for the purpose of supervising and expediting freight traffic from the United States.

H. C. Opie, sales agent for the Arthur Balfour Co., Ltd., of Montreal, has been on a six weeks' trip through the Eastern Provinces, and while on this trip had the memorable experience of being one of those who survived the terrible disaster at Halifax. While sitting quietly in a room at the hotel, Mr. Opie suddenly found himself blown through [illegible] which the door had just been torn. Before leaving the stricken city Mr. Opie aided in the relief work for some time after the accident.

Joseph Burr Tyrrell, B.M.A., B.Sc., F.G.S., mining engineer, of 14 Walmer road, Toronto, has been awarded the Murcheson Medal by the Geological Society of London. Mr. Tyrrell, who is one of Canada's foremost geologists, explorers and mining engineers, is at present in England. He is one of Toronto's prominent explorers, of whom little is known. He has spent many years in exploration work in Alaska and Hudson's Bay with wonderful results. The Murcheson Medal was founded in memory of Sir Robert Impey Murcheson, a famous British geologist, who died in 1871.

T. A. M. Taylor, manager of the small tools department at the Toronto branch of the Canadian Fairbanks-Morse Co., has resigned from this position and has opened an office at 318 Stair Building, Toronto, where he will engage in the small tools and machine shop supplies business. Mr. Taylor will carry a general line of supplies, milling cutters, drills, reamers, shell tools, mechanical tools, etc. Mr. Taylor joined the staff of the Canadian Fairbanks-Morse Co. [illegible] at the Montreal office and two years in Toronto. He has had charge of the small tool department for eight years, and more recently has specialized in [illegible] rooms.

# TRADE GOSSIP

D. [illegible] Mineral Production.—Revised [illegible] of the mineral production of British Columbia for 1917 show the total will be approximately $37,500,000. This is a falling off from the total of 1916 of $4,790,000.

The Canadian Steel Foundries, Ltd., Montreal have recently recieved a large order from the Imperial Munitions Board for stern frame castings for a number of vessels now being constructed in different parts of the Dominion.

Close Down on Public Works.—To conserve finances for the war, Hon. F. B. Carvell will practically close down all Federal public works. In addition to saving the money required for these works, the labor employed will be diverted to essential industries .

U.S. Steel Corp. Unfilled Tonnage.—The unfilled orders on the books of the United States Steel Corporation on Dec. 31 amounted to 9,381,718 tons, an increase of 484,616 tons compared with the orders on Nov. 30, according to the monthly report issued last Thursday.

The Frick Co., Waynesboro, Pa., have recently sold the following equipment to the Lennoxville School, Lennoxville, Que.: One 3-ton V. S. A. enclosed type belt driven refrigerating machine with high side and D. E. piping for storage rooms. To be used in refrigerator room.

The Standard Machinery & Supplies Co. of Montreal are now representing the F. B. Stevens Co. of Detroit, Mich., manufacturers of foundry facings and supplies, etc. The company will handle the complete line of Stevens products throughout Canada, with the exception of Ontario.

Trains Crossing Quebec Bridge.—Regular passenger train traffic over the new Quebec brige has been inaugurated. The service was opened Jan. 6 when a train from Moncton used this route. Hereafter trains will leave the Union Station in Quebec City daily for Montreal and eastern points via the bridge.

Armstrong-Whitworth of Canada, Ltd., have closed their office in the Dominion Bank Building and opened a warehouse at 130 Wellington Street, Toronto, in charge of J. L. Hynes, where they will carry a complete stock of high-speed steel, carbon tool steel, gauges, shop tools and special munition tools.

Ottawa Hydro-Electric.—The Ottawa Hydro-Electric Commission has had another successful year. The increase in revenue for 1917 over 1916 shows the total revenue for the first year of the municipal plant $35,000 in 1916. The expenditure showed only $16,000 increase and of this amount $12,000 was for power.

Big Lake Fleet for Ocean Service.—The United States Shipping Board has decided to remove from the Great Lakes an additional thirty ships for ocean service. The vessels will be cut in half this winter and will be removed through the Welland Canal and reassembled when navigation is resumed in the spring. Already 42 ships have been brought out.

The Standard Machinery & Supplies Co. of Montreal have been appointed sales agents for the Atlas Crucible Steel Co. of Dunkirk, N.Y. They will handle the various lines of high-speed and carbon steels in the whole of Canada, with the exception of a part of Ontario. In Ontario the territory includes Renfrew, Pembroke and east of those points.

The Liquid Air Society will in the course of a couple of months move their head office to Toronto. For the past several years the administration of the Canadian business has been done from the Montreal office; the factory at Montreal will still be maintained as a branch, and will continue to be the main production unit of the company's several branches..

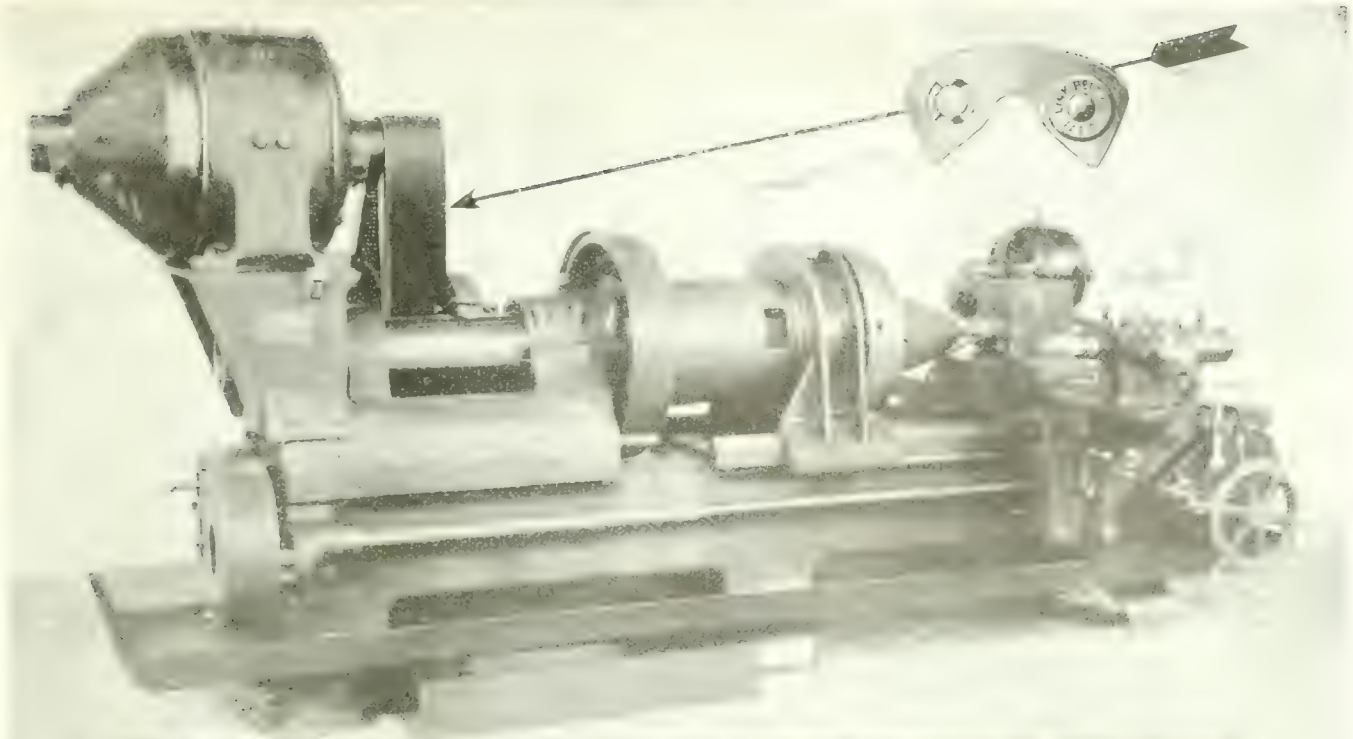
New Railway Rates in February. It is understood that the increase of fifteen per cent. in freight and passenger rates on all Canadian railways will become effective on Feb. 1. Mileage rates thus advance from 3 to 3.45 cents. The new rates have already been affirmed by the Dominion Railway Commission, and only the detailed schedules of the various lines have yet to be passed upon by the Government officials.

S. S. Angouleme Wrecked.—The steel freighter Angouleme which was built at the Thor Iron Works, Toronto, last summer is reported a wreck off the Scarlet Island on the Nova Scotia coast. The Angouleme was christened "Orleans" and was built for the Playfair interests but was later renamed and sold to the Overland Navigation Co. The vessel was 261 feet long, 43 feet wide, 28 feet deep and had a deadweight capacity of 4,500 tons.

Would Make St. John a Dominion Port.—A proposal for the Dominion Government to take over the port of St. John, N.B., make it a Dominion property, and place it under a commission similar to the Harbor Commission at Montreal, has been considered by some of the members of the Dominion Government. Hon. F. B. Carvell is taking the matter up with the Dominion Cabinet, and while it may take some time to complete the negotiations, it looks as if something may come of it.

High Speed Steel Prices Fixed in U.S.—The committee on steel and steel products of the American Iron and Steel Institute has recommended the following fixed prices on high speed tool steel. Mill shipments $2, and shipments from makers' warehouse stocks $2.01 base per pound. All prices f.o.b. point of shipment and net without discount. Tungsten finishing steel 65c per lb., on mill shipments and 66c on shipment from warehouse stocks. A long list of extras has also been submitted.

Committee to Consider Railway Problem.—To consider the whole Canadian railway problem rendered imperative by the freight rate decision, a committee composed of Hon. Messrs. Reid, Meighen, Calder, Carvell, Robertson and Sir Thomas White, has been appointed. The freight rates decision of the Railway Commission will not be given effect to until investigation by this committee. It



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MACHINE tools driven through Link-Belt Silent Chain receive all the power of the motor. Every variation of speed, every reversal, is instantaneous. Motor and headstock are linked by unyielding, yet flexible steel, permitting no slip and no backlash.

## LINK-BELT SILENT CHAIN DRIVES

lead in machine tool drives. Designers prefer them for their compactness and convenience of application. The transmission is 98.2 per cent. efficient on actual test—"Flexible as a Belt Positive as a Gear More Efficient than Either."

Write for Data Book No. 125, which tells all about Silent Chain Drives. With its assistance you can figure your own machine tool drives, and determine their cost.

CANADIAN LINK-BELT CO., LIMITED

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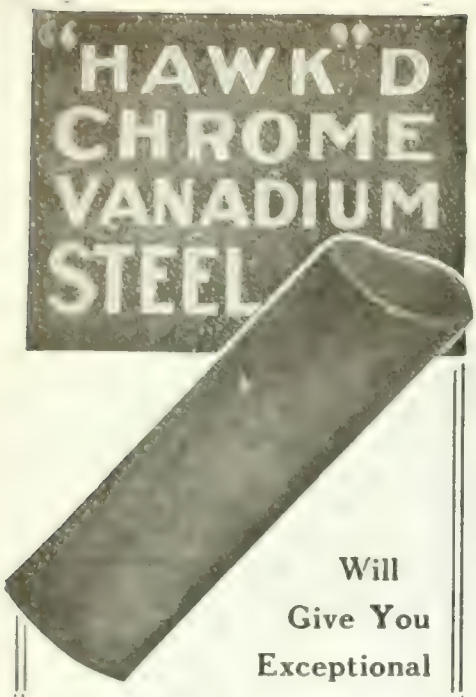


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Give You
Exceptional

**Shell Forging Production**

WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat-treated and ready for use.

It does not stick to the work.

There are many cases where each punch has turned out over 2,000 shells.

It means more shells, per machine per day.

STEEL OF EVERY DESCRIPTION.

**Hawkridge Brothers Company**

303 Congress St., BOSTON, MASS.
U. S. A.

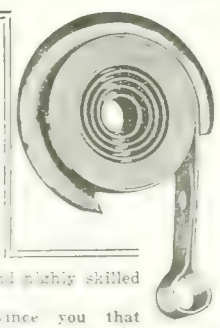
'Barnes-Made'
**Springs**

are unusual in service and wear.

They are the re-

and highly skilled

A[illegible] convince you that [illegible] are the



THE WALLACE BARNES COMPANY
218 South St., Bristol, Ct., U. S. A.

[illegible] "Barnes-made" Products


is possible a further step toward nationalization of the transportation system may result.

**Western Traffic Conditions Much Improved.**—In Western Canada the action taken by the Canadian Railway War Board to increase the movement of coal from the mines to the prairie cities and towns, it was said, has had the effect of greatly diminishing the shortages which were reported a few weeks ago. On one of the lines which it was claimed should have moved more coal there has been an increase in the movement of no less than seventy per cent., and a number of the mine operators have advised that they are now receiving good service from the railways.

**Box Cars to be Returned From U.S.**—As a result of representations made by the Canadian Railway War Board to the American railway authorities at Washington, the United States railways have been ordered to send nearly 6,000 empty box cars to Canada, and deliveries of these cars will be accomplished as speedily as the lines to the south can move them out of the congested district. With these cars available, the Canadian railways will be in a position to move a great deal of the freight which has been delayed in Canada awaiting cars to move it to the United States.

**Steel Concern Changes Name.**—An interesting development in the steel trade of recent date has been the absorption of the well known Sheffield concern the Eagle & Globe Steel Co. by Arthur Balfour & Co., Dannemora Steel Works Sheffield, England. In future all Canadian business will be carried on under the name of Arthur Balfour & Co., and no change will be made in the Canadian offices, except in the name as stated above. W. A. Bradbury, 123 Craig St. W,. Montreal will continue as general Canadian agent.

**Marine Engineers Meet.**—New wage schedules showing increases were considered by the Great Lakes Executive of the National Association of Marine Engineers, who were in conference in Toronto a few days ago. The new schedule has not yet been issued, but it is understood that it will approximately be from $1,440 to $2,100 a year for chief engineers, and from $1,152 to $1,800 a year for second engineers. The present wage scale is as follows: $960 to $1,500 a year for second engineers, and $1,200 to $1,800 a year for chief engineers.

**Asbestos in Queensland.**—The restrictions on shipping and imports generally are doing much to encourage Australian enterprise. In the past Australia has been content to get supplies of asbestos from Italy, Canada, and South Africa, although promising asbestos deposits have been known to exist in Central Queensland, deposits capable of yielding unlimited quantities. Now the attention of the State Mines Department has been directed toward this natural wealth, and it is hoped that the foundation of a new industry will be firmly laid.

**Will Devise Means of Holding Dye Market.**—Manufacturers of dyes from several Canadian cities and from New Jersey, Philadephia, Chicago and Cincinnati will meet with representatives of the United States Government in New York on January 22 and 23, for the purpose of devising means of holding their domestic and foreign markets against the onslaught of German commerce "shock battalions" after the war. Formation of an International Trade Association to stabilize and standardize the dye industry, the present investment of which, it is stated, is $200,000,000, will be considered.

**Niagara Power Shortage.**—The American Cyanamid Co., of Niagara Falls, Ont., which makes ammonia for use in the manufacture of high explosives, recently reported it was 15,000 h.p. short of its usual power supply, and has been compelled to cut down its capacity very considerably. The Union Carbide Co. and the Electric Metals Ltd., two Welland concerns making war supplies, are each short about 15,000 h.p. also. In this city, St. Catharines and other places in the district, verandah lights and ornamental lights have been ordered cut off and the street lighting will be cut off after midnight soon.

**Railway Board Seeks Transfer of Tracks.**—In order to secure the rails required to keep the main arteries of traffic in good condition, it was decided at a meeting of the Canadian Railway War Board, held in Montreal recently, to petition the Government to take up the metal on lines that are not vital. This work will entail the removal of 1,500 to 2,000 miles of rails, and the Government will be asked to hold over certain classes of labor continually passing through Canada to Europe to handle it. Some 20,000 laborers will be wanted, and their wages, about $50,000 a day, will be spent in this country.

**U.S. Steel Production Cut in Half.**—It is estimated that the average steel production of the United States to-day is but little over 50 per cent. capacity. Operations at 50 per cent. capacity mean a loss of some 1,750,000 tons of steel monthly as long as the present situation continues unrelieved. And steel men can see little prospect of an early betterment. In some quarters it is thought that labor is responsible to some extent for the present tie-up of industry. Owing to the demand for workers it is claimed that laborers have assumed an independent attitude and are working carelessly and producing considerably below their ability.

**Coal Deposits Near Prince Rupert.**—The British Columbia-Skeena Coal Co. controls 30,000 acres of anthracite coal lands on the Upper Skeena River, northwest of Prince Rupert, B.C., where recent discoveries report the existence of large deposits of coal closely resembling in analysis the smokeless coals of Pennsylvania and Wales, now used by the United States and British navies, and said to be the only lumpy anthracite coal in Canada. The national importance of this find at the present time, when naval supremacy is so vital, and good coal so scarce, will be readily appreciated. Heretofore Canada's coal supply has been altogether bituminous.

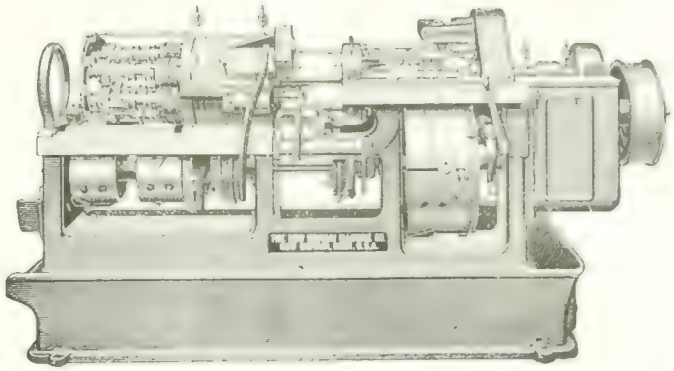
**Petroleum Production in U.S.** — Petroleum produced and marketed in the United States in 1917 reached the record-breaking total of 341,800,000 barrels, the geological survey announces in its preliminary yearly estimate. The quantity exceeded by 14 per cent. the 1916 record production. Record levels were reached and firmly maintained by prices of crude oil at the wells and the enormous demand absorbed not only the current output but necessitated a net draft of about 21,000,000 barrels of oil in storage, principally in California and Illinois. The surface reserve of crude oil at the end of the year is estimated at 153,000,000 barrels.

**Steel Men Interview Munitions Board.** —Representatives of the steel companies were in consultation at Ottawa last Thursday with the Imperial Munitions Board. It is understood the steel manufacturers object to the inspection results and would change the present system. At present the British Government employs an inspection company to pass upon the output of the munition manufacturers and of the steel for munitions. The rejections have been of so great a percentage as to alarm the producers, who allege that unskilled men are being used as inspectors. It is improbable there will be any change in the inspection system.

**Pig Iron Statistics.** — December pig iron statistics show the sharp cutting down of production in the United States in the second half of the month, and the January showing will doubtless be worse. The total of coke and anthracite iron last month was 2,882,919 tons, or 92,997 tons a day, as against 3,205,794 tons in November, or 106,859 tons a day. Capacity active January 1st was only 93,500 tons a day, as against 106,953 tons for December 1st, and only 324 furnaces were in blast January 1st, a loss of 24 in the month. December production of 2,882,919 tons compares with 3,178,647 tons in December, 1916, and 3,203,322 tons in December, 1915.

**Lifting Embargo Helps Molybdenum Industry.**—The lifting of the embargo on molybdenum, and tungsten, their ores and concentrates, is expected to have an immediate stimulating effect on molybdenum mining endeavor in that in such a broadened market inducement is offered for the employment of foreign capital, especially from the United States. Whereas heretofore the molybdenum mine operators have had their product confined to a very narrow market, securing for their output perhaps the smallest price of any of the allied countries, they will now be able to consign their product to the most remunerative markets, thus resulting in an increase of perhaps 100 per cent. or more to their income. The chief molybdenum deposits are located in Northern Ontario and Northern Quebec, the latter along the Transcontinental railway.

**Manufacturers Fear Pig Iron Shortage.**—The deputation of Ontario manufacturers who waited on the Dominion Government a few days ago at Ottawa

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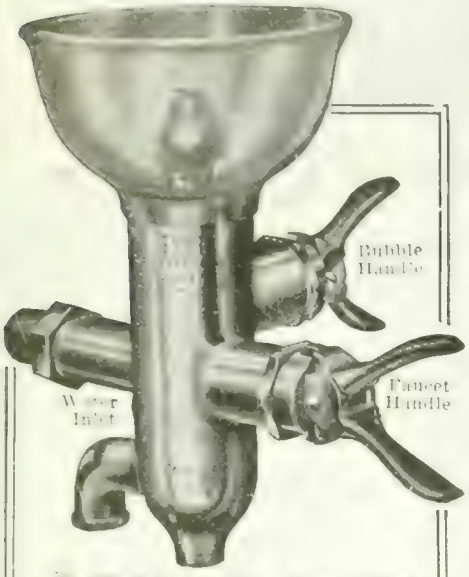


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asking the creation of a war board to control essential war material, expressed a fear that an adequate supply of pig iron might not be available in the near future. They would have the war board empowered to negotiate with the United States for a supply. Already the government has a controller of metals, who is doing this. It is claimed that there are ample facilities in Canada for the production of an adequate supply of pig iron. The only danger is in the failure of the coke supply for the pig iron smelters. The smelters in Ontario are dependent upon the United States coke ovens for their supply, and even in the United States some ovens are banked owing to the scarcity of the necessary fuel.

**New Shipbuilding Plant at Toronto.**—Work is now proceeding on the contruction of a two-million-dollar shipbuilding plant at Toronto on the west side of the harbor. The plant is being erected for the Dominion Shipbuilding Co., which was recently granted a provincial charter. It is expected that the entire plant will be finished by next summer, when work will commence on the construction of five steel freighters for salt water service. The vice-president and general manager is L. Dahlgren of Toronto. The company has leased for a term of 21 years slightly over 15 acres of reclaimed land at the foot of Spadina avenue. They are erecting a modern shipbuilding plant, the largest building being about 800 feet by 100 feet. Five shipbuilding berths capable of taking ships of canal size, that is, up to 261 feet in length by 43 feet beam, are being erected.

**Bituminous Coal Production in 1917.**—The 1917 bituminous coal production in the United States is put at 544,000,000 tons, an increase of 42,000,000 over 1916, in preliminary estimates to-day by the Geological Survey. Fuel Administration officials had expected the total to be more than 550,000,000 tons, but a falling off in output in December reduced the figures. December's production was the smallest of any month since last April, due principally to car shortage. The last week of the month showed great improvement over previous weeks, but in that week the mines were operated at only 88 per cent. of their total capacity.

**Nova Scotia Industrial Production.**—It has been estimated that in 1917 the following values were produced by the industries of Nova Scotia:

| | |
|---|---|
| Coal | $23,600,000 |
| Coke and by-products | 5,000,000 |
| Gold and other minerals | 250,000 |
| Gypsum, limestone, etc. | 1,250,000 |
| Building materials and clay products | 450,000 |
| Iron and steel products | 20,000,000 |
| Fisheries | 10,092,000 |
| Manufactures, ships and freights | 47,750,000 |
| Products of the farm | 36,117,203 |
| Products of the forest | 4,500,000 |
| Game and furs | 500,000 |
| Total | $149,509,203 |

# WOODWORKING

**Peterboro, Ont.**—On Jan. 6, fire destroyed the factory of the Peterboro Canoe Co. For some months past the company has been manufacturing shell boxes, and the plant was stocked with machinery and materials used in this line of manufacture, in addition to the regular equipment for manufacturing canoes and power boats. The entire plant, with the exception of a warehouse, was badly gutted. The exact cause of the fire is not known. The loss to the building will be in the neighborhood of $30,000, and the machinery and stock will run the total loss considerably higher.

# INCORPORATIONS

**Modern Paper Box Co.** has been incorporated at Ottawa with a capital of $100,000 to manufacture boxes and pulp products of all kinds at Guelph, Ont. The incorporators are J. P. Hale, W. L. Clark and W. R. Mackenzie, all of Guelph, Ont.

**St. Lawrence Shipbuilding & Steel Co.** has been incorporated at Ottawa to build and operate ships, docks, etc., at Sorel, Que., with a capital stock of $1,000,000. The incorporators are P. Bercovitch, E. Lafontaine and N. Gordon, all of Quebec.

**Structural Steel Co.** has been incorporated at Ottawa by W. R. L. Shanks, F. G. Bush and H. W. Jackson, all of Montreal, to build bridges and structural work of all kinds. The company is capitalized at $5,000 and the chief place of business is at Montreal.

**The Dominion Metallurgical Co.** has been incorporated at Ottawa with a capital of $250,000 to manufacture iron, steel, alloys of all kinds. The chief place of business is Toronto, and the incorporators are H. A. Harrison, W. M. Cox and W. N. Robertson, all of Toronto.

**Pyrene Mfg. Co., of Canada, Ltd.,** has been incorporated at Ottawa with a capital of $100,000 to manufacture "Pyrene" fire extinguishers and fire fighting appliances of all kinds. The head office is at Montreal, and the incorporators are J. A. Miller, A. H. Elder and M. C. Lalonde, all of Montreal.

**The International Ore Corporation** has been incorporated at Ottawa by H. A. Harrison, W. M. Cox and W. N. Robertson, all of Toronto, to carry on the business of mining, washing, concentrating and smelting ores of all kinds. The chief place of business is at Toronto, and the capital stock of the concern is $1,000,000.

# RAILWAYS

**Guelph, Ont.**—Owing to the shortage of power the street car service here has been greatly curtailed. Manager Heeg stated recently that the situation had practically come to a question of closing down some of the smaller factories in order that the manufacture of munitions and the completion of war orders might proceed without interruption.

## BUILDINGS

**Toronto, Ont.**—The Graham Co., Chicago, Ill., are preparing plans for mail order warehouse, estimated to cost $1,000,000, for the T. Eaton Co. Toronto Office, H. J. White, 408 Ryrie Building.

## CONTRACTS

**Palmerston, Ont.**—At the recent municipal elections the by-law for partial tax exemption of the Paget Grain Door Co. passed.

**Toronto, Ont.**—The John V. Gray Construction Co. have been awarded a contract for a new boiler-house by the Swift Canadian Co.

**Brantford, Ont.**—The Austin Company, Cleveland, Ohio, have the general contract for an extension to the Dominion Steel Products plant.

## MARINE

**Toronto, Ont.**—The Toronto Ferry Co's. docks at the foot of Bay street have been destroyed by fire entailing a loss of $35,000. The steamer Chippewa was damaged to the extent of $1,000.

**Yarrows, Ltd., of Esquimalt, B.C.,** has a contract with the Imperial Munitions Board for producing thirty propellers. A large number of propellor contracts have been given to Yarrows. Each propellor has a diameter of 14 ft. 6in., and weighs roughly six and three-quarter tons.

**Chatham, Ont.**—The Chatham, Wallaceburg and Lake Erie Railway was operated last Friday for the first time with the use of hydro-electric power. For some time the road has been practically tied up, as a result of the low gas pressure, which is used to generate the current for the road. So successful was the test that it is quite likely the road will

**Vancouver, B.C.**—The wooden steamship Warnootaka was launched at the Western Canada Shipyards here last Friday. Mrs. R. A. Mann, wife of the president of the company, broke the bottle of wine over the vessel's bows The Warnootaka, named after the first white settlement in British Columbia, is said to be the first vessel of any size ever launched in False Creek. Her keel was laid July 20 last. She is 250 feet long, with a deadweight capacity of 2,800 tons.

## CATALOGUES

The Port Hope File Mfg. Co. of Port Hope, Ont., have issued a wall calendar featuring the P. H. and Imperial brands of files.

The Cleveland Twist Drill Co., Cleveland, Ohio, have issued an attractive wall calendar for 1918, which besides being of advertising value, serves to bring out a message which does not receive the attention that its importance merits. The calendar points out the invaluable work that is being done by the machinist in the great effort now being put forth in the production of munitions and equipment for the fighting forces. A copy of this calendar will be gladly sent to anyone interested.


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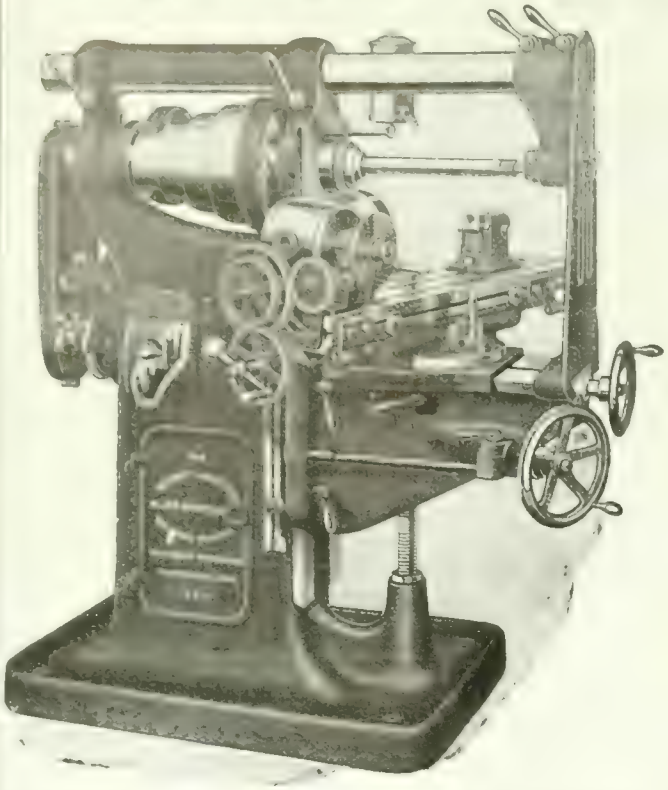

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Hanson-Whitney Co. 4
Hendey Machine Co. 3
Hendey Machine Co. 3
Hilles & Jones Co. 4
Hilles & Jones Co. 4
Hobart Bros. Co. 4
Hoefer Mfg. Co. 4
Holden, Edwin 4
Holden, Edwin 4
Holden, Edwin

# Comparison of Working Costs of Principal Prime Movers--I*

By Oswald Wans

*High thermal efficiency does not necessarily imply commercial superiority. Available data are seldom complete and render difficult the justification of claims and working costs advanced by advocates of respective prime movers. The engine of lower thermal efficiency may, therefore, under certain conditions, be the sounder proposition commercially.*

THE problem of economical power is one that must repeatedly present itself to those responsible for the welfare of industrial concerns, or indeed to any one upon whom falls the onus to provide power for whatever purpose. Yet the available data are seldom complete, and are frequently misleading. The claims and working costs advanced in favor of the several prime movers are often conflicting and difficult to reconcile with fact. It is not suggested that a lack of good faith is responsible, as an analysis of such estimated costs generally reveals the fact that the explanation is to be sought in the too limited basis upon which the costs have been founded. The condition that a certain type of engine possesses an exceptionally high thermal efficiency does not necessarily establish its commercial superiority. On the contrary, an engine of lower thermal efficiency may, under favorable conditions, be a sounder proposition from the commercial standpoint, and this in practice is the ultimate criterion of the engine's worth.

Working costs based mainly upon the low rate of fuel consumption are practically useless, and although the statement may be termed obvious, nevertheless, not infrequently one finds that the capital charges are either inadequately covered or entirely ignored. One may allege, without feeling, that the advocates of internal-combustion engines have been the greatest offenders in these respects, but it must be acknowledged that nowadays the undertakings of manufacturers generally are based upon broader lines, due doubtless to the accumulated data consequent upon a more extended experience.

The object of this paper is to give data that will be of service in estimating capital expenditures and working costs, and in establishing the relative commercial value of the principal prime movers. For this purpose typical examples of the following prime movers will be considered:

Suction-gas engines and plants burning anthracite, coke, and wood refuse.

Gas engines using town gas.

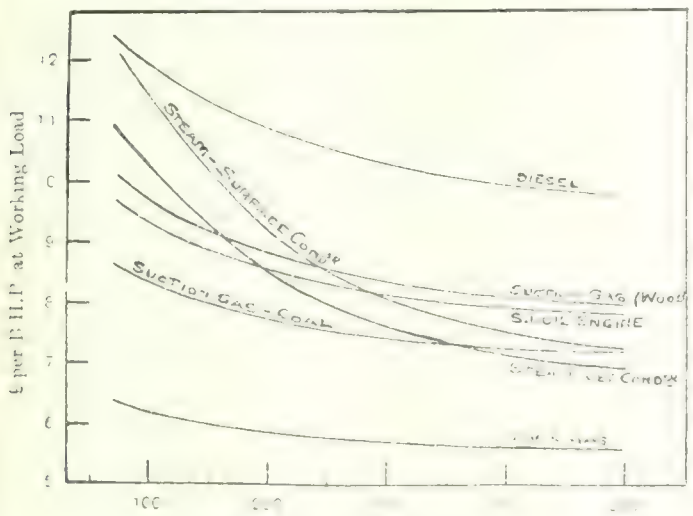
Oil engines of the solid injection high-compression type.

Diesel engines.

Steam engines.

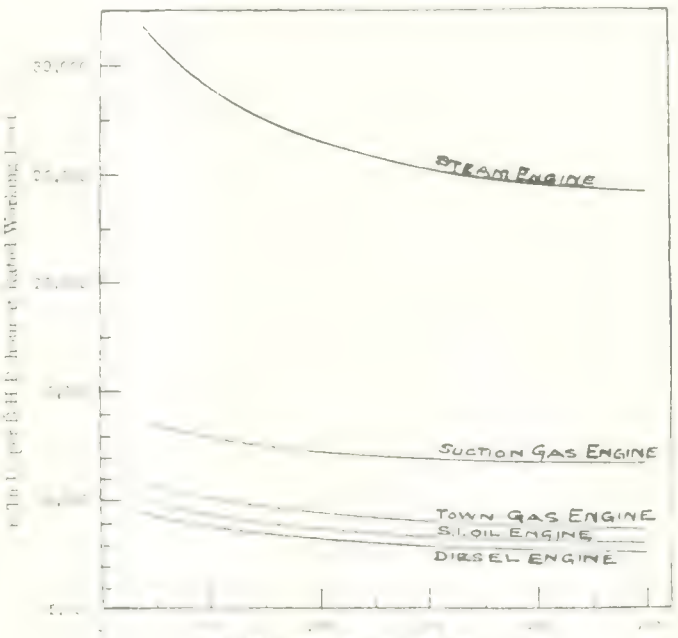
The scope of the paper includes units up to a working load of 500 b.h.p., a power range embracing the engines for which there is by far the greatest demand. For higher powers two or more units can be used sometimes with advantage, for such installations possess a considerable power flexibility, in that the units may be cut out or put into service to suit the load requirements. This facility largely obviates the disadvantages of underloading, particularly valuable in the case of an internal-combustion engine, and offers a further advantage in the event of a break-down of one unit, for a complete stoppage of work may be prevented. In a multi-unit installation the expenditure and working costs may be taken as proportional to the number of units.

It is desirable to confine the present paper to the power units indicated, as the factors governing the costs of the larger installations are distinct, for example, the possibility of using bituminous coal with a recovery plant, live and exhaust steam turbines, etc., should be considered, thus introducing another set of conditions. It is perhaps hardly necessary to state that working costs, to be of commercial value, must contain the charges due to capital expenditure, depreciation, etc., as well as those arising from the direct running expenses. Further, the latter should be founded upon "everyday" performances; the results of




B.H.P.—Rated Working Load

FIG. 2. EXPENDITURE CURVES




FUEL CONSUMPTION CURVES

avoided.

The items constituting the total working cost are:

**Capital Charges:**
Depreciation.
Insurance.
Running Charges
" " sundry stores.
" repairs.

It is necessary to determine firstly the capital expenditure and this factor therefore will be dealt with at once and

*Read before the Institution of Mechanical Engineers, London, Oct. 19, 1917.

[illegible] investigation of the local conditions.

### Capital Expenditure

The capital expenditure should cover the total cost of the completed installation in working order. The following list gives the items included in the expenditure curves, Fig. 1.

| Installation. | Items included in Expenditure |
|---|---|
| Suction gas or Town gas engine. Solid injection oil engine. Diesel engine. | Industrial engine, pulley, foundation bolts, compressed air starter with receiver and connections, exhaust pipe and silencer, barring gear, cooling tower, tanks, water circulating pipes and pump, foundation erection. |
| Additional for suction gas engine. | Producer, cleaning plant and charging platform, air and gas piping, producer foundation and bolts, erection. |
| Additional for town gas engine. | Gas mains connections and service piping. |
| Additional for solid injection oil engine and Diesel engine. | Fuel tanks and piping. |
| Steam engine. | Industrial jet and surface condensing super-heated steam engines, barring gear, foundation and bolts, steam, exhaust and feed piping, boiler, seatings and flues, super-heater, feedwater heater and pump, steel chimney, economiser for 150 b.h.p. and upwards, erection. |

It will be observed that buildings and flooring have not been included. These exemptions are made, as their cost varies widely, being largely dependent upon the taste of the purchaser, and may, therefore, range from a bare galvanized structure to a substantial stone or brick building. Furthermore, existing buildings are frequently used with more or less modification.

quire a covering, whereas some form of protection is necessary for a boiler. A well-equipped engine-house should possess a crane, but the cost of this item is dependent to a certain extent upon the proportions of the engine-house, and has consequently not been taken into consideration, but its cost would not be materially different for the several types of engines. Cooling towers have been included in all cases, with the exception of the small gas and oil engines of about 50 b.h.p., as the more usual practice is to employ cooling tanks suitable for thermo-syphon circulation.

When deciding the size of the engine, it is necessary to consider its overload capacity, for this factor greatly affects the capital expenditure, the reliability, and the fuel economy. It may be remarked in passing that much of the trouble at times experienced with internal-combustion engines is solely due to excessive overloading. That gas and oil engines should have a large power margin is an essential of reliability and cannot be too strongly emphasized. The effect of the overload capacity upon the economy of an installation is dealt with later, and for the present merely its influence upon the capital expenditure will be examined. The maximum overload that may be depended upon varies considerably with the type of engine, thus:

Steam engine . . . 35% above rated working load
Solid injection oil engine . . . . . 15% above rated working load
Diesel engine . . . . . 15% above rated working load
Gas engine . . . . . 10% above rated working load

The larger overload carried by a steam engine is a characteristic of considerable value in the handling of fluctuating and peak loads. Moreover, this advantage is attained without impairing the fuel economy at the working load. Unfortunately this feature is not possessed by an internal-combustion engine. An overload of 35 per cent. may be carried, but only at the expense of the fuel economy at the mean working load, which in the case of a gas engine would be about 18½ per cent. below the rated working load.

The degree of importance to be attached for all installations. A common maximum load of 35 per cent. above the mean working load consequently has been assumed, and the effect upon the capital expenditure is illustrated by the following table:

| Plant. | Rated Working B.H.P. | Rated Max. B.H.P. | Necessary Inc. in Rated Max. Load to give 35% overload |
|---|---|---|---|
| Steam engine . . | 100 | 135 | Nil |
| Oil engine . . . . . | 100 | 115 | 17½ per cent. |
| Diesel engine . . . | 100 | 115 | 17½ per cent. |
| Gas engine . . . . | 100 | 110 | 23 per cent. |

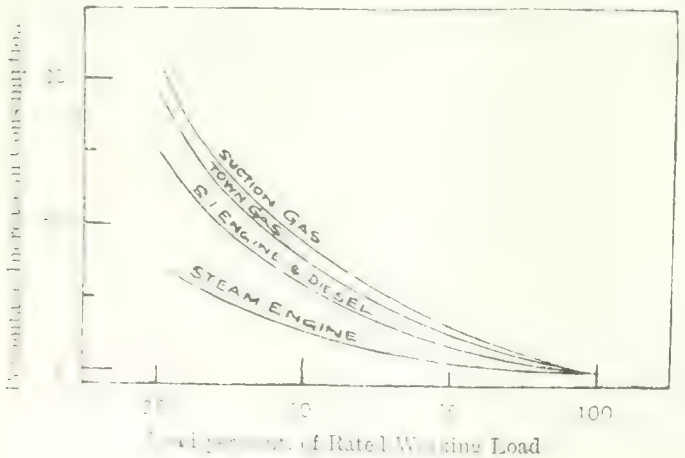
For a mean working load of 100 b.h.p. and 135 b.h.p. maximum load it will be seen from the fourth column that a larger internal-combustion engine is required than is indicated by the rated working load. For example, the gas engine must have a maximum load some 23 per cent. greater than the rated maximum load usual for a 100 b.h.p. rated working load engine requiring, it follows, a larger engine and outlay than appears at first sight to be necessary.

The expenditure curves, Fig. 1 (page 71), give the total cost per b.h.p. at the rated working load, and from which it will be seen that the cost of suction-gas engine and plant of 100 to 110 b.h.p. is £8.3×100=£830 as against £8.1×123=£997 for a 100 to 135 b.h. engine. That is to say, the cost of the gas engine is increased by approximately 20 per cent. in order that it may perform a duty equivalent to a steam engine of 100 b.h.p. rated working load. This example serves to illustrate how necessary it is when comparing capital expenditures to place the comparison on "all fours" as regards power capacity.

The expenditure curves are based upon the costs of horizontal engines, excepting Diesel engines, but would not be greatly different for the vertical type. Generally speaking, vertical engines cost more per horse-power, but a saving is effected in the cost of the foundations.

### Depreciation

A divergence of opinion appears to exist as to the annual charge that should




SUCTION AND LOAD CURVES

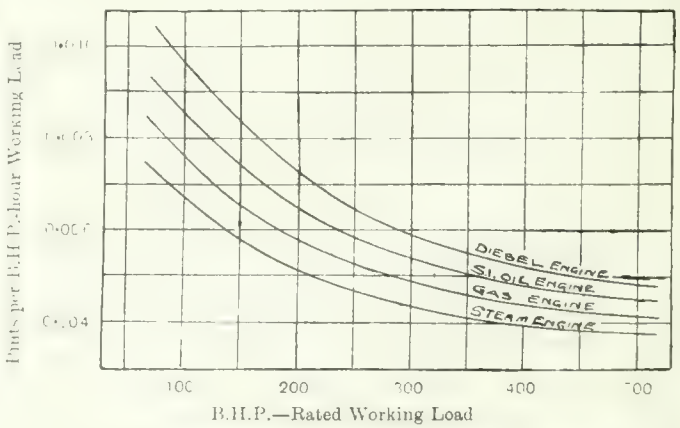



FIG. 1. LUBRICATING OIL CONSUMPTION CURVES.

The cost of the buildings for internal-combustion engines would be less than for a steam plant, and this applies equally to suction-gas engines, for the producer and cleaning plant do not re-

ed to the overhead capacity of an engine can be decided only after full consideration of the duty required, but for the purposes of comparison it is necessary that similar load conditions are consider-

be made to cover depreciation. The seller naturally wishes to place as favorable a complexion as possible upon the engine in which he is particularly interested, and it is to be feared that this

desire tends to under- rather than over-estimation of the charges under this heading. Generally speaking, the estimated costs of steam installations show a greater uniformity and liberality in this respect than is usual with internal-combustion engines. As an example of

iginally installed. Yet it is surprising how often one finds an antiquated engine struggling along with its load, and positively eating money that could be saved by substituting a modern plant. The depreciation of 5 per cent. referred to above corresponds to a life of well over fifty

especially suitable a particular type of prime mover, thus eliminating this factor and thereby deferring the probable date at which the plant may be considered obsolescent.

**Insurance and Interest**

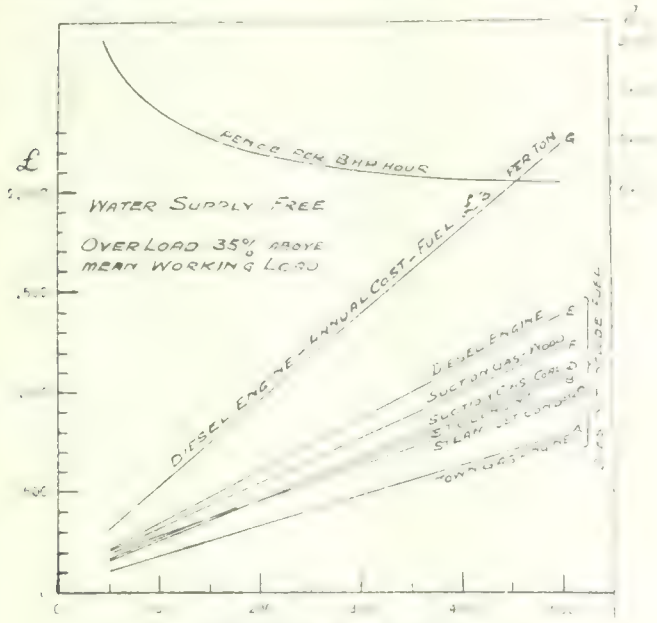
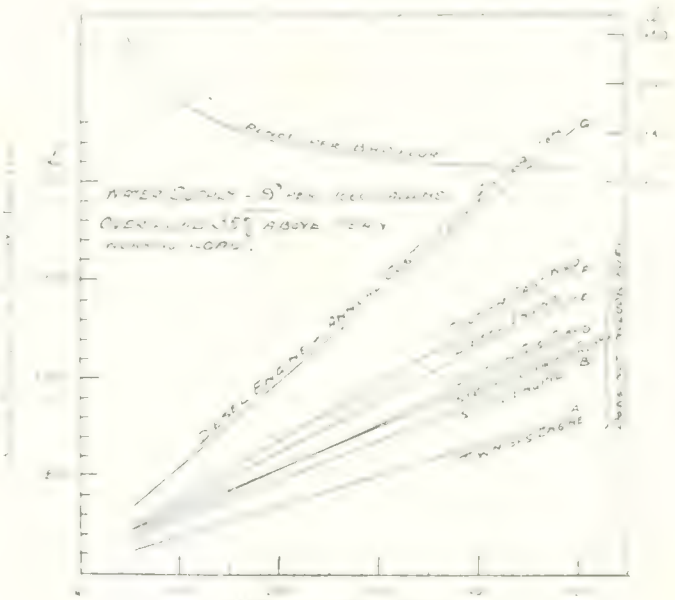



FIG. WORKING COST CURVES



WORKING COST CURVES

the low rate for depreciation for the latter, the not uncommon charge of 5 per cent. may be cited. A little reflection should show how inadequate a provision this affords. It will be well to explain briefly what is here implied by the term depreciation. The depreciation charge is considered as the annual amount that should be written off the capital expenditure to cover the deteriorating value of the plant as regards obsolescence. This definition does not agree with general usage, inasmuch as wear and tear are not included.

In the author's opinion this departure is justified because:

(1) Developments are nowadays so rapid that there is an increasing tendency for a power plant to become economically obsolete before it is worn out.

(2) The allowance made for repairs should be sufficient, in a modern engine, to cover wear and tear during its economical life whilst serious breakages should be covered by insurance.

Viewed from these standpoints, it follows that the depreciation charge is solely dependent upon the anticipated economical life of the installation. In other words, it is not a matter of how many years an engine may run, but for what period it can be reasonably expected to maintain its economical superiority over competing prime movers irrespective of type. Immediately this superiority is lost, the commercial value of the installation, as a source of power, falls and the advisability of replacing it by an up-to-date plant should be considered.

It is false economy to keep a plant in service merely because it continues to perform the duty for which it was originally installed. Yet it is surprising how often one finds an antiquated engine struggling along with its load, and positively eating money that could be saved by substituting a modern plant. The depreciation of 5 per cent. referred to above corresponds to a life of well over fifty years, if based upon the diminished value and allowing a high scrap value or about twenty years if taken in equal annual instalments. In either case the anticipated life is obviously excessive. The determination of this period must, in the nature of things, be somewhat prophetic, nevertheless the past, to a great extent, is an index to the future, and it may be inferred that an internal-combustion engine before the expiry of twenty years' service would be an extravagant consumer of fuel, and in a generally worn-out condition; indeed, this would be equally true of a steam installation.

The depreciation rate should spread the expenditure burden over a reasonable number of years, and permit in good time of the removal of the power plant in favor of a more modern type, should the developments in later-day practice render the running costs comparatively high. It is considered that a uniform annual rate of 8 per cent., equivalent to twelve and a half years' service, fulfils these conditions, and that this rate should apply to all the prime movers under consideration, seeing that the commercial life is dependent upon the best practice, irrespective of the type of engine. The amount written off annually is, therefore, 8 per cent. of the total expenditure given by the curves, Fig. 1 (page 71).

It should be noted that this uniform rate is intended to apply to cases in which the several prime movers under consideration are applicable and, therefore, in competition. The competitive factor applies to the large majority of installations, but there may be instances in which the working conditions render especially suitable a particular type of prime mover, thus eliminating this factor and thereby deferring the probable date at which the plant may be considered obsolescent.

**Insurance and Interest**

The insurance premium for engines usually covers breakage, but not wear and tear, and this fact should not be lost sight of when fixing the annual reservation for repairs. The premiums range from about one-eighth per cent. of the cost in the case of boilers to about 3 per cent. for Diesel engines. The charges under this heading are therefore comparatively small, whereas the accruing advantages are self-evident. The rate of interest upon the capital expenditure has been taken as 5 per cent. in the working costs, curves Fig. 5 and 6.

**Cost of Fuel**

As already stated, estimated working costs, founded upon the fuel consumption possible at the most economical load, are of little value. Everyday figures only should be considered, and failure in this respect is frequently the cause of erroneous estimates. In practice the engine seldom runs at the rated working load, having to cope alternatively with loads that may be temporarily greatly in excess and at other times considerably less. These practical conditions have a marked bearing upon the working costs, and particularly so in the case of an internal combustion engine.

The accompanying curves, Fig. 2 (page 71), show the average consumptions in B.T.U. per b.h.p. hour at the rated working load. These values, however, hold good only when these loads are carried continuously, and the extent to which modification is necessary to suit practical conditions is contingent upon the load factor and the peak loads to be

ed upon its merits, but to effect a comparison a common overload of 35 per cent. will be assumed again. This condition necessitates the underloading of all the installations with the exception of the steam plant, that is to say, the mean working load will be below the rated working load to an extent dependent upon the maximum load capacity of the unit.

This unloading increases the consumption, and the curves, Fig. 3, show the average percentage increase for a given decrease in load below the rated working load.

These curves clearly indicate the importance of the correct determination of the load factor, and the absolute necessity to consider similar load conditions in order that a true comparison may be made. The following table shows the increase in full consumption due to the underloading necessitated by an overload of 35 per cent.:

| | | Increase |
|---|---|---|
| | working load | from Fig. 3 |
| Steam engine ..... | Nil | Nil |
| Oil engine ..... | 14.5 | 2.5 |
| Suction gas engine... | 18.5 | 12.0 |

A farther allowance must be made for stand-by losses, which will depend upon the frequency and length of the stoppages. This loss of course applies only to suction-gas and steam installations, and the amount may vary considerably according to the care exercised. The following values, expressed as a percentage of the fuel consumption at the rated working load for a working week of 60 hours, have been included in the working costs, curves, Fig. 5 and 6.

| | per cent. |
|---|---|
| Suction-gas installations, anthracite | 8 |
| Suction-gas installations, wood | 6 |
| Steam installations | 15 |

In cases where the plant runs continuously throughout the week, the losses would be considerably less and would be about one-third, assuming that the boiler or producer fires are kept alight over the week-end.

## BANK OFFICIALS REVIEW ONTARIO'S 1917 TRADE

IN the course of a comment on business conditions written by leading officials of the Canadian Bank of Commerce and forming part of the report of the annual meeting of that institution it is pointed out that it should be constantly borne in mind that the large measure of prosperity which the people of Ontario continue to enjoy is almost wholly attributable to the extraordinary requirements created by the war. The increasing demand for commodities of almost every description stimulated production throughout the year and unceasing activity has characterized practically every important branch of industry in the province. Agricultural returns are above the average, manufacturing results are most satisfactory, the mining output has been large and business conditions generally are sound; in fact, substantial progress has been made towards placing many industries, both old and new, on a basis which should enable them to meet successfully the keen competition for trade which is anticipated after the conclusion of peace.

### Manufacturers Prosperous

The manufacturing industries have prospered in a manner far exceeding all expectations, which is largely the result, either directly or indirectly, of the Government expenditure on supplies for the war. Manufacturers of munitions during the greater part of the year have been working to capacity, but latterly, owing to the cessation of orders for shells, fuses, etc., there has been some slackening in activity. All steel plants, rolling mills, and wire mills have been fully occupied. The manufacture of agricultural implements has received special impetus from the heavy purchases of the farmers throughout the Western provinces. Motor car manufacturers have been busy and some plants report the largest output on record. Considerable development has taken place in the production of woollen goods, and it is conjectured that the Canadian mills will be able to hold a larger share of the domestic trade after the war. Orders for munitions and military supplies have latterly been received from the United States, and it is anticipated that many mills will be fully engaged with these until midsummer next. All this increased activity has been accompanied by steadily increasing cost of materials and of labor, particularly of the former, the scarcity of which in many lines is increased by the prolongation of the war.

### Purchasing Power High

The purchasing power of the public remains high and wholesalers and retailers report business as being exceptionally good, with collections promptly made and losses from bad debts unusually small. The difficulty of securing certain lines of merchandise has increased. Owing to the check experienced as a result of the cessation of munition orders, buying has proceeded carefully and merchants realize more clearly than ever before the necessity of carrying reasonably light stocks. The labor situation caused manufacturers considerable anxiety and difficulty during the first part of the year, but this condition has been somewhat ameliorated owing to the lessening of munition orders.

There has been little movement in real estate or in building, although the demand for small houses is in excess of the supply. A fair inquiry exists for good farms, and there has been less tendency on the part of renters to leave their farms. The high price of labor operates as a deterrent to any great extension of a back-to-the-land movement, which the prevailing high prices might justify. Payments of interest and principal on mortgages have been up to the average, with little or no increase in the demand for new loans.

### Lend Surplus Funds

That the inhabitants of the Province of Ontario as a whole have enjoyed unexampled prosperity during the past few years has been signally demonstrated by their response to the appeal to lend their surplus funds and future savings to the Dominion of Canada for the carrying on of the war. The Victory Loan offered by the Minister of Finance amounted to $150,000,000 and 362,900 individual subscribers in the Province of Ontario alone applied for $203,823,500, much more than the total loan and nearly half of the amount subscribed by all the provinces of the Dominion, which amounted to about $417,000,000. This great achievement will undoubtedly result in a new spirit of thrift and economy, while the self-discipline and accumulated savings should aid materially in lightening the load which later on will have to be carried through the period of readjustment that must of necessity follow the declaration of peace.

## RAILWAY EARNINGS SHOW GOOD INCREASE

GROSS earnings of the three principal railway systems of Canada aggregated $255,552,275 in the calendar year 1917, exceeding the largest total previously recorded for any year, namely, 1916, by $21,264,805, or 9.1 per cent.

The figures for the year, as compiled from the weekly earning returns of Canadian Pacific, Grand Trunk and Canadian Northern, were completed by Canadian Northern's return for the final ten days of December. While the weekly returns are subject to slight adjustment in the final monthly reports of the companies, the comparisons from year to year vary but slightly in the grand aggregate.

The rise from the acute depression of 1914 has been spectacular in the extreme. Against some 179 millions in that year the receipts of the roads rose to 255 millions in 1917, an increase of 76 millions, or about 43 per cent. On the upward swing the previous high mark in gross business established in 1913 has been exceeded by 37 millions.

The record for the year by months shows the heaviest gains in the spring months, as compared with 1916, some narrowing of the increases in the summer and a further expansion in the autumn. The only month in which the figures fell below the 1916 level was August.

The individual returns of the companies for the year show a fairly even percentage of expansions. It may be noted that while the weekly returns place C.P.R.'s aggregate at the new high level of $148,937,000, the actual total in the monthly returns, based on complete figures for eleven months and weekly figure for December, will exceed $152,000,000.

## WORK OF SHIPPING BOARD OF GREAT MAGNITUDE

THE first annual report of the United States Shipping Board, brief mention of which was made in last week's issue, says among other things that the Emergency Fleet Corporation, which is the most important of the board's war powers, is now engaged in what is probably the greatest construction task ever attempted by a single institution. It has developed for this purpose within a period of six months an organization of more than 1,000 employes, including a large force of technical experts. The corporation has sixteen offices in various parts of the United States. It is supervising the building of 1,118 vessels in 116 shipyards distributed throughout the United States. It is disbursing for the construction of those ships something in excess of a billion dollars per annum. It is controlling substantially all the shipbuilding of the country other than of naval vessels, and its program calls for the completion in 1918 of eight times the tonnage delivered in 1916.

### Meeting the Situation Fairly

When the United States entered the war, says the report, American shipbuilders were principally engaged in the construction of ships for foreign account, principally British and Norwegian. The yards were working substantially at capacity. The problem of the corporation, therefore, was not merely to build ships, but also to build new yards in which more ships might be constructed.

To this end, contracts were placed for a large number of wooden ships, most of them to be built in new yards, it being found that such ships could be built, within certain limits, without interfering with the steel ship program. The corporation has experienced some difficulty in arranging for supplies of proper lumber, but it is believed that this difficulty has been largely overcome and that the wooden ships may be expected to be completed with a fair degree of promptness.

### 2,500 Ton Steel Ships Requisitioned

As to steel ships the corporation has made every effort to standardize designs for steel construction, but it is deemed inadvisable at this time to publish the details of those designs.

In order to speed up construction and to assure unity of control over shipyards, the corporation, on August 3, 1917, in accordance with President Wilson's order of July 11, 1917, requisitioned all steel ships under construction of over 2,500 tons dead-weight capacity. As a result of this order the United States became possessed of 413 ships in various stages of construction, of a total tonnage when completed of 2,937,808 tons. Of these, 33, of a total tonnage of 257,575, have been completed, and it is estimated that the remainder will be delivered within the next 18 months.

### Training the Workers

The corporation is making rapid progress in placing direct contracts for ship construction. In the last analysis it is man-power that builds ships; and the mobilization of a large, competent, trained and willing force of workers for the shipyards of the country has been among the most important of the corporation's activities.

Other [illegible] low:

The board has recently adopted a policy of requisitioning for government account all power-driven steel cargo vessels of 2,500 tons dead-weight or over, and all passenger vessels of 2,500 tons gross register or over, adapted to ocean service. The operation of these vessels is entrusted in large part to the companies by whom they were formerly controlled, but all receipts have been for government account, the owners being credited with the requisition rate fixed by the board. The vessels, moreover, are under full control of the board as to voyages, cargoes, and rates and as to safeguards for their protection against the hazards of war-zone service. It is hoped that this policy will be the means of achieving two results which in the opinion of the board are necessary: First, complete unity of control over the distribution of shipping, so that war needs may be filled in the order of their emergency; and second, just and effective regulation of rates, so that [illegible] war with Germany may not be financially exhausted by extortionate transportation charges.

Further experience may develop that, consistent with the purposes above outlined, some of the steamers not adapted to war service may profitably be released from requisition. As to other lines, more effective methods of regulation and control may prove to be necessary. It should be borne in mind that aside from the requisition power the board at present has no jurisdiction over rates in foreign trade and no jurisdiction over interstate rates, except where vessels are common carriers operating on regular routes. If experience shall prove it to be necessary, the board will recommend drastic legislation to meet more effectively the situation arising from the acute dearth of tonnage.

The freight rates to be charged to shippers on requisitioned vessels left in commercial service or assigned to foreign governments have been the subject of careful consideration. The board, of course, has no desire to profiteer at the expense of any government associated with the United States in the war against Germany, or of the general public. On the other hand existing contracts, particularly those on a c.i.f. basis, and special market conditions often present a danger that a reduction in rate will not insure to the benefit of the consumer but will merely transfer from the shipowners to favored shippers the monopoly earnings which it is intended to eliminate. The policy of the board therefore will be to charge freight rates based on the requisition rate whenever it can receive assurance that the benefit of these low rates will accrue to the American or allied governments or to the consuming public; and to charge higher rates whenever this fact shall not be so established. The application of this policy will no doubt present difficulties in individual cases but it is believed in principle to be sound.

The requisition program as yet has been in effect for such a short period of time that no accurate statement of receipts and expenditures can now be made. Accounts, however, are being kept with scrupulous care along sound and conservative lines, and in due season will be presented to the Congress.

### Ships From Great Lakes Utilized

The Great Lakes, shut off as they are from sea-level connection with the ocean, have nevertheless contributed materially to the work of procuring tonnage for war purposes. An unprecedented number of newly constructed ships have been brought down from the Lakes, and in addition 21 steel steamers have been withdrawn from Lake commerce and are being brought down for war service. Of these, 16 were too long to pass through the locks, and it was necessary to cut them in two, bring them down in parts, and reassemble them on the St. Lawrence. Twelve of the vessels were put together afloat, an achievement never before accomplished. Ten steel tugs have also been commandeered from the Lake fleet, and are being fitted with surface condensers for ocean use.

A committee has been appointed to advise the board as to the matter of just compensation to be paid for vessels from the Lakes to which title has been taken, [illegible] its task.

### Chartering Committee's Duties Outlined

The program of control of shipping through requisition covers only American steam vessels over 2,500 tons dead weight. To exercise a salutary degree of control over other American and neut[illegible] a chartering committee was established, with offices in New York; and with the assistance of the War Trade Board all charters of neutral ships, of American steamers under 2,500 tons, and of sailing ships of any size loading from ports of the United States to foreign ports, must be approved by this committee. The committee has exercised this control with two primary objects in mind: First, so far as possible, to induce neutral tonnage to assume its fair share of trans-Atlantic trade; and, second, to effect a material reduction in the high charter rates prevailing, not only in trans-[illegible] oriental trades.

Under Schedules 1591 and 1593 the Bureau of Supplies and Accounts of the Navy Department is calling for bids for furnishing various navy yards with large quantities of electrical material. Among [illegible] magnet wire, etc.

The War Trade Board has passed a resolution authorizing the director of the bureau of exports to license freely cargoes originating in the United Kingdom, France and Italy or their colonies.

possessions or protectorates when shipped via United States ports to United [illegible] ports, etc.

[illegible] that which leaves Canada by rail, passing through the United States in bond, and then shipped from a United States port, and cargo shipped from Canada by [illegible] at a United States port.

With regard to shipments from Canada to Japan [illegible] by steamers which call at a port of the United States, the same ruling will apply as to shipments from Canada to England, and such cargo will be licensed by the collectors of customs in exchange for copies of the manifest.

Eighty commercial automobiles, valued at $69,709, and 1,020 passenger motor cars, valued at $676,483, were exported from the United States to Canada during October, according to the latest returns of the Department of Commerce. During the ten months' period ending October, 1917, there were 696 commercial motor cars, valued at $913,088, and 14,261 passenger automobiles, valued at $10,791,081, imported into Canada from the United States. The combined exports of commercial and passenger automobiles from the United States to the Dominion in October a year ago numbered 1,021 cars, valued at $718,962, while during the ten months' period of that year they were 11,118 cars, valued at $8,025,079.

## TRAIL SMELTER OUTPUT

OPERATIONS of the Consolidated Mining and Smelting Co. of Canada, during the year ending September 30, 1917, were significant and not only was the great enterprise at Trail, B.C., a financial success, but satisfactory progress in the matter of development has been made as well.

The main achievement was the production of 10,000 tons of pure zinc of a value of $3,000,000, which event marks a definite stage in the metallurgical history of the country. The production of refined lead was increased by 2,000 tons to 22,000 tons, the production of sulphuric acid was doubled, and a new record was made by the production of $13,000,000 worth of metals.

J. J. Warren, managing director, states that a daily production of over sixty tons of pure zinc was reached during the year, and that an extraction of over 90 per cent. was made from certain classes of ore. Since the process has been standardized every effort is being made to reduce costs, and a concentrating mill with a capacity of 400 tons of ore a day is being operated to treat the Sullivan zinc ores. On the question of profits, the managing director gives [illegible] Board [illegible] tation of a keen buyer, inasmuch as the Board has required that the company meet the prices current in the United States with a certain allowance for [illegible]

has absorbed the bulk of the company's production, the Canadian commercial requirements having slackened very considerably during the war.

## AMERICAN DYE MAKERS ORGANIZE

REPRESENTATIVES of more than 200 aniline dye manufacturing firms and corporations and dealers in dye stuffs met in New York, January 22 and 23, to discuss the formation of a national trade association to serve as a clearing house for information in stabilizing and standardizing the dye trade. In the three years since January, 1915, the business of dye making in the United States, has increased with almost immeasurable rapidity until to-day there exists a commercial development in which $200,000,000 of capital has been invested, but which is without standards as to quality, production, costs, credits, exact terminology, etc.

H. Gardner McKerrow, manager of the Textile Department of E. F. Drew & Co., Inc., has taken the lead in organizing the movement for the meeting, Mr. McKerrow is spokesman for a large element in the dye trade that seeks a co-operative association which will standardize colors and tints, voice the consensus of the trade on tariff schedules, formulate contract forms, provide for the arbitration of disputes, and serve as a clearing house for the exchanges of trade information on credits, packing, labor and raw materials.

"Before the outbreak of the world war there were less than half a dozen dye manufacturing concerns in the United States contending with the competition of the incredibly efficient German aniline dye manufacturers," said Mr. McKerrow. "To-day there are more than 200 American manufacturers of intermediates and of aniline dyes and there has been invested $200,000,000. The business has been supassingly prosperous but prosperous under conditions of fictitious values and the curtailment of competition."

"The leaders in the trade are anticipating the economic stress of peace times, when the German manufacturers, striving to recover their place in American markets and in other export fields, will have the backing of their most proficient trade methods, their co-operative cartels, and the support of state mobilized shipping and banking facilities. American dye manufacturers, each with his own color standard, his own standard of concentration of dye stuffs, experimenting for himself as to specialties, etc., will be unable to withstand the teerible drive of the highly trained shock battalions of Teuton aggressiveness in the world markets.

Mr. McKerrow said that several representatives of the Federal Government from the various governmental departments interested in the production of coal tar derivatives would attend the dye manufacturers' meeting. The large Du Pont interests have expressed great interest in the meeting and will be represented. There will be representatives from dye manufacturing firms and corporations in Passaic, Paterson, Camden, Jersey City, N.J., from Cincinnati, Philadelphia, Chicago, Boston, Providence, and Toronto and Montreal, Canada.

## U.S. STEEL CORPORATION OUTPUT

THE United States Steel Corporation reports that unfilled orders on hand December 31 amounted to 9,381,718 tons, compared with 8,897,106 tons on November 30, an increase of 484,612 tons.

Unfilled tonnage on hand Oct. 31 amounted to 9,009,675 tons; on Sept. 30, 9,833,447 tons and on December 31, 1916, 11,547,286 tons.

The increase of 484,612 tons in the unfilled tonnage in December was much more favorable than looked for. Preliminary estimates had it that there would be a decrease of something like 200,000 tons. The December statement shows that new business came in at a rate almost 20,000 tons daily in excess of shipments.

The inability of the Steel Corporation to ship its products, due to inadequate transportation facilities, evidently had a great deal to do with the increase, but it is evident that new orders in December were very close to capacity. December shows the first increase in unfilled tonnage since April, 1917. Unless there is a decided change for the better in transportation facilities, the current month should show a further increase in orders, but it must be borne in mind that these increases are largely at the expense of shipments and earnings, and do not represent conditions as they actually exist, because, had normal shipments been made in December there would have been an increase in that month, but a much smaller one than actually reported.

## TOO MANY APPLICANTS FOR MUNITIONS WORK

MARK H. IRISH, director of the Department of Labor, Imperial Munitions Board, Toronto, recently issued a letter on the subject of labor. He says:—

"It has been brought to my attention, by the Ontario Government Employment Bureau, that large numbers of men and women applying for work state their preference for positions in munitions plants, and, when informed that, at the present time, there are no vacancies, continually decline opportunities in other industrial lines, stating they prefer to wait for openings in munitions production rather than bind themselves elsewhere.

"Such actions doubtless arise from a belief that an increase in munitions will shortly be needed. I am aware that there is no foundation for such opinion, and I earnestly repeat the advice that I gave last autumn, namely, where employment is desired, such employment should be secured, and under no circumstances should existing chances for work be put aside in the hope of a demand for employees from munitions plants."

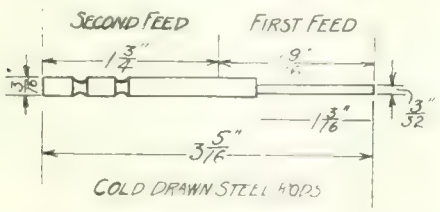
# PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

## HOW A SCREW MACHINE JOB WAS DONE

By H. Middletown

WE had to turn out a quantity of the rods shown in the drawing. They were easy to make but at the time the only machine available was a ⅜ in. Hartford automatic which was suitable for work only 1½ in. in length. That was sufficient for the portion to be turned and it was by stretching things a little increased to feed 1¾ in. The stock was then arranged to feed out 1 9/16 in. for the first operation of turning and then to




feed the remaining 1¾ in. for the necking and cutting off operations. Two stock stops were used in the turret and the box milling tool located between them to provide the proper sequence of operations. The fourth hole in the turret head was left vacant.

As is apt to be the case when working near the limit, an interference occurred and in an unexpected quarter. It was found that on bringing back the turret after the turning operation the turret would start to index before the box tool had cleared the work. This was apparently an insurmountable obstacle and held up the job a couple of days. It was finally suggested that the chuck be opened a little previous to allow the stock to be drawn back ¼ in. which was enough to clear the tool while it swung by, this to be followed by feeding up to the stop as before. This simple little trick solved the problem and the job was run [illegible]

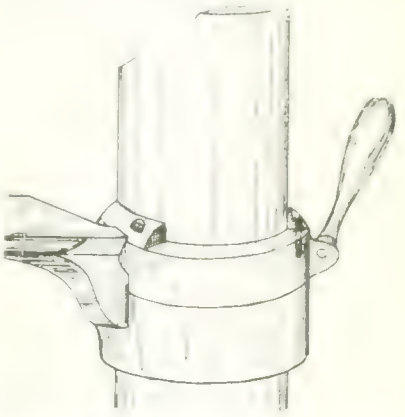
## IMPROVEMENTS TO SENSITIVE DRILLS

By Donald H. Hampson

TO anyone who has worked any length of time around sensitive drills, there must have occurred the question, "why don't the makers make certain minor improvements that would add so much to the life of the machines?" Such improvements would be a positive fastening for the rack on the back of the quill, an adjustment to take up the slack between this rack and its pinion, a dirt protector for the table where it slides on the column, and a better fastening than a set screw for the head or socket that contains the hand feed rod.

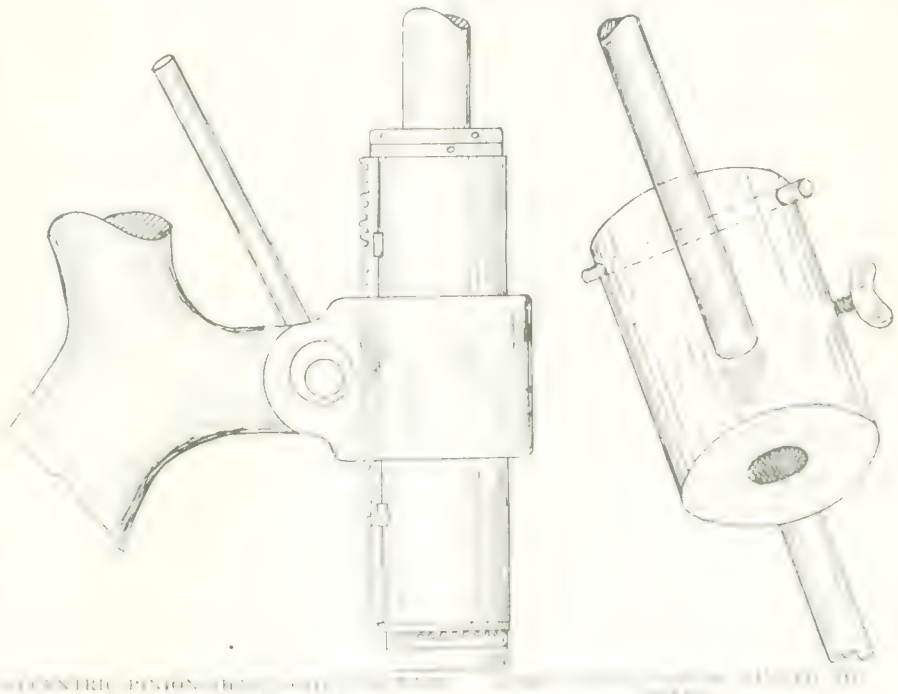
The first two defects are felt most keenly when counterboring or drilling to an exact depth, or especially [illegible] when using small drills on "through" holes. The slack manifests itself by the catching and breaking of the drills as they break through the bottom of the work and by an uneven depth of hole on the blind work. Why any maker ever started to use two No. 10 screws to fasten on the rack is a mystery; they do fairly well when new but after a year of service the screws get loose and wear the holes and then no screws can be kept tight in them. If a key were put across the rack and quill, it would take the thrust of feeding and the screws would never get a chance to loosen up. The best fitted screws would crush their own threads and those in the hole, if continually hammered, as are the rack screws. As the teeth wear and chiefly, as the pinion shaft bearings wear, there is lost motion at these points which is directly noticeable to the workman. This can be taken up by packing behind the rack or putting in new and over size parts. The proper way would be to put bushings in the pinion shaft bearings and if these were made eccentric, all wear could be taken out by re-setting these.

All the known constructions of table about the column are the split and binder type and with all of them the loosening to move the table creates a gap, which though sometimes small is always big enough to receive falling chips. Those workmen who invariably wipe all the dirt off before loosening the clamp are as scarce as the proverbial hens' teeth. Once this dirt gets in, it never gets out (unless the drill gets an overhauling) and consequently the table is tipped out of line. A wiper or scraper would prevent this trouble just as it protects the vital parts of a grinder.



WIPER TO PREVENT CHIPS FALLING BETWEEN COLUMN AND TABLE STRAP

The feed lever is usually put through a casting that is set on the right hand end of the pinion shaft and in many cases it is fastened with a set or thumb screw, presumably to allow the casting to be turned to a more convenient position for feeding. If the feed lever is made to shift through the socket, two positions are obtained which are all that [illegible] movement of the table or the head will provide any other setting to bring the lever into a handy location. This casting should be a tight fit on the pinion shaft and should be either keyed or taper pinned. The time which a boy, if not watched, will take



ECCENTRIC PINION [illegible] KEYED TO DRIVE [illegible]

to make the necessary (?) adjustments which this loose casting and the thumbscrew requires is unbelievable; the time spent in trying to keep it right after it has worn sloppy and the set screw has marred the shaft is exasperating and uneconomical.

Any workman likes to feel a snug machine under his hands. He cannot help doing more and better work when a touch of his hand produces an instant movement of the tool instead of taking up the slack in a dozen places first, like an engineer starting a heavy train of cars. These suggested changes would be mere trifles in the cost of building the machines but they would add immensely to the value to the ultimate consumer.

## DIES AND DIE MAKING

By J. D. O.

OWING to the increased demand for standardization and interchangeability of parts, the subject of dies and die-making is becoming more and more important every day, so much so that the die-maker is rapidly becoming a specialist and the demand for good die-makers is much greater than the supply. There are a great variety of dies, some of them costing thousands of dollars and even at that price they are a paying investment.

### Effect of Taper on Punch

The commonest form of die is the ordinary round punch and die used for punching rivet holes in boiler plate and other material. The amount of taper given to the punch is an important factor in the life of the punch. Some argue that the taper on a punch allows the metal to close round the punch and makes stripping harder. This does not seem to be borne out by tests and experiments that have been made. Three

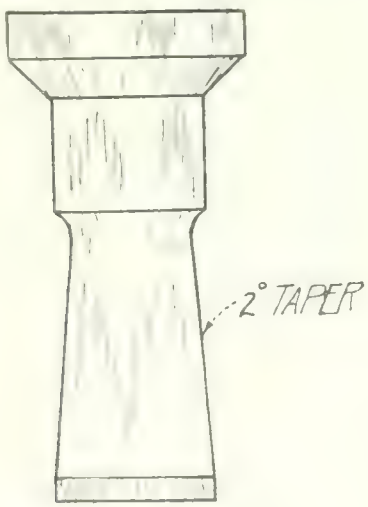



FIG. 1. PUNCH WITH TAPER.

punches 23-32 in. dia. were made, and three pieces of machinery steel 2 in. wide, 2½ in. long and ⅝ in. thick were punched, one piece with each punch. One punch was made straight, one with one degree taper, and one with two degrees taper. The three punched pieces were stripped from the punch by a testing apparatus under exactly the same conditions. The punch with a two degree taper stripped at 550 lbs. The punch with a one degree taper at 780 lbs., and the straight punch at 2,000 lbs. A punch made with two degrees taper strips easily and stands up well against breakage due to stripping. It is a well known fact that a large percentage of punches are broken in stripping; on the other hand a taper punch cannot be ground without losing its size, so that a good practical punch is made with two

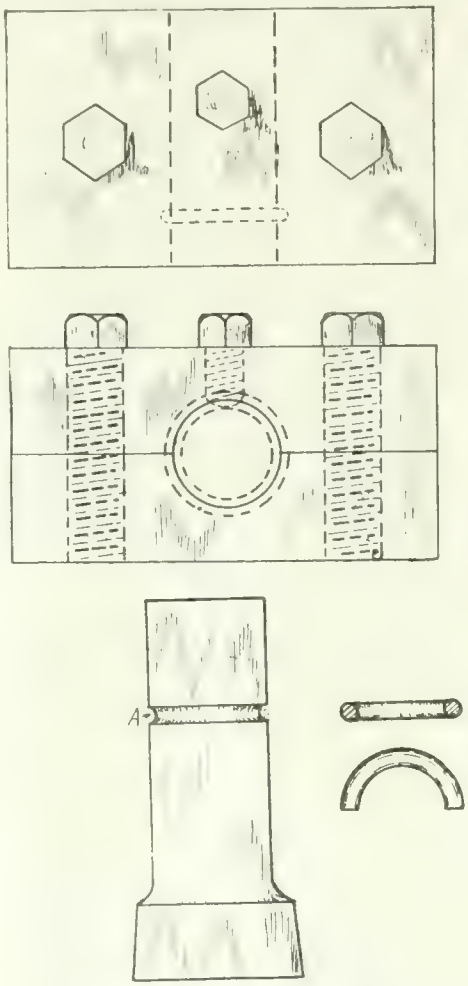



FIG. 2. RING AND GROOVE METHOD OF HOLDING PUNCHES.

degrees taper, except for a short length which is made straight to allow for grinding. See sketch Fig. 1.

### Methods of Holding Punches in Their Places

If punches are simply driven into their holders or fastened with an ordinary set or safety screw, they are apt to cause a lot of trouble by being pulled out of their holders, besides being sometimes very hard to remove when you want them out. Fig. 2 shows a holder designed to prevent the punches drawing out of their sockets and also permit of their easy removal. A semi-circular groove A is cut around the punch, while the cap or clamping plate has a similar groove cut in it. A half ring of steel wire is made to fit the combined half round grooves in the punch shank and the clamp. This ring is set into the grooves and the clamp tightened up.

Fig. 3 shows a very efficient punch holder design which has the advantage of allowing a series of punches to be

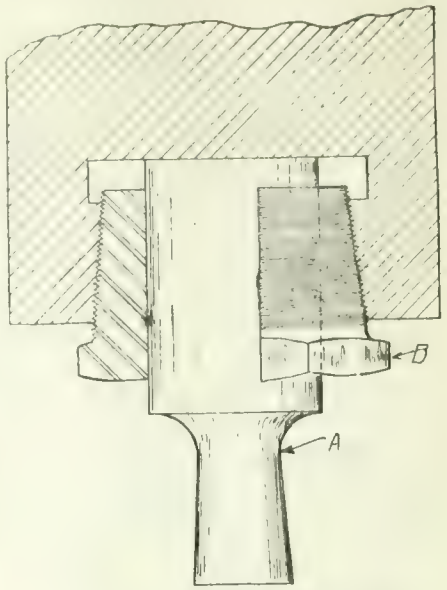



FIG. 3. A COMPACT HOLDER FOR MULTIPLE PUNCHES.

placed very close together, it also permits of any punch being removed or replaced without disturbing the others. The punch A is held in position by the threaded sleeve B which is tightened up by a special box wrench.

### Punch Stripper

Many die-makers make a mistake by paying too little attention to the stripping arrangements. A proper stripping arrangement is necessarily a very important part of the design of any punch and die. Sometimes a rubber stripper as shown in Fig. 4 is very satisfactory, it has the advantage of holding the work

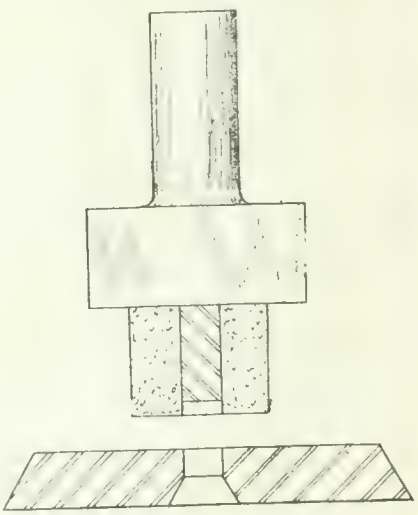


FIG. 4. PUNCH AND DIE WITH RUBBER STRIPPER.

firmly down to the die before the punch comes in contact with it.

### Cast Iron Punches and Dies

It is not generally known that in some cases a satisfactory job can be made

with a cast iron die and punch. Of course it is preferable to make the die at least of cast iron. It is often necessary, especially in a small job shop, to make a small number of blanks, but not enough to warrant the manufacture of a regular tool steel punch and die. If the blanks are not over 1-32 in. thick, the die at least can be made of cast iron, and if carefully made will produce several hundred blanks. Experiments have been made with cast iron dies in large quantities by inserting chills in the foundry; the shape of the blank perforations, if any, must be made with the proper amount of clearance. Dies made by this method cost very little, the punch being made of tool steel as usual Cast iron dies have been used for experimental motor and armature laminations producing a satisfactory type of stampings.

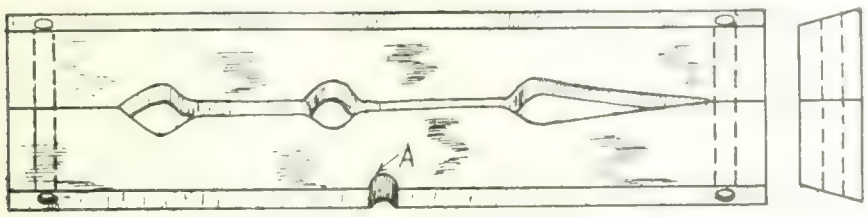



FIG. 5. SPLIT DIE FOR BLANKING OUT CLOCK HANDS.

### Split Dies

Sometimes it is much more convenient to build up a die in sections than it is to make it in one piece. The split dies shown in Fig. 5 are used for blanking out clock hands. The two sections are doweled together as shown to prevent them from shifting endwise. The semicircular notch A is to receive a round stud in the die bed and prevent the die from shifting when in use.

### Dies for Forming a Tube

This die consists of the bedplate A, suitable for the press intended to be used, the die B, the mandrel C, the punch D, and the punch holder E. Fig. 6 shows the punch up with the blank dropped in and the mandrel in position. The weight of the mandrel has a tendency to crowd the blank over against the punch and allow the mandrel to start in the die The blanks should be placed in the die with the burr in toward the mandrel to prevent the tendency to buckle back. Fig. 7 shows the die in its closed position. This die will form tubes ⅛ in. thick or less and 8 or 10 inches long. The open front is very convenient for feeding blanks, and a fork can be used at one side of the die to pull the tubes off the mandrel. It is more convenient to lift the tubes out of the die with the mandrel, pulling them off outside, than to remove the mandrel while the tube is in the die.

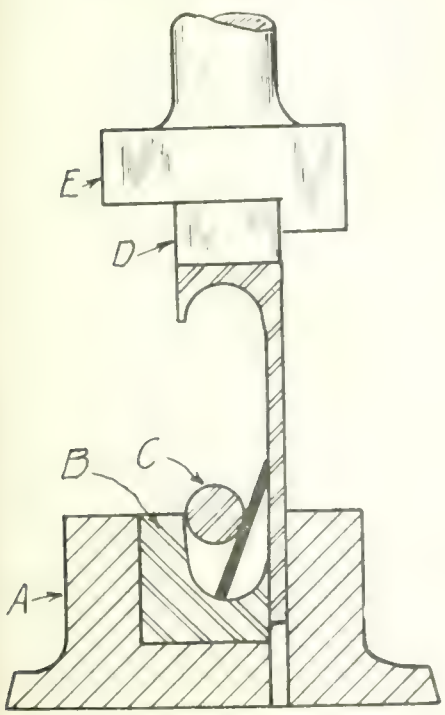



FIG. 6. MANDREL AND BLANK IN POSITION

### Practical Hints on Die-making

The method of laying out and machining a die depends mostly upon the shape, as some shapes could be finished entirely in the lathe, planer or shaper, while others would have to be done by hand or by some special milling or profiling machine or attachment. The first operation is usually to shape up the stock to the right thickness and to fit the machine where it is to be used. In taking the finishing cut leave as smooth a surface as possible, give it a rub over with a flat smooth file, then with a clean rag or piece of waste apply a coating of bluestone and water. Allow it to dry and the steel will have a copper-colored appearance, which shows up the marking off very clearly. If there are any circles or parts of circles, make very fine centre punch marks. Don't make large centre punch marks; in fact, the punch should be ground the same taper as the leg of the compass to ensure making a perfectly true circle.

### Marking Off

In making straight lines don't depend upon holding the scale or straightedge with your fingers, as it is very apt to move and cause you to make false lines. Always clamp your straightedge down and see that your scriber is sharp and hard. If the die is an irregular shape, the bulk of the material is usually removed by drilling a series of small holes as close together as possible just inside the marking which indicates the finished dimension. Be very careful in marking off the centres for these holes. You will save time in the end by doing so. Let the outer edge of the circle come within 1-64 in. of the finished dimension marks. If the drilling is carefully done, you will have no difficulty in removing the metal required unless the holes drilled are too small. In that case the thick part of the chisel would bind in the hole before you drove it half-way through the stock. The size of the holes would be decided by the thickness of the stock. For an ordinary blanking die 1 in. thick I have found 3-16 in. holes the most satisfactory.

### Putting on Clearance

After getting out the metal, as just described, it will reduce the amount of work in finishing if clearance is now put on the die. If an end mill and milling machine is available, turn the die upside down and mill about 1-16 in. outside the finished lines, leaving about ⅜ in. of thickness for finishing; this leaves very little material to remove for finishing. Finish now with the best means at hand, often with a file, leaving a taper of 1 deg. for clearance. If there are any holes to drill or tap or any other work, finish the die completely and harden before starting to make the punch, as the die is more likely to alter its shape in hardening than the punch is. The die is now used for a template to mark off the punch. As the die is now hard and the punch soft slightly tapping the punch into the die with a hammer leaves a clear impression, showing where to file the punch in order to make it fit.

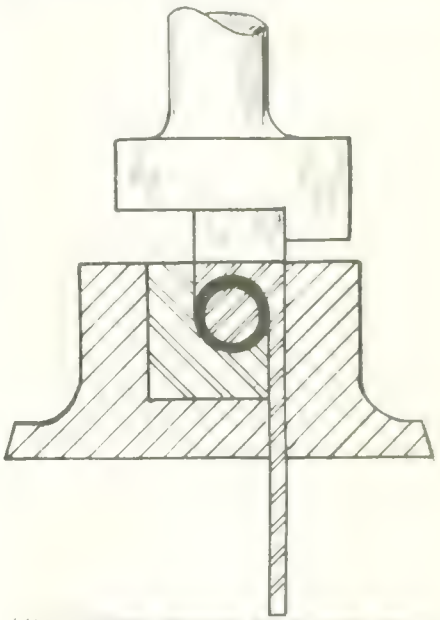


FIG. TUBE FORMED BY CLOSED DIE

## GENERAL HINTS FOR MACHINE SHOPS

By J. Davies

if not impossible, proposition. There

holding down, the wear of the tool, sand holes in the casing, spots of scale, etc., to say nothing of errors caused by the carelessness of the machine operator. To correct work of this kind scraping

over again. Good scrapers can be made from old smooth files, if they are of the right shape and can be used without rehardening. If they need to be reshaped and rehardened they are not very satisfactory.

### Scraping Plane Surfaces

Scraping is usually done in the following manner; brush off any dirt or dust and rub a smooth file over to remove any burrs. A surface plate thoroughly cleaned and coated thinly with marking material is placed on the work and carefully rubbed over the entire surface. No pressure on the plate is necessary the weight of the plate being sufficient. When the plate is removed patches of marking will be found on the work and these marks indicate the high spots, which are removed by the scraper and the process repeated until the surface plate marks the work over the entire surface. In the making of a surface plate or straightedge, unless you have a master plate that you can absolutely depend on, it would be necessary to make three of them. Two plates or straightedges may fit each other and neither of them be straight but if three surface plates will fit each other, that is if any one of them will fit the other two then they must all be perfectly flat.

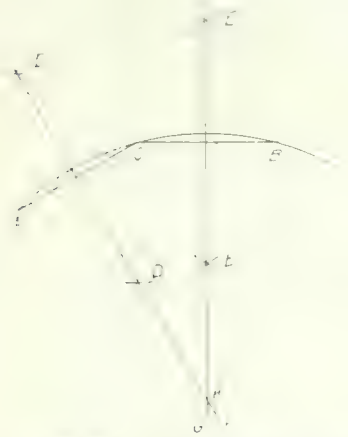


FIG. 1. METHOD OF FINDING DIAMETER OF CIRCLE FROM GIVEN ARC.

### Given the Arc, to Find the Diameter of a Circle

It is very handy sometimes to be able to find the original diameter of a broken pulley or wheel from a small piece of the outer rim. First divide the portion of the circle that you have into two parts as shown in Fig. 1. It is not necessary that the two parts should be of exactly equal length. Now set the dividers to any length and from the two points marked A and C make the four short lines D and from the intersection of the lines D make the line F. Then [illegible] B make the four short lines marked E and from the two points where they cross make line [illegible] F and G cross marked H indicates the correct center of the circle.

### Laying Off Circles on a Flange With Centre on Raised Boss

If you have a piece of work such as a cylinder cover, a gland, or any casting with a raised boss as in Fig. 2, and it is desired to lay off a bolt circle on the flange to given dimensions, the setting of the dividers may be found thus.

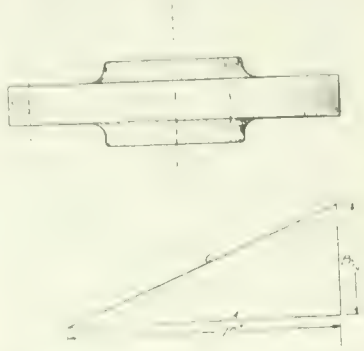


FIG. 2. METHOD OF LAYING OFF CIRCLE WITH CENTRE RAISED ABOVE WORK.

The center of the bolt circle is 10 in. from the center of the boss, while the top of the bos is 2 in. higher than the top of the bolt circle. Take a 2 ft. square or straightedge and and scribe a line A B on a surface plate or flat piece of tin, making the line B at right angles to line A, with line A 10 in. long and line B 2 in. long. Draw the diagonal line C joining A and B then set your dividers to length of line C and you have the exact radius for laying off the circle.

### Broaching or Drifting

By these terms is meant the process of forming or finishing regular or irregularly shaped holes in metal by pressing or driving a cutting tool of the exact form through holes that have been previously drilled and roughly formed to the required shape. As much of the stock as possible should be removed by drilling.

The simplest application of this method is in broaching a square hole such as that in a chuck or tap wrench. Suppose a square hole is to be made in the end of a piece of round stock as in Fig. 3. Draw a circle as large as can be made inside the square then lay off the square. Next drill 4 small holes about ⅛ in. in the corners just touching the sides of the square. The large hole is next drilled which leaves the drilled holes as shown in sketch. Care must be taken in drilling the large center hole or the drill will run toward one or other of the small holes. In some cases it is advisable to plug up the small holes, especially in the case of awkward shaped or irregular holes. A square piece of steel shaped and tempered may now be driven in the holes.

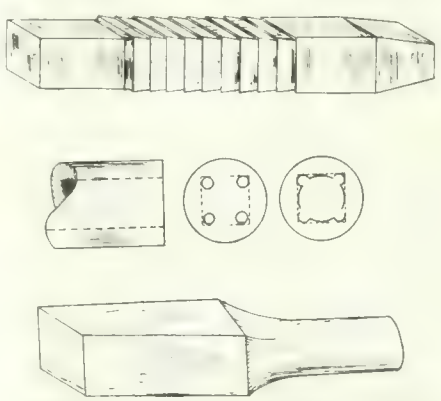


FIG. 3. BROACH AND DRIFT USED IN FINISHING SQUARE HOLES.

A very handy, quick and rough and ready method for forming square holes is to drill the hole to size across the corners, so that a piece of square stock will go in the size required. Then heat up the stock and flatten the sides to fit the square using the square stock as a mandrel.

For repetition work or machine broaching, the broaches are usually made with a number of cutting edges, with a piece turned at the end to fit the largest hole that can be drilled in the stock, this acts as a pilot. The teeth are all made the same size so that only the leading teeth cut and those behind steady the broach. As the leading teeth become too dull they are ground back below the size and the next set of teeth are used for sizing and so on until the broach or drift is worn out.

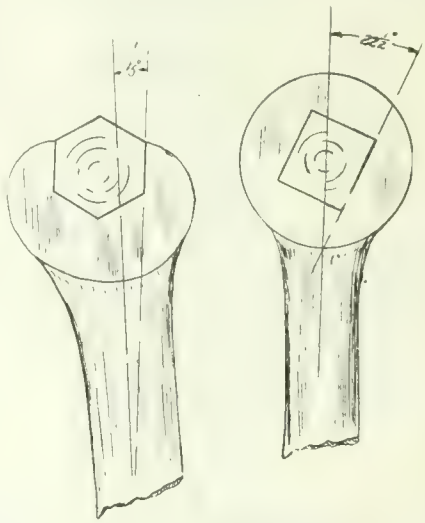


FIG. 4. ANGLES OF OFFSETS FOR HEXAGON AND SQUARE WRENCHES.

### Changing Emery Wheels

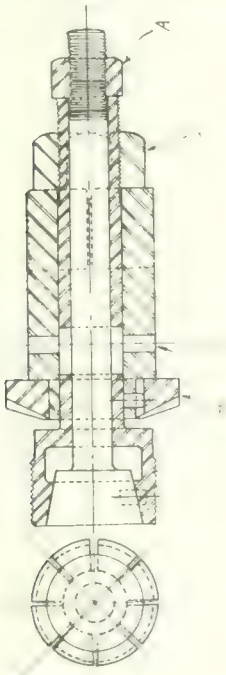
When standing before a grinding machine with the emery wheels revolving towards you, that wheel at the right hand end is held on with a right hand threaded nut and washer, and the emery wheel at the left hand is held on with a left hand thread, that is assuming a machine with a wheel on each end of the same shaft. So that to take off the nuts, it is necessary to turn in the direction in which the emery wheel is revolving.

An exception to this rule would be the case where the wheel turns on a stationary shaft. Such an instance is the buggy wheel rotating on a stationary axle where the nut is always turned in the same direction the wheel revolves in

travelling forward for the purpose of tightening it.

### Making Wrenches

Wrenches as a rule can be bought from the manufacturers much cheaper than they can be made in the ordinary machine shop, yet for the sake of convenience or for a special job it is often desirable to make one for one's own use. When this is the case they might as well be made right as not, the principal requirement of a good wrench is that it will turn a nut in the least possible space. For hexagonal heads or nuts the jaw should have an offset of 15 deg. so that by turning the wrench over, the nut will be advanced one sixth of a revolution in two moves, which is the least




REAMER FOR FUSE HOLE BEVEL.

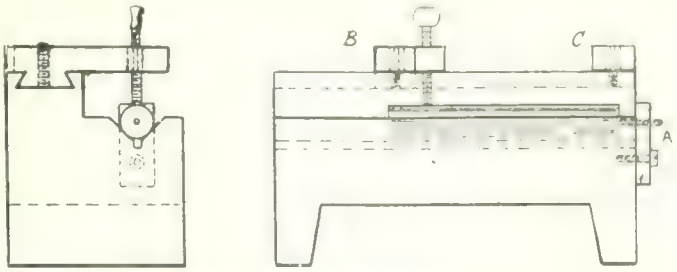
possible movement that the wrench would make. This is a very desirable feature in surmounting obstructions when working in cramped spaces. If the wrench is intended for square nuts or set screws, box wrenches etc., the angle of the offset should be 22½ deg. as shown in Fig. 4.

### JIG FOR COTTER-PIN HOLES

By J. E. Cooley

In drilling holes for cotter-pins on the end of short rods and shafts, separate jigs are required for the different diameters of these parts. The jigs used usually are in the form of a square block which is slipped on over the ends of the stock to be drilled. The work involved in putting these on and taking them off, besides squaring up the blocks, requires considerable time.

In the sketch is shown a design of an adjustable drill-jig for this purpose; made a sufficient length to take in a limited number of different diameters and lengths of rods and shafts. The jig has a Vee cut across the lower side to hold the work. At the end of this is a steel piece (A), having a stop-screw for locating the distance in drilling the holes on the end of the work. On the top edge of the jig is a dove-tailed groove in which the drill-bushing pieces (B) and (C) are made to slide and set where desired. The headless screw in these is




JIG FOR DRILLING COTTER-PIN HOLES.

turned down to hold them in place. Piece B is made wider than C, in order to take in a thumb-screw for holding down the work in place, as shown.

### MACHINE OIL VS. AUTOMOBILE ENGINE OIL

By D. A. Hampson

A screw machine that had been running 1,800 R.P.M. was put on a brass job and its speed increased to 2,600 R.P.M. It gave continual trouble in the main bearings—heating up, sticking, stopping. Plenty of good "machine oil" had been used but that made no difference. When automobile engine oil was tried the the trouble stopped right away and the machine ran as well as at the lower speed.

### THE SUCCESSFUL TOOL DRESSER

By J. R. M.

THE success of a certain tool dresser, known to the writer, was his knowledge of human nature and a careful study of the men who were continually using the different tools he was called upon to make and temper. He did not follow the general practice of tempering the tools to set standards of color, or degree of hardness, but used his judgment in making the various tools to suit the particular workmen that were called upon to use them. He was of the opinion that a smith should adapt himself to the special needs of the individual operator and guide his tempering of the tool to correspond to the ability of the user. A skilled mechanic, who knows how to grind a tool and use it properly, will use a much finer and higher tempered tool than another man or boy less skilled in these essential requirements. A smith who can adapt himself to such conditions is assured of greater efficiency from his output from the forge.

### SUCCESSFUL SEA TRIP BY CONCRETE SHIP

THE first concrete ship has made a round trip and sailed into its home port, after a successful voyage. It is a Norwegian vessel, caled the Nansenfjord, and has just returned from the British Isles, after having steamed two thousand miles. This ship was built several months ago, and is made of structural steel and concrete. It is said to have answered every test satisfactorily, unaffected by the vibration of the engines and notwithstanding the jamming which a ship frequently receives when it is docked. Also it shows no ill-effects caused by contraction and expansion. The vessel is of the single-screw type, driven by a heavy oil engine, and has a displacement of about five hundred tons.

### STEEL PLANTS CLOSING FOR LACK OF RAW MATERIAL

THE extent of the depression in the steel industry in the United States as a result of inability to secure raw material is reflected in the fact that only nine of the U.S. Steel Corporation's furnaces in the Chicago district are in operation out of 29. Conditions are about as bad in the Pittsburg district.

Steel manufacturers will put up a strong fight against the movement in Washington to force another readjustment in steel prices. In December domestic consumers were liberal with their orders because prices were adjusted up to April 1. Now that another adjustment is talked of orders have fallen off in the belief that any change will be downward. The plan to establish a different set of prices for each producer, based upon cost of production, is not liked by manufacturers, who take pride in their low costs. They feel that, having brought their plants up to a high state of efficiency, they should not be compelled to accept the same margin of profit as the high cost companies.

### PANGBORN CORPORATION PRESENTS EMPLOYEES WITH LIFE INSURANCE POLICIES

EMPLOYEES of the Pangborn Corporation, Hagerstown, Md., were presented at Christmas with life insurance policies, ranging in amounts from $500.00 to $1,000.00 according to length of service. The Pangborn Corporation bears all expense of maintaining the insurance and all the employees have the satisfaction of knowing that their near and dear ones will be provided for in this amount in case of death.

**Standard Ship Launched.**—The second of the 8,800-ton standardized steel merchantmen under construction for the U. S. Emergency Fleet Corporation was launched recently at a Pacific port thirty days after the first launching and sixty days after the keel was laid.

# EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions - Your Co-operation is Invited

## ORGANIZED KNOWLEDGE AND NATIONAL WELFARE

By O. C.

THE future of any nation is secure if it lives up to its possibilities and develops to the full its natural resources, which development can be only accomplished through organized knowledge. It is essential to an individual, to a firm and to a nation that its organized knowledge should be kept up to date by constantly increasing and applying this knowledge. To accomplish this, interest in research should be constantly kept up, and much research in all branches of science be kept going. This should be done not only in physics, chemistry and engineering, but also in the biological and mental sciences. Increase in knowledge in the field of biological sciences means more and more better food, improved public health and increased material welfare. Better knowledge of the fundamental principles of the mental sciences means increased efficiency in administration, legislation, education, operation and research.

The research by which organized knowledge is increased will doubtless always be carried on by three distinct types of research organization; research by the government in national laboratories, research by the universities in connection with instruction, and research by industrial laboratories in the interests of manufacturing firms. National research includes such problems as standardization of measurements, guardianship of the public health, and those connected with contagious and vocational diseases. It has to deal with making good roads and increasing the fertility of the soil, as well as with matters merely relating to lessening the cost of production. University research must always be chiefly concerned with the advancement of the various sciences as such, and the development of the fundamental principles of each science. Industrial research takes the middle ground and has already become a distinct profession. Its proper field has to do with the elimination of works troubles and the investigation of fundamental principles. This brings up the question of the ideal research man and ideal research laboratory. A large number of students are really fitted for research work if properly trained along the right lines, and thus might be evolved the ideal investigator, who should have a mind at once fertile and well trained. His mind should be trained to have unerring judgment and to reject ideas which are not logical and promising.

### Desirable Training

The best training for a research man is a thorough grounding in the fundamental principles of his science, physics, chemistry, or whatever it may be. If he has this, it is safe to say that in any properly organised research laboratory, under proper leadership, the student will have many more useful ideas than he can himself possibly follow up. Fertility of mind is not so much an inborn quality of the mind itself as of the training and association which that mind has had.

The ideal industrial laboratory consists of two quite distinct divisions, one doing all the works testing and analysis of materials and the other dealing with large fundamental problems, requiring skilled specialists and considerable time for their solution. The alternate plan, having a single research laboratory covering both works troubles and new problems, is not so successful, as the new work is liable to be interrupted whenever a special press of works problems comes in, and is therefore less efficient.

Industrial research is best carried on by team work. Thus two, three or more men work together on the same large problem or group of problems, the aim being to have a good theoretical man, and a good practical man working together as much as possible, or even a physicist and a chemist in some cases. The important point is, however, to have regular conferences of the men working on the problem, say once a week, to discuss it, to plan new work, and to consider the various interpretations and applications of the results obtained.

The conferences may also be attended by a member of the legal department, who will take in hand any ideas worth patenting, and also by a member of the works wing of the research division who will look after the application of any results that have reached a sufficiently completed stage. In this way the specialists are relieved of the responsibility of directing the attention of the works and of the patent department to useful patentable results.

### Closer Touch Wanted

It is a crying need, as far as national welfare is concerned, that professors and teachers should be in closer touch with industrial problems. The ideal instructor for a research student is a man who has already carried out research work along industrial lines. It is also necessary that there should be more co-operation amongst the various branches of research—national, university and industrial. When the problem in the research department has been worked out it has then to be transferred to the works, and it is here in applying this knowledge that the engineer takes part in the scheme. It is of as great importance here as for the research man that the engineer should be fully trained and possess a special knowledge of fundamental principles. It is the engineer who, when he experiences troubles in the work, carries back his troubles for the research department to elucidate. He must also possess a knowledge of those fields of work related to his own special field, in order to become more fully competent.

Research is one of the youngest of the professions. It is of vital importance that students who are to follow research should be thoroughly and efficiently trained, and that they should not embark upon it without thorough knowledge of its aims and methods.

## EFFICIENT SHOP INSPECTION

By M. H. Potter

INASMUCH as munitions of war must be accurate within very low tolerances, Canadian manufacturers have lately been confronted with a more or less new and complex proposition—namely that of inspection. Furthermore a large number of manufacturers have found that inspections pays, that it not only increases the quality of their product but also lowers its cost. They have therefore applied inspection to their regular routine.

In order that the reader may clearly follow the inspection as here outlined the following classifications are used: the chief inspector, head inspector (in direct charge of one department) examiner (to check the work by use of "go" and "no go" gauges).

### Chief Inspector

The chief inspector must have the full confidence of the engineering department and always be in direct touch with this department. This will enable him to know exactly those parts which must be held to close limits and those which need not. This not only means more rapid production but gives the operator the knowledge that the examiner is there to help him and not to interfere with or delay his work. The latter is of utmost importance as the average operator invariably looks upon the work of the examiner as a necessary evil and takes it for granted that delays will result. The head inspector should be posted to guard against and finally eliminate this great barrier which at present exists. The chief inspector must therefore work for common sense but rigid inspection; when it is adhered to, the operator soon becomes acustomed to it, learning that only good work will pass and making every effort to produce it.

The chief inspector must insist upon the daily reports being kept up to date and accurate, having one or more clerks to handle these. The heads of the vari-

ous departments by consulting them know where the hold ups are. They also point the way to the operator who cannot produce satisfactory results. The engineering department often learns much through these reports and by changing the design or altering the functions as first laid out avoids repeated delays. It can therefore be readily understood that a properly managed inspection department is a great help to all concerned inasmuch as it is the key to the solution of almost any trouble that may arise.

### Qualifications for Inspector

The head inspector must know the work of his particular department and be able to replace the operator in order to have the confidence and good will of the operator. Otherwise the proper spirit, which as previously pointed out is so essential, will not exist. He must be a practical man. In making appointments or filling vacancies the following should be taken into consideration; that the alert, progressive operator can be trained to inspect the work he has been doing far better than an inspector who has been inspecting different work.

Naturally a good inspector can take charge of the inspection of most any work but should not be called upon to do so. If he is to have the responsibility of the work in his department he must be paid a little more than the operator whose work he inspects. Then again, this makes the position a desirable one. He should be paid by the week and entitled to all the privileges of such an employee.

Many opportunities to increase production are available to the head inspector and the right man will often make suggestions along this line which will bear investigation. By observation, provided he understands the work he is inspecting, he is able to make such recommendations. Drilling along this line must be continually aimed at and should be one of his requirements.

### Employment of Girls

Girls have almost taken the place of the male examiner; when properly handled they work faster and will do the same work for less pay. The hourly basis of payment is satisfactory—the piece work system should never be resorted to. Whenever possible they should be separated from the operators and so confined as to be able to concentrate their minds upon the work. If unable to handle one gauging, they should be transferred to another department and given a second trial. In this way the best results can be obtained. An eight hour day should never be exceeded under any circumstances.

### Tool Room Application

The foregoing applies to general manufacturing. If tool room work is involved, a jig, fixture and template inspector must be employed. He is not only required to check the work but must also be capable of judging the design from the blue prints. It is customary for the designer to consult the inspector and submit his designs for criticism before proceeding with the work. The tool inspector must be a practical tool maker in every sense of the word and have enough executive ability to command respect.

## FILLING UP ODD TIME IN THE FOUNDRY

By T. J.

IN most foundries it occasionally happens there is a slack interval in which it is inadvisable to put off the moulders and other workers, but still there is difficulty in keeping them employed sufficiently to cover expenses. At such periods some form of work, which might be called "stock work," is very desirable, and in regard to this there are many domestic castings that can be turned out at a moderate profit if anyone cares to look around. There is always some demand for iron wheels for toys, such things as false bottoms for grates, door and garden scrapers, and other things readily made with no very high grade metal, and higher up there are ornamental castings both easy to make and selling regularly in the retail trade. To assist in the selection of goods to make, get hold of a few illustrated hardware catalogues, and see what can be produced cheaply, bearing in mind that as nothing was being made to order, the stock would have to be made in slack times to meet the orders as they came.

Having made what might be thought a good selection, the drawings should be taken to some distributing house and terms arranged with them for the goods; they will probably purchase certain stock quantities at various times, sending out in small lots as their orders came in. At the price charged to retailers for much of the ironwork there is room for good profits to both makers and dealers, thus making the matter well worth consideration. In brass and other metals there are a good many outside items that can be made to fill up odd times and which can be done with scrap metal as a rule, so long as it is run down of one color, and beyond this mere foundry work machined work can be produced where there are facilities for doing this cheaply in slack times; some kinds of toys, and what may be called puzzle locks, not being despicable as a small means of paying wages as well as the cost of material, all however, depending on cost of production. Necessarily, the workmen must assist in filling up the time to the best advantage without slacking; but usually they will take advantage of this kind of work rather than stand idle, that is, if proper explanations are given to them.

## 95 PER CENT. OF VETERANS FIT FOR FORMER WORK

CONTRARY to the general impression created by the emphasis which is laid to-day on the awful mutilations of the present day warfare, the great majority of the soldiers returned to Canada unfit for further military service and discharged have been able to return to their old occupations and carry on in civil life. In fact the number who must be educated in a new line of work represent only 5 per cent of those who have come back, according to the figures of the vocational training fyles in the Military Hospitals Commission headquarters.

A few men unsettled by the irregularity of military life want to switch to some new line of work, but the average man, detained in the convalescent hospitals in Canada for further medical treatment, is anxious to get back to his old job.

### Back To The Old Job

"What are you going to do when you are discharged?" one middle-aged man was asked.

"Do?" he echoed. "I'm going to do what any sane man of my age would do. I'm going straight back to work. This is just marking time in one's life, like having to go to a wedding on one's busiest mail day. I'm not going to exploit the war as a means of getting a living, or emigrate, or do any fool thing like that. I am going straight back to my office, I am. I know exactly where I turned down the page of my sales book when I came out—it was page 79—and I'm going to start again on page 80."

## CANADIAN UNIVERSITIES AID IN REHABILITATION

CANADIAN colleges and universities are doing much in the work of the rehabilitation of the Canadian soldiers who have returned from the front disabled for further military service and requiring further education to enable them to carry on.

From coast to coast in every province the higher educational institutions have demonstrated their willingness to do all in their power to help in the work of re-education. Faculties in all departments in which soldiers have required work have been eager to do their bit by co-operating with the vocational training department of the Military Hospitals Commission in adapting courses for their needs.

The advantage and economy in both money and time to be gained by using existing facilities is readily evident. The university plants for technical training are ideal, although the courses have to be adapted to shorter periods of time. The University of Toronto, McGill, Queen's, the University of Saskatchewan and University of British Columbia have all taken an active interest in the work.

Courses have been arranged to provide instruction in motor mechanics, machinist work, tool making, pattern making, electrical work and telegraphy.

In some instances the vocational officers have arranged for men to complete arts courses, and in others men who had started to be scientific farmers have been given courses in agriculture.

# Business Problems During and After the War*

By Judge Elbert H. Gary

*How [illegible] ordinary interest attaches to deliverances by the notable author of the following remarks. As head of one of the largest industrial corporations in the world, whose activities and resources are of vital influence in reaching a verdict in the war, the expression of his views on present and future problems is most timely, covering as it does the principal phases and possibilities of the situation..*

THAT Germany is more virile, more efficient, more determined and more aggressive than she was at the beginning of the war, and that as a nation, if she wins in the near future, she will be stronger financially, industrially, commercially, militarily, and with a comparatively small reduction in the number of men, notwithstanding the loss of millions of soldiers, was a striking statement by the speaker.

Our country, as a whole including the several branches of Government, does not yet appear to appreciate that in order to win in this war it is necessary to appropriate every ounce of energy, every dollar of wealth and every atom of skill within reach, to be drawn against when needed; and to offer every sacrifice, even of personal opinion or pride or desire for advancement of the interests of individuals or political parties. Of course every one has decided that every other person ought to subject personal ambition to the demands of the public welfare; but large numbers go no further. This includes you and me, and it does not exclude others occupying more conspicuous places in the nation's registry. But this is only one side of the canvas.

If we are going to continue in the war against Germany, with all her power, we may well ask ourselves what is necessary for a defense against this modern monster of despotism, tyranny, destruction and oppression; and also whether or not we are able to meet the requirements.

Various branches of activity, all essential to final success, such as food, transportation, arms, barracks, aircraft and seacraft and the money necessary to provide such resources were dealt with, after which the subject of labor received attention.

### The Problem of Labor

Labor is scarce and growing more so, although there are employed large numbers of American women who are doing their full share, in both civil and military lines of activity, in accordance with their strength.

Now it is manifest that in order to render the assistance that is asked of us and which seems to be imperative, we must have more and more men, for soldiers and workmen, skilled and unskilled. We cannot produce the quantities or amounts demanded unless the number of men is materially increased, nor unless all who are willing to work are permitted to do so to the extent of their reasonable capability and desire. There is a shortage of labor in this country at the present time on the farms, the railroads, the ships, in the shops, the factories, the mines, the offices. Production even up to the present capacity cannot be secured unless more workmen are employed. And for the building of increased productive capacity and for the operation of the same, additional men must be procured.

We may be excused for having been slow in getting ready for defense against unjust attack, even since August, 1914, but there can be no justification for failure in the future to push vigorously and without unnecessary interruption, in every department of the Government, preparation for assisting the allied forces to carry on and to win the war by the utilization of everything that is valuable for war purposes. Expenditures had better be too large and preparation overdone than to risk the danger of neglecting to provide any single item that might add to the military strength of the allied forces.

### The Weakest Spot

The weakest spot in our situation is lack of sufficient production of the things that are vital to the life and strength of the armies, which might be obtained except for the scarcity of labor. It would be unwise, nay, unpardonable, if this shortage shall not promptly be overcome. This question at present is of commanding import.

This country has an advantage over all others in times of war or peace, by reason of her natural resources and accumulated wealth, but it is not of full practical value unless the agencies for production and use are sufficient. To the extent that workmen are lacking in number, to a corresponding degree are wealth and raw materials without value. It is questionable whether, when an abundance of ships is built, there will be trained men and machinery in ample numbers and quantities, and, in the case of battleships, adequate supplies and munitions.

### Duty to Labor

The labor question is one which employers are sometimes reluctant to discuss for fear of misinterpretation of motives, but in war times every question which bears vitally upon the conduct and termination of the war should be considered frankly and fairly by the employer, the employee and the public generally. Each is equally interested. Each is entitled to protection and the rights of none should be neglected, although the necessities of the general public are always of primary importance.

Lest anyone might conclude that I have in any respect changed my views as heretofore expressed concerning labor generally, I may be permitted to say: Workmen should always have fair, just and liberal treatment. They should be paid good wages, taking into account the service rendered and all conditions which reasonably apply. The welfare, safety and health of the men and their families should receive careful attention by employers. Relief funds for the result of accidents or old age should be established. All men, of all grades, ranks and nationalities, should be permitted to work when and where they please and on terms that they agree to. The laws should impartially protect both capital and labor and permit imposition or abuse by neither.

The precarious conditions, already adverted to, compel the United States to do everything within its power to bring the war to a speedy and victorious close. We insist our soldiers shall not be placed in the trenches or on the firing line unless and until they are completely hardened, trained and equipped, and that they shall always be furnished with sufficient supplies to protect them and preserve their health. The fathers and mothers of this country have given their sons in defense of our beloved land. These men are entitled to every practicable effort on our part to assist them, and this without one moment of unnecessary delay. Efficiency, abundance and promptness will save millions of men and billions of money.

### Need for Man-Power

To the extent needed for the purposes named, the United States should immediately, under proper conditions and reasonable restrictions, draw from the islands of the sea and from oriental countries, enough men including soldiers and sailors to meet every emergency. There would be no difficulty in obtaining within a short period large numbers of strong, healthy, intelligent, loyal men for civil or even military duty, and the number could be increased from time to time as required. All who are acquainted with the facts know that we need more men and that we can get them if we are so disposed. If legislation is requisite, Congress should act without delay.

There may be, there already have been, objections to the admission of certain nationalities, even temporarily and under carefully considered restrictions.

*Abstract of address delivered before the Com[illegible]

These have been persistent, especially by foreigners who heretofore have settled in this country. But the thing to do first is to win the war; to stop the spilling of blood, the destruction of the lives and health of our noble and loyal men and the unjustified depletion of our resources. We can discuss and properly decide other questions later. If we now delay, we may not have the opportunity to consider the other matters.

And still, if objections are raised and discussed, they can be fairly met and with good reasons, in addition to the one war's necessity, which is undebateable. At any rate they are not fundamental nor of much consequence by comparison.

### Confident of Victory

We believe the war will end victoriously for the allied forces within two or three years; we hope in a much shorter time. It could not terminate in favor of the other side within a decade, for, with all the means at our command we would fight for that period or longer before we would submit to the despotic rule of an autocratic [illegible]

So sure are we that we will be perfectly organized, that the management will be of the highest order and that the war will be brought to a successful conclusion that we are justified in considering with care and anxiety the world's business affairs growing out of and following the war.

We shall be met with the fullest preparation and the fiercest competition on the part of the others and we must likewise be in condition to protect our interests and to push our claims for a fair share of the world's business. There will be an opportunity for economic progress, which, if neglected, may never return.

### Future Aspects of Trade

Legislators, as well as business men, should, even now, give heed to future trade problems, for of great importance is legislation which will place our country on a parity with all others in the protection of our domestic trade and the extension of our foreign commerce. Other governments will, by legislation, aid, in every proper way, their business interests to expand and prosper—many have already arranged for this; and our government should do likewise. An intelligent persons seeks opportunity to profit by experience of others.

Neither Germany nor any other country, whose home industries are fully protected, will hereafter be permitted to enter the markets of Great Britain, except on a basis of equal or reciprocal protection, depending upon all the circumstances, including the products involved. There will be careful study and scientific discrimination, all with the single intention and effort to secure every proper advantage. The theories of the past, based on habit of thought, and conditions which have disappeared, will be swept aside and principles more practical, more selfish and more useful will be substituted. England for the [illegible] English will be the national slogan, as it ought to be.

From the same motives and for the same reasons, American industry must be protected, not unfairly, not to the prejudice of the general public nor to the point of permitting abuse or oppression of any interest, but to the limits of reason and honesty, all things being considered. Laws which will secure just prices to the consumers, reasonable profits to the producers and to the transportation companies, and fair wages to the workmen, all based on inquiry and study, should be the aim.

### Merchant Marine Necessary

To compete with other countries we must have a merchant marine equal in every particular to the best, with every advantage and no disadvantage in comparison with any other, unhampered by laws, rules or regulations which might interfere with practical and successful business operation. We should be prepared to deliver the surplus of everything we produce at the doors of non-producing countries in packages and on terms satisfactory to those who desire to purchase.

Our merchant ships must never again be compelled to haul down the American flag or to occupy an inferior position in the international struggle for economic excellence and advancement. Americans, if given an equal chance with the people of other nations, will furnish business to comfortably support a merchant marine excelled by none.

If there be established, maintained and effectively executed a basis for equitably disposing of all international disputes by arbitration, a very large navy for the enforcement of legitimate civil rights will not be necessary; but in any event, the United States should maintain a navy of sufficient strength to protect her commerce in every part of the world. Heretofore it has not always been absolutely independent and safe, notwithstanding what may have been said or written to the contrary.

### Constructive Policy Demanded

Of high importance is the maintenance of a constructive policy by our government, one that is calculated to build up, to extend, to increase efficiency. It has been demonstrated that concentrated wealth, integration of industry, large units, big and capable organizations are not only valuable but indispensable in times like the present; and they are proportionately so at all times. When large quantities, highest quality and efficient and prompt execution are requisite, the demand for supplies can be properly met only by large resources and capacity. Small unintegrated or disintegrated or impoverished productive agencies are not adequate.

The railroads in certain sections of the country are a striking example of the imperative need for additional tracks, equipment and terminal facilities which money alone can provide, and this in [illegible] been expended for these purposes. It is a pity that they have not been pecuniarily able to make full preparation to meet the emergencies of the present time, for there is a marked deficiency in railroad capacity. They need a good deal of additional money, and they should be allowed tariffs large enough to furnish it.

And all this applies with equal force to a post-war period. To occupy a proper place in the world's economic forum, our country, by a wise policy, should permit, and even encourage, the building up and maintenance of wealth and of production and transportation capacity proprotionate to the great and increasing resources of the country as compared to other countries. Abundant manufacturing and transportation facilities on land and sea and lakes, supported on a living basis, ably and properly managed by private interests, are what a prosperous country should have.

### Past Policies Deprecated

During the last decade or longer, in varying degrees, the policy of the United States has not been favorable to conditions which, at present, are deemed wise, proper and necessary.

The policy of Germany, and, in less degree, of other nations, has been to construct, to build up, to extend, to enlarge, to foster enterprise and to protect industry; while our policy has been, in a measure at least, to disorganize, to disintegrate, to prevent, to limit and even to destroy. For this reason Germany to-day has a military organization and a business organization ahead of all others, and this has prolonged and will further prolong the war, notwithstanding the superiority of her enemies in wealth, numbers and other resources. We should be placed on an equality. It is not intended to convey the idea that unbridled license to concentrated business is advocated; quite the contrary. In these matters, as in all others, there should be authority for governmental investigation, supervision and control, non-partisan and subject to judicial interference and correction for proper cause. Abuse and oppression by the public or the individual should always be preventable by law.

All expenditures that are being made at the present time nduer government direction, so far as possible without interfering with or minimizing their value for military purposes, should be made in view of and in accordance with the requirements of business enterprise after the war. In the adoption of designs, in the method of construction, in quality and quantity, those in charge can often, without detriment, change and improve suggested plans for the benefit of service in times of peace. This question, at least, should be in the minds of the builders and the purchasers when contracts are concluded.

### Loyalty From All

Speaking to and for that part of the business fraternity comprised of capital-

ists and employers of labor and their representatives, I urge that during and after the war, by our attitude and conduct, we demonstrate a spirit of loyalty to country, or adherence to the principles of justice and honesty; that we exhibit an intention to observe the requirements of law, to recognize the rights of competitors, customers and the general public and that we treat our employees considerately, fairly and liberally. Our practices must be in accordance with the highest ethical standards. Thus, up to the measure of our deserts, will we be entitled to the confidence and to the cooperation of those in authority.

I believe all things requisite will be demanded by the people of the United States for its and their protection and advancement, during and after the war, and that the demand will be crystallized into a governmental policy; that it is generally realized we have reached a crisis in our history; that disaster threatens; that it may be averted if we do not hesitate or quibble over nonessentials; that America for Americans will also be our national watchword; that laws will be passed, or repealed, whenever necessary to aid in securing peace and to give every interest, big or little, and every individual, full opportunity to live, to progress and to prosper.

**Optimism Paramount**

Therefore, I am an optimist, even in these times. There is, as always, a silver lining to the clouds which now obscure our vision. We need not despair. We have reason to be hopeful. There is sunlight beyond. Right will prevail over might; and reason will overcome madness. We shall be victors in the mortal combat that rages, and afterwards our country will make longer and faster strides in the struggle to maintain a deserved and satisfactory position in the ranks of nations. The business men of the United States, in the management of their affairs, have reached a high level of efficiency and moral excellence. They are at present of incalculable assistance to the Government and they may be depended upon to do their part in restoring the world's equilibrium after peace shall be proclaimed. We are proud of our country. Let us continue to give our country reason to be proud of us.

## WHEEL MOUNTING FOR CYLINDRICAL GRINDING

By Howard W. Dunbar

WHEEL breakage on cylindrical grinding operations is serious for two reasons:

(1) Probability of injury to workman.

(2) The loss of an expensive wheel and stopping of production.

There are many causes for wheel breakage, among them the improper mounting of the wheel on the wheel collar or sleeve. Writing in "Grit and Grinds" the author states that mountings for wheels, or wheel sleeves and collars as they are commonly known, take many different forms depending on the type of wheel to be mounted and the amount of grinding to be performed, but all of them employ the same general principles. Ordinarily in sleeves with small holes, 5 in. for example, the sleeve and the collar grip the wheel on the two outside surfaces so that the collar and mounting extend outside of the width of the face of the wheel; in other words the wheel is not countersunk around the hole to receive the flanges or wheel collars. This is the common type of wheel mounting for general purpose cylindrical grinding.

On special operations other types of mountings are provided which include wheels having large diameter holes and wheels with the sides countersunk so that the wheel is recessed and the mounting is set into this recess, allowing the side of the wheel to pass by any portion of the object being ground which extends out beyond the ground surface.

Cupped, dished, cylinder and ring type of wheels all have their mountings which are peculiar to the wheel and the function that it is to perform. These various forms of wheel mountings, as above stated, employ the same general principles for holding the wheel. In some instances the gripping surfaces are covered with a lining of soft metal, the object of which is to imbed itself in the rough grain surface on the wheel, forming a good gripping medium for holding the wheel in place, not requiring extreme pressure or tightness of the flange and sleeve for retaining the wheel in place. Others provide a series of spots of soft metal having the same object as the soft metal lining. Still others have a plain cast iron surface which is more frequently employed on large hole wheels, as the point of resistance to slippage of wheels in the flanges is brought more closely to the point where the grinding wheel comes in contact with the work being ground. Therefore, the force required to hold the wheel in place is very much less than in the smaller diameter of holes where the gripping medium is farther away from the point of grinding. Other types of mountings require the use of a gasket between the flanges, wheel sleeve and wheel.

In any event, there are certain conditions to be observed in placing a wheel on the wheel sleeve. The more important ones are outlined below:

(1) In mounting the wheel on the sleeve be sure that the wheel slides freely over the center of the wheel mounting. Never put the wheel on when it is necessary to force it on or pound it in place. A slight amount of scraping in the case of a lead center will make a wheel go on freely, or a little rubbing with a rat-tail coarse file in the hole of the wheel having no lead mounting will make the wheel slide on freely.

If the wheel is forced into the mounting when the hole is too small, strains are set up in the wheel, which when clamped by the flanges or the pressure of grinding are apt to cause breakage of the wheel.

(2) Never mount a wheel when the hole is so large that it can shuck about, because such a wheel with a large hole will be very much out of balance and the space left by the opening will make a bridge of the wheel, so that when the wheel is worn down to a point coming close to the diameter of the hole, the pressure from grinding will be sufficient to crack the wheel across this bridge. A wheel mounted in this condition is more apt to slip around than a wheel which fits properly on the center.

(3) Always tighten the wheel sleeve and flanges snugly, especially where the soft metal gasket or blotter is employed, because such holding mediums require a little more pressure to properly mount the wheel and prevent it from slipping on the sleeve. It is difficult to grind pieces round or to size if there is the slightest slippage of the wheel in the mounting.

(4) Do not tighten the wheel sleeve too tightly, particularly where the cast iron or wheel sleeve and flange comes directly in contact with the wheel, without any equalizing medium in the form of soft metal or blotter between them. Too great pressure is sufficient to set up strains in the wheel, particularly where the surfaces are not perfectly parallel, and the wheel, under the pressure of the grinding operation, will explode or fly to pieces.

(5) Always tap the wheel lightly with a hammer or piece of steel after the sleeve has been drawn up on it properly, ready for placing on the machine, to determine if the wheel by such an operation may have become damaged or broken. A small crack may not be readily seen but can be detected if the wheel is struck lightly with a hammer, for a wheel showing such a crack will not ring clearly, whereas a perfect wheel, or one without cracks at all, will.

(6) Make certain that there are no small pieces of foreign substance, such as steel chips, little pieces of brass, dirt, etc., on the surface of the wheel to be clamped by the flanges and sleeve. Such foreign substances are very apt to set up strains in the wheel which will cause breakage if allowed to remain.

(7) Always inspect a wheel by looking it over carefully and tapping it lightly with a hammer before attempting to put it on the sleeve at all. It sometimes happens that wheels are broken or damaged in transit.

J. W. Gerard had a happy way in Berlin of chafing the great war lords and dictators. A grand duke said to the Ambassador at a reception:

"Germany will win this war. Then let America look out."

"How will Germany win?" said Mr. Gerard, calmly.

"With her submarines, with her gases, and, above all," said the grand duke, "with perseverance. Perseverance, Mr. Ambassador, always conquers."

"Always," said Mr. Gerard, winking at a fellow countryman. "How about the hen on the china egg?"

# PROGRESS IN NEW EQUIPMENT

There is Here Provided in Compact Form a Monthly Compendium of Shipbuilding and Marine Engineering Auxiliary Product Achievement

## 26-IN. CRANK SHAPER

MODERN conditions calling for extreme accuracy at the highest speeds and feeds have caused increased attention to be given to shaping-machine design, the continuous and rapid development of this type of machine in recent years having resulted in machines in which workmanship, material and design are equal to that called for in the best tools of other types.

The machine illustrated herewith is of massive construction and capable of affording maximum rigidity under heaviest cuts, and is a recent product of the Canada Machinery Corporation, Ltd., Galt, Ont. It has a maximum stroke of ram of 26½ in. with a cross table travel of 30 in., and vise capacity of 15 in. between jaws.

Column is a single cored casting of exceptional weight, having all bearings cast integral; the bull gear bearing has an enlarged diameter next to the gear, thereby increasing the bearing surface and adding strength at the point under most severe strain. The base to which the column is bolted is deep and well ribbed, and is provided with a front extension having a planed surface for holding table support, and has flanged sides to collect the oil and chips.

Ram has exceptionally large square sides fitted with adjustable gibs, which can be adjusted to take up the unequal wear of ram slide. An improved design of tool head is employed, having both automatic and hand feed which can be set to feed either up or down at any angle. Swivel is graduated to 90 degs. right and left, and vertical feed screw has micrometer index collars graduated in sixteenths and thousandths.

Nine changes of down feed are obtained by means of simple mechanism without moving the dog on the column, and the feed can be instantly stopped or reversed by a convenient crank handle. An automatic throw-out disconnects the feed in case of over-travel of ram and friction washers are provided which slip if the tool sticks.

Three sides of the box form table are machined and fitted with tee-slots. Horizontal travel is 30-in., vertical adjustment 14 in., while table top is 17 in. wide by 24 in. long. The apron to which the table is bolted is provided with tee-slots so that work can be bolted direct when the table is removed. The table support on the outer end of base relieves the cross rail of considerable strain and prevents springing of the table.

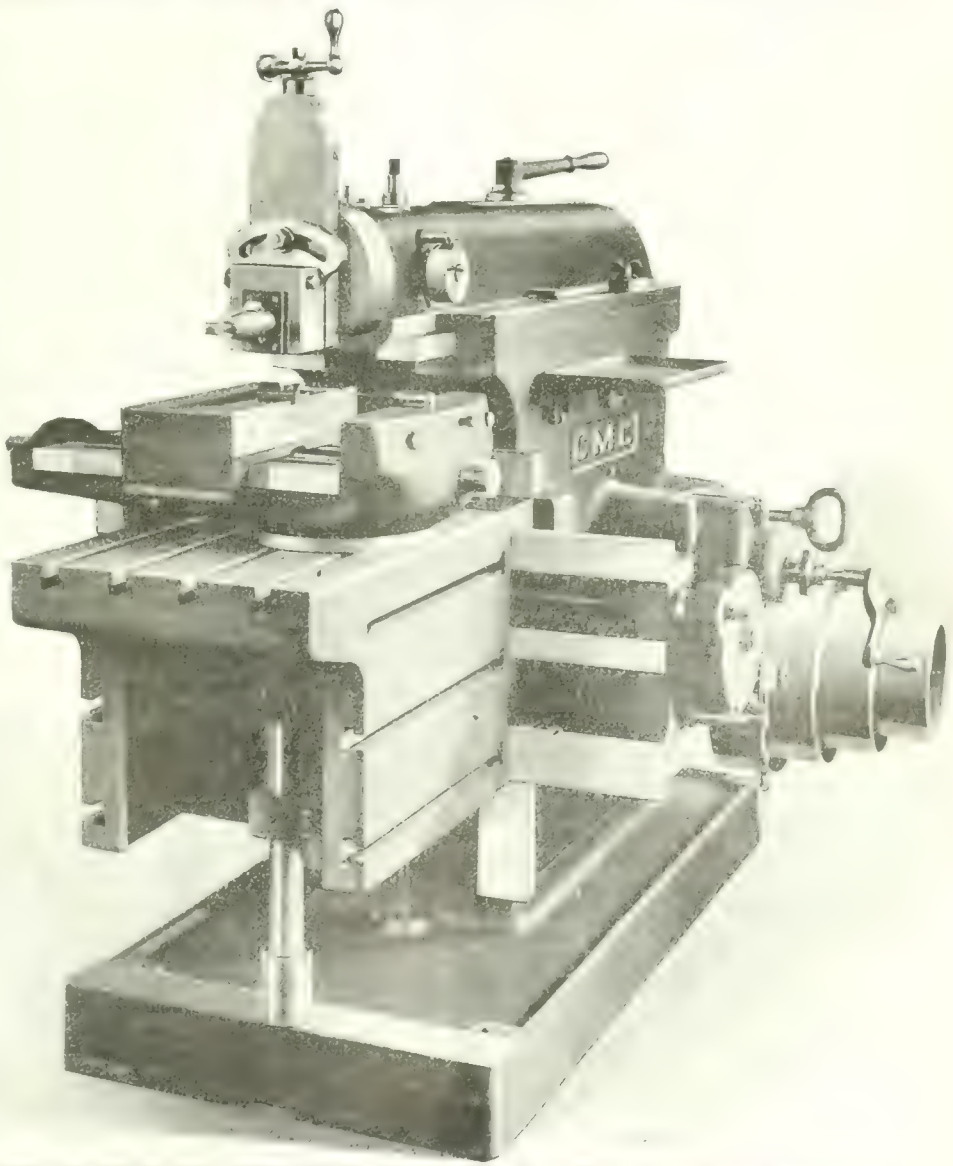
The vise is bolted directly to the table permitting work which projects over the side of the table to be held in the vise, an advantage over a vise mounted on a base.

The cross rail has three bearing faces, the apron being gibbed to the upper and lower faces which are close together.

Drive is by four step cone, provided with double back gears giving ratios of 6 to 1 and 29 to 1, giving 8 cutting speeds on the ram. The rocker arm is attached to the ram by means of a double link which insures an even motion and also eliminates the tendency of the rocker to lift the ram at the beginning of the stroke, neutralizing the upward thrust of the tool.

The eight speeds provided give a range of from 6 to 98 strokes per min. to the ram, the length of stroke being changeable while the machine is running. A direct reading stroke indicator shows the actual stroke the machine is set for, whether in operation or not, and is not dependent on the movement of the arm.

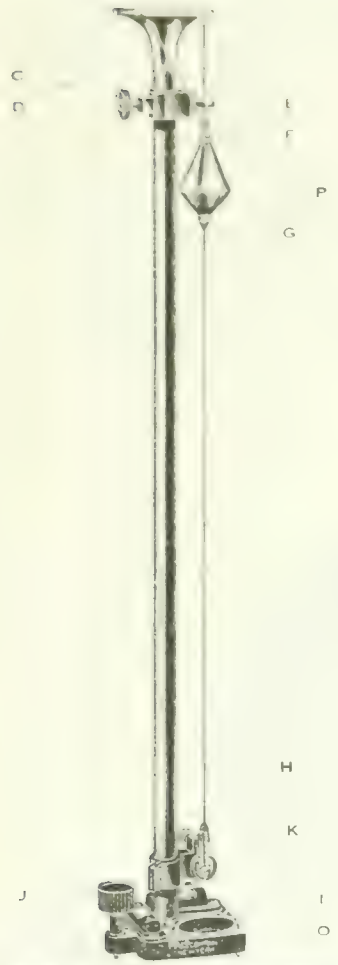
The design of the machine enables a four speed gear box with single pulley or motor drive to be substituted when desired; standard equipment furnished includes vise, swivel jaws, countershaft and full set of handles and wrenches. The weight of the machine is 4,900 lbs.



26-in. CRANK SHAPER WITH POWER DOWN-FEED, DIRECT READING RAM INDICATOR AND SPECIAL BASE SUPPORT FOR WORK TABLE

## A PORTABLE HARDNESS TESTER

INSTRUMENTS for testing the hardness of metal by actual deformation of the surface of the test piece are usually limited to laboratory installations and are heavy. The Waldo hardness tester as supplied by the Palo Company of New York, is unique in this respect, that it is portable and it is claimed still secures



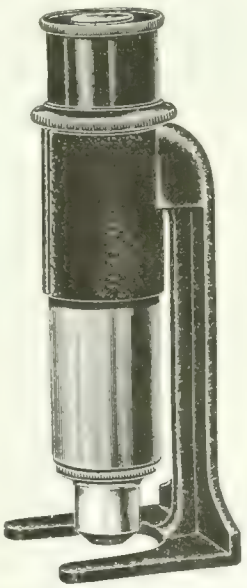

PORTABLE HARDNESS TESTER

weighing one-tenth or one pound, and falling one foot to the surface of the material whose hardness is to be measure This plummet P shown in illustration has a conical, replaceable, chill-tempered, 60 degree, steel point G, of which several are furnished with each instrument. This plummet has tried to its upper extremity a very thin silk thread which bends over a funnel-shaped end piece A,B,C, into which, at A and B, slotted holes are cut with burnished edges so that the silk thread passes through them with practically no friction loss. The funnel A, B, C, turns with a slight friction in the end of the jointed supporting brass tube I, C. The silk thread is attached to a small burnished ring at its lower end, which ring in turn is caught in a little trigger at K, which can be released by the thumb screw H without jarring the instrument. The silk thread then passes from the release catch K through the hole A, through B, through an adjustable third hole at E, which is clamped in place by the thumb screw D so that the plummet point G is exactly over the aperture O in the base of the instrument.

The base of the instrument is supported on three points, two of which are controlled by levelling screw J. Small cross levels indicate the verticality of the supporting rod I, C.

In use, the instrument is set on the surface of the material whose hardness is to be tested, so that the aperture in its base O is concentric with the exact spot to be tested. The plummet is then hung as shown, and lowered by holding the silk thread by its ring between the fingers so that the exact position of the clamp D,E, may be found for insuring the vertical fall of the plummet. This being determined, with the instrument levelled, the thread ring is placed in its releasing trigger K, and with the plummet in its position F, G, the funnel support A, B, is gently turned until the distance from the conical point G to the surface of the material to be tested O, is exactly one foot. The instrument is now ready for use.

A convenient way of stopping any slight swinging motion of the conical point G is to touch it gently with a small camel's hair brush or a piece of cotton wool. The instant the plummet is still, the trigger is released by the thumbscrew H, and the plummet falls, making a uniform circular indentation in the material tested. The object in releasing the plummet from the bottom of the apparatus is to avoid any disturbance in its upper support. The entire operation consumes but a few seconds after a slight experience with the instrument. The microscope is designed so that it has sufficient illumination and magnifying power to measure easily with an eyepiece micrometer the diameter of the impression made by the falling plummet point. The average diameter of the circular depression is then measured. Scale for measuring indentations is embodied in the microscope.

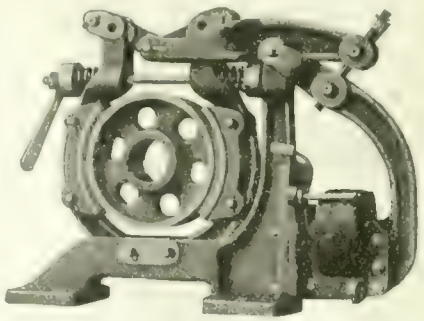


MICROSCOPE FOR USE WITH HARDNESS TESTER.

## MAGNETIC BRAKES

A NEW design of direct current magnet brake has been developed for use with mill, crane and hoist motions. As shown in the accompanying illustration the magnet armature is of the clapper type which eliminates the necessity of having any moving parts within the coil and consequently ensures freedom from wear, sticking or damage to the insulation of the coil windings.

These brakes are characterized by the quickness of their operation. They respond almost instantly, "releasing" when the power is applied and "setting" when the power is cut off. This is due to the design of the operating magnet which gives high initial pull and a very small distance of travel (¼ inch to 1 inch).



MAGNETIC BRAKE FOR USE WITH MILL, CRANE AND HOIST MOTIONS

The operating of the brakes is as follows:

When voltage is impressed on the motor the magnet is energized and the magnet armature lever overcomes the pressure of the compression springs through a toggle and releases the brake-shoe grip upon brake wheel. While the magnet remains energized the brake wheel is allowed to rotate freely. As soon as the current is shut off from the motor the brake magnet releases and the compression springs force the shoes against the brake wheel and bring the motor quickly and smoothly to rest without shock or jar. The compression exerted by the springs can be easily adjusted so that any holding or retarding torque up to the full capacity of the brake can be obtained for equal braking effort for both directions of rotation. Simple means for making adjustment for shoe wear are provided.

In case adjustments for shoe wear should be neglected a safety feature has been introduced so that the brake does not fail to hold the load but the magnet will not release the grip on the brake wheel. This insures proper brake operation and the elimination of accidents due to the slippage of the brake-wheel.

As a product of the Westinghouse Electric and Mfg. Co. the new brake shows in design a close adherence to their alternating current type of brake except in the necessary alterations in magnet and armature lever but the features of simplicity and accessibility of the few parts are typical of both types.

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## PUBLICITY AND ITS INFLUENCE ON NATIONAL EFFICIENCY

THE increasing hope which is being placed by the Allies in the ultimate influence of aerial conflict as one of the deciding factors of the war has resulted in growing interest being taken by all sections of the community in the immense aviation program of the United States and the methods adopted by them for insuring the successful carrying out of their plans

Foremost among these plans, and, from an engineers' point of view, possibly the most vital in its ultimate effect on the efficiency of the air service was the decision of the United States authorities to build a standard motor.

On first thoughts the decision to make a standard motor seems to smack of tameness and simplicity, monotony of performance and limitation of power, lack of improvement and a general marking time of all those features whose continued development and maintenance at maximum efficiency is vital at this time.

The conditions under which the engine was evolved are now past history in the technical press, but so accustomed has a certain section of the scientific and engineering public become to accomplishments of this nature that the circumstances attending the inception of the idea were soon dismissed to give place to the more urgent problems of production.

It is more than interesting, however, to consider the real facts as they have come to light as to how a government department could be prevailed upon to take such a sweeping step and do that which, while obvious to many thoughtful students of the situation, was radical enough to make them keep their opinions to themselves. The question of a standard engine? Why, was it not more than Britain had dared to tackle, and did not Britain know best? Why, therefore, should they agitate for a reform, which while desirable from many points of view was still looked askance at by one of the principal belligerents?

In aviation, as in munitions, ships, artillery, etc., it becomes more obvious every day that standardization is the one hope of victory. Why, therefore, was the matter not appreciated much sooner?

An English authority writing to a leading paper on the subject, says: "It is, moreover, known generally that after trying every variety of type in the designs of internal-combustion engines for aeroplanes, the Germans in the Gotha and other machines on which they mainly depend have deliberately chosen and are consistently sticking to vertical cylinder machines, embodying the best verified racing car practice and presenting the most straightforward manufacturing job."

The most straightforward manufacturing job! There is the whole situation in a sentence, and that, with its resulting effects on fighting efficiency—reduction in number of spare parts, simplicity and ruggedness of design, making failure less possible and repair more easy—is the feature of the situation whose importance was recognized by the manager of a leading United States journal in the automobile field.

Soon after the war broke out this publisher sent a writer to Europe who wrote a series of articles on transportation and aviation conditions. Chief amongst his communications were those relating to the many makes and designs of aeroplane motors with no form of standardization among them, resulting in conditions that made for anything but the best results in building and repairing.

The secretary of the Associated Business Papers, Inc., recently reviewed the work of that organization—how its members had been instrumental in adding 8,000 men to the New York State National Guard, and in organizing several engineering and roads units, etc. Further, when the War Department at Washington was able to obtain the services of only four expert mechanical designers, this association and its members were instrumental in raising from among the readers of their papers a force of 104 expert engineers to serve the government.

Confronted with two such evidences of trade paper accomplishment—an expert analysis of fateful conditions with common-sense recommendations regarding the only remedy on the one hand, and convincing evidence of the influential support given such papers by industrial and technical leaders throughout the country on the other hand—was the War Department prepared to go its own way and ignore the obvious?

In Canada, technical journals as a class have not been appreciated at their true worth by the authorities as a means of helping production and disseminating information. Students of the situation find it difficult indeed to account for such a divergence of attitude between two government bodies such as are at Ottawa and Washington. Proximity of location and assumed similarity of thought are without corresponding influence on matters of publicity, and in a smaller community,—less infested, if at all by enemy agents, which has suffered proportionately little material damage from such sources and that entirely unrelated to technical publicity—business papers as a class have not been utilized in the same manner which has yielded such surprising and encouraging results a few short hundreds of miles away.

The ultra-conservatism of British government circles may induce such an attitude on the part of those in authority here, but until they can produce results equaling in importance those obtained by our big ally on the south under a directly opposite policy we shall remain unconvinced regarding the efficiency of their methods.

# Steel Manufacturers to Increase Production 20 Per Cent.

*Government Assistance to Steel Makers Proposed—Coal Shortage Continues Despite Less Severe Weather—Steel Plate Prices Decline—Machine Tool Market Steady.*

**Although the very severe weather has passed, its effect is still being felt in industrial circles more particularly on account of the continued freight congestion. The lack of adequate transportation facilities aggravated by the severe climatic conditions has increased the already acute shortage of raw materials. It will be some time before the industrial situation is normal notwithstanding the efforts that are being made to ameliorate conditions. The coal shortage is particularly acute and the shortage of cars appears to be the primary reason. For the same reason there is a shortage of coke which is curtailing the output of iron and steel. On account of the serious shortage of steel, the steel manufacturers have agreed to increase production by 20 per cent. over the 1917 output, providing adequate supplies of raw materials are available. The Dominion Government proposes to assist the steel men in the attainment of this object. If the mills are able to increase production to this extent, the shortage will be materially relieved in so far as certain products are concerned. The outlook in regard to steel products imported from the States, however, is not so hopeful. Prices of steel plates, black and galvanized sheets and Canada plates have declined due to the lower prices on these products prevailing in the States. Prices of all other steel products are firm and unchanged. There has been a general advance in the prices of lubricating oils and compounds, ranging from 3c to 8c per gallon. Copper, antimony and aluminum are weaker and quotations lower. There is no improvement in the tin situation which continues acute. The machine tool market continues steady**

MONTREAL, Que., Jan. 21, 1918.—Coal conservation and the drastic measures taken by the American Fuel Controller to rectify the difficulties that are so emphasized at the present time are the central features in a situation that is marked with questions of vital importance to the industrial and commercial activity of the United States and likewise Canada. This action on the part of the American Government was so sudden that very few of those affected were prepared for the sweeping regulations and restriction of production that the measure entailed. However, it appears that fewer industries will be severely affected than at first supposed, and it will likely be only the non-essentials that will be materially restricted, although a large number of manufacturing plants and domestic interests will be required to observe the ruling that has been put into effect. The primary reason for this drastic order was to conserve the available supply of fuel and regulate its distribution to such industries as are essential to the immediate prosecution of the war; a factor that was considered of primary importance. While the observance of this impromptu law is only intended for the United States, its effect will be far-reaching and Canada must sooner or later realize the important bearing that such action must have on this country. Railroad transportation is again resuming its normal activity after the severe trials of the past few weeks, but many districts are still laboring under the excess freight that has accumulated during this period.

### Pig Iron

The production of pig iron has been greatly affected by the disturbing conditions [illegible] as regards the weather and also the political situation. Furnaces have suffered much from the lack of coke and other raw materials [illegible] of a very poor grade, so that producers [illegible] meet the heavy demands of steel making requirements. Negotiations are still on between the Canadian and American Governments to see what arrangements can be made to obtain delivery of more pig from American sources, but so far nothing satisfactory has been done. Little Canadian metal is for sale, and producers report a situation that is becoming increasingly acute. Prices are nominal, with virtually no quotations.

### Steel

The drastic measures recently taken by the American Government for the conservation of fuel has marked an epoch in war-time developments. Following the period of demoralization of trade incidental to the severe weather that has prevailed in all sections of the country, this latest action on the part of the United States authorities has added to the disorganization of the steel industry. The measure that was primarily thought to include all manufacturing industries has, however, been shorn of its severity, as more recent announcements appear to indicate that many of the more essential manufacturing establishments will be allowed to continue their activities provided sufficient supply of fuel is now available. Much dissatisfaction has been openly expressed at the ruling of the American Fuel Controller, but on deliberation it may be found that such a policy is in strict accord with the requirements of the country, as conditions at the present time make it imperative that the distribution of fuel should be so regulated as to cause the minimum inconvenience to all concerned. The congestion of supplies for export that is becoming more and more pronounced every day on the Atlantic seaboard will be relieved by the shutting down of additional arrivals, and during the interval of inactivity of manufacturing it is hoped that the coaling and loading of bottoms will enable shipping to become less acute at these ports of distribution. The movement of freight that has been curtailed during the past few weeks has resulted in the accumulation of excessive supplies at the mills and foundries, so that warehouses are filled to capacity and embargoes add to the difficulty of clearing and shipment of material.

The possible diversion of coal and coke to more essential industries threatens to disorganize many merchant furnaces and other domestic activity. Steel production has been so hit that it has been estimated that during the past two weeks the output has been about 50 per cent. below normal. Conditions during the past few days have shown much improvement and the transportation companies are in a better position to handle the enormous quantities of freight that has been piling up since the bad weather set in. With a good spell of moderate weather it is hoped that the situation in the near future may take on a much easier tone. While Canadian activities are not directly reflected in the disturbed condition existing in the States, the situation here is marked with considerable nervousness over the recent developments. While Canada as yet has not felt the actual pinch of coal shortage, the scarcity is none the less apparent, and the future has not been improved by the developments across the line, as Canada, to say the least, must share the burden equally with her Southern neighbor, particularly with that portion of fuel that is brought in from the United States. Local conditions are comparatively unchanged with the inability to obtain material particularly pronounced; price quotations are relatively the same and very firm.

### Metals

Apart from the slight excitement that has developed through the increase announced in the price of lead, the situation is devoid of any feature of consequence. Copper is regular and unchanged. Tin is uncertain, with arrivals just sufficient to meet the most urgent requirements. Interest in spelter has

been renewed by the announcement that a fixed price may soon be made. Lead is not active, but the market is stronger. Antimony and aluminum are both firm and unchanged.

**Copper.**—While some agitation has been made for an increase in the fixed price on copper, it is very unlikely that such action will be taken owing to the apparent satisfactory situation that now prevails in this market. Nothing has developed that would indicate that the American Government are contemplating a further revision of copper prices, at least in the immediate future. Refineries have suffered by the recent tie-up of railroads, but not to the extent of other industries, owing to the fact that their fuel supply was ample to carry them over the acute period. The local situation is much the same as last week, with business steady and comparatively brisk. Prices are unchanged at 32c and 33c per lb.

**Tin.**—Consumers are beginning to realize that the metal at any price is of more importance than the price itself, and are, therefore, booking in advance, irrespective of what the future may develop. The situation in the States is comparatively unchanged, with shipments arriving fairly regularly. Permits are still difficult to obtain, but sufficient metal is coming through to avoid undue nervousness, but the inability to obtain enough to acquire a surplus supply has the tendency to retain the market in a very strong but uncertain position. New York quotations are still nominal, and dealers here report a strong and steady market, with an undertone of strength. Current quotations are strong and firm at 77c per lb.

**Spelter.**—After several months of investigation and negotiation it is reported that the American Government are about to fix the price on grade "A" spelter. Just what this price will be is uncertain, but leading producers anticipate that a fair price would be about 12c or 13c per lb. For the past few months sales made on Government requirements have been made on the understanding that a price would be decided on and settlement made on this adjusted or agreed figure. Apart from the expectancy of the Government action the market is unsettled and quiet. The local situation is dull and quotations are unchanged at 10½c per lb.

**Lead.**—Despite the fact that the demand has not been such as to justify an advance, the Trust price on lead has again been advanced ¼c per lb. This makes the ruling quotation on the New York market 6¾c per lb. Speculation appears to be the cause of this most recent development, as producers are not selling and consumers show no disposition to buy other than for their immediate requirements. The demand on the local market continues light, and dealers report unchanged prices, but with an undertone of strength; present quotations are on the basis of 9¾c per lb.

**Antimony.**—Slight activity was evident in this market during the past week, but buying was light. The market generally has a tone of weakness, but quotations continue firm. Locally the situation has developed no features, and quotations remain unchanged at 18c per lb.

**Aluminum.**—Nothing of importance to report in this market, and quotations are comparatively unchanged, slight declines being noted on the New York prices. Dealers here continue to ask 60c per lb.

### Machine Tools and Supplies

While the activity in the machine tool industry shows little improvement over that of the previous week the outlook seems to be very encouraging owing to the satisfactory inquiries from many sources. The demands for munitions equipment continue light, although some purchases have been made to supplement plant equipment already in use. Business in general machine shop tools is of a steady character, but delivery has been very poor owing to the difficulties of transportation and the shortage of cars on the various railroads. The volume of business in the United States in connection with war requirements is so enormous and the urgency so imperative that shipment of tools to Canada from American builders is next to impossible. At present the local activity is confined to light buying of such equipment as would be required for general purposes. The demands for all classes of supplies, both as regards small tools and machine shop accessories, continue on scale equal to the industrial activity of the country, but in common with all other commodities the delay in delivery causes no small inconvenience to many manufacturers. High speed steel is in good demand, but is often difficult to obtain owing to the inability to secure shipment of material from England and the abnormal consumption in the States. Prices on all small supplies are well maintained, and the market is generally firm.

### Scrap

The market has again taken on a better tone and activity has increased following the period of dullness incidental to the railroad difficulties resulting from the severe weather of the past few weeks. Local business is far from brisk, and dealers here are watching the American market for developments. Generally the situation here is unchanged, with slight fluctuations reported during the past week, but current quotations are on a par with those listed last week. New York reports a decline on copper and brass scrap and a corresponding advance on lead.

**CANADIAN GOVERNMENT PURCHASING COMMISSION**

**The following gentlemen constitute the War Purchasing Commission appointed by the Canadian Government: Hormidas Laporte, Montreal, chairman; George F. Galt, Winnipeg; William P. Gundy, Toronto. Thomas Hillier is secretary, and the Commission headquarters are at Ottawa.**

## Toronto

TORONTO, Ont., Jan. 22.—The drastic order issued by Fuel Administrator Garfield suspending manufacturing operations for five days in all States east of the Mississippi River caused a sensation in local industrial circles on account of the possibility of a similar order being enforced in Canada. There has been no hint given out that such drastic measures are contemplated but the coal situation is sufficiently severe to warrant unusual methods being adopted to relieve the congestion on the railways. Latest reports indicate that coal is moving in heavier volume but there is a considerable deficiency to make up before the situation is anything approaching normal.

### Steel

As a result of a conference held at Ottawa between the war Committee of the Cabinet and the steel manufacturers it was announced a few days ago, that the manufacturers have undertaken to increase the production of steel 20 per cent. over last year provided sufficient supplies of raw materials are available. The key to the situation is raw materials and it is here where the government will have to take a hand in relieving the present congested condition on the railways and also assist in providing additional labor of which there is a shortage. Unless sufficient supplies of raw materials can be obtained, the steel men cannot increase production. The railways are badly in need of rails and the mills at the Soo and Sydney will be called upon to furnish the required tonnage. It is understood that the U.S. Steel Corporation has sold to a Canadian interest 2,500 tons of rail at a price above $57 per ton. A twenty per cent. increase is a fairly tall order for the steel production last year was larger than any previous year. The steel companies have for some time been extending their plants and generally increasing their all round efficiency so there should not be much difficulty in obtaining the required increase in output, providing of course that the necessary raw materials are available.

This new arrangement should go a long way towards relieving the shortage of steel, although on steel products imported from the United States, Canadian consumers will still be dependent upon the mills across the line. In view of conditions in the trade in the States and the enormous demand for steel there appears to be little hope of any material increase in the available supply for consumers in Canada. According to the latest information there is no lack of steel in the States for government work but manufacturing consumers not engaged upon

per cent. capacity. The situation in the [illegible] is serious and will affect consumers in Canada. The U.S. Government, however, is endeavoring to relieve conditions and it [illegible] there is a considerable improvement in the situation.

There has been a downward readjustment in prices of steel plates and black [illegible] Canadian market, as a result of the lower prices obtaining in the States. Warehouse prices in the States are still below prices in Canada because the former benefit by the lower mill prices, these being fixed some time ago. Canadian consumers on the other hand do not necessarily benefit by the fixed price schedule, so prices here are not always based on those prevailing in the States as was the case at one time. There has been no change in Canadian mill prices and there is no indication of a movement either up or down. There is no change in the steel plate situation. Although prices are down it cannot be said that the decline indicates weakness in the market. Every ton of plate produced is required.

Plates ¼ in. and heavier are now quoted at $10; heads $10.30 and tank plates $10.10 per 100 lbs. Black sheets No. 28 gauge are now quoted at $8.25 and No. 10 gauge $10 per 100 lbs. Galvanized sheets are likewise down, Premier No. 28 U.S. being now $9.20 and 10¾ oz. $9.50. Canada plates dull, 52 sheets, are now quoted at $8.50 and all bright $10 per box. Prices of all others steel products are firm and unchanged.

### Pig Iron

The pig iron situation continues acute and there is no improvement in conditions in the trade. Although the effects of the storm last week are diminishing, the weather continues cold handicapping the railways in their efforts to move freight. A decline in production at the ovens and freight congestion have both reduced available supplies of coke with the result that the shortage is greater than ever. There is no free coke in the open market and it will likely be some time before there is any, the requirements of contracts being quite in excess of production.

### Scrap

[illegible] very quiet, there is very little business being done. The freight congestion is partly responsible for this condition but there is also little enquiry for old metals, except perhaps heavy melting steel and cast iron scrap which are in fair demand. There have been no price

### Machine Tools

Business in machine tools continues on a steady basis, the demand being largely for equipment for munitions plants. Canadian machine tool builders are keeping busy, particularly for special tools for munitions plants. The machine tool trade in the States is very active and many lines are hard to obtain. Deliveries continue to get more backward and shipments are being delayed owing to the congestion of freight.

### Supplies

There has been a sharp advance in oils and compounds and new prices have been named for the following: machine oil 29½c; cylinder oil, capital 49½c; cylinder oil, acme, 41½c; lard oil, $2.55; Imperial quenching oil 4½c per gallon. Standard cutting compound is now quoted at 7c per lb. and acme cutting oil, antiseptic, 39½c per gallon.

### Metals

There is a weaker tendency in prices of non-ferrous metals this week due for the most part to local conditions which have resulted in declines in copper, antimony and aluminum. The decline in copper is partly due to the fact that prices are fixed in the States but a slight scarcity of the red metal has had the effect of keeping prices up locally. Although the price of copper has been fixed at 23½c there is some possibility that this may be raised to 25c. There is no improvement in the tin situation and quotations continue nominal. No tin is allowed to leave England where a considerable tonnage is being held up. Both lead and spelter are firm at unchanged prices. Business in this district in the metal trade continues satisfactory.

**Copper.**—Although the price of copper was fixed at 23½c, an effort is being made to raise the price to 25c. It is not only the small producers that are behind the agitation but some of the larger producers are also urging upon the U.S. Government to change the maximum price to 25c. The producers claim that a higher price is necessary to make a reasonable profit in view of the all round increase in producing costs. Some of the larger producers are satisfied with the Government price but admit that production may be slightly curtailed at the present price which might be increased to 25c. There is a slight weakness in copper locally, prices having declined on cent. Lake and electrolytic are quoted at 31c and castings at 30c per pound.

**Tin.**—The tin situation continues to grow more serious and prices are entirely nominal. There is no spot tin available in New York and no metal is allowed to be shipped from England. Permits are so uncertain that the trade does not know when any more tin will be shipped or in what quantiy. Locally the quotation is entirely nominal at 80c per pound.

**Spelter.**—The market has a stronger tone notwithstanding that the available supply is more than ample to meet current consumption. The government purchases are likely the reason for the improvement in the situation. Local price is unchanged at 10½c per pound.

**Lead.**—The position of lead is more satisfactory and the supply so far has been sufficient to meet consumers' trade The undertone of the market is strong with an upward tendency, though it is not thought probable that there will be any sharp fluctuations. Local price 9c per pound.

**Antimony.**—The market is weaker and the price of antimony has declined 1c. The demand at the present time is very light. Antimony is now quoted at 17c per pound.

**Aluminum.**—Lack of demand and a weak market has resulted in lower prices for aluminum which is now quoted at 60c per pound, a decline of 2c a pound.

## New York

NEW YORK, Jan. 19.—A sudden and urgent call for 1,000 machine tools has come from the Ordnance Dep't. of the Army through the machinery section of the War Industries Board. The machinery is required for the manufacture of big guns and unless the tools are delivered within sixty days the program of the Government for producing ordnance will be seriously disarranged. Some of the tools are wanted within thirty days. The list includes 500 planers, a number of horizontal milling machines, a large number of vertical milling machines, several hundred engine lathes and over 100 floor type horizontal boring, milling and drilling machines. Builders of and dealers in machine tools are unable to meet the Government demand and a hurry call has been sent broadcast through the industrial press to all manufacturing industries having tools not engaged on war work. The Government is ready to buy, rent or to borrow any tools that will meet the requirements. The American army in France must be provided speedily with heavy guns and unless this ordnance is supplied mortality among the troops will be increased enormously; a strong appeal is therefore made to the patriotism of manufacturers who may have tools of the type needed by the Government to release them for use in the manufacture of ordnance.

### Increased Rifle Output

The Navy Dep't. has distributed orders for 60 locomotive cranes. The Frankford Arsenal has also made additional purchases of machinery and manufacturers in the Central West who have received contracts for war munitions are buying shop equipment. The Winslow Ornamental Iron Works, Chicago, has placed orders with the Amalgamated Machinery Corp., which will be used in executing a contract for 200,000, 155 mm. shells, corresponding to United States 6-inch shells. The capacity of the Remington plant at Eddystone, Pa., is being increased and new equipment is being purchased. When the improvements are completed the plant will be able to turn out Enfield rifles at the rate of 6,000 per

day; its present capacity is 2,500 per day. The Hyatt Roller Bearing Co., Newark, N.Y., which has a contract to manufacture 1-pound shells for the United States Government, and the Regina Co., Rahway, N.Y., which is to manufacture roller bearings for war munitions are now in the New York market for shop equipment. The S. K. F. Ball Bearing Co. of Hartford, Con., has bought tools recently for installation in an extension to its plant. Several other New England manufacturers holding war contracts have placed orders for plant additions which will require purchases of machinery.

### Cantonment Shops

An interesting report is that the Government will install machine shops at all of the cantonments to develop a corps of machinists that will be ready to make repairs to field equipment in France. Machine shop equipment is also to be purchased for the American armies in the Phillipines and in Hawaii.

Manufacturing industries throughout the country were startled by the sudden order issued by the Fuel Administrator to shut down all plants for five days beginning with Jan. 18 and on all Mondays up to March 25. It is evident that the action of the Fuel Dep't. was as much to assist in relieving freight congestion as it was to save fuel. The order exempted blast furnaces, coke ovens, and steel mills rolling products required by ship yards and by manufacturers of war munitions. The original order was also modified to permit the operation of copper refineries and of several other plants, the output of which is essential to the manufacture of important war munitions. Previous to this order, however, the lack of fuel, heavy storms and low temperature had caused further reduction in operations of blast furnaces and of steel plants. The industry as a whole to-day is operating at scarcely 50 per cent. of capacity. Prostration was greatest at Chicago, and industrial activity there to-day is scarcely more than 30 per cent. of capacity.

## Pittsburgh

PITTSBURGH, Pa., Jan. 19.—All ordinary consideration as to market activities and trade prospects yield at the moment to the immediate influence and probable effect of the Fuel Administration's drastic plant-closing order. Fuel is not to be burned for operating plants from Friday, Jan. 18, to Tuesday, Jan. 22, both dates inclusive, also for the Mondays to and including Mar. 25. As to the ten Mondays involved other interests are included, office buildings and newspapers among others, newspapers being limited to one edition.

Perhaps naturally, there was a great deal of criticism in various quarters when the order was suddenly announced. This report need not concern itself with the causes for the order being issued or with the criticism, for this is intended to be an iron and steel report, and the outstanding fact is that the iron and steel industry has not criticised the order. Some iron and steel men have made criticisms, but the criticisms have been of those who criticized the order and the Fuel Administration. Promptly upon hearing of the order the iron and steel industry decided to obey it promptly and to the letter.

### The Exemptions

To desire to obey, and to obey, were two different things, however. The major portion of the capacity was closed Thursday midnight, while departments that were running after that hour were closed as rapidly as it was physically possible. Then exemptions began to be received by wire from Washington, and various departments were put in operation again as rapidly as possible. By Friday night partial or entire exemptions had been received by steel companies that produce altogether at least 80 per cent. of the country's steel, but the proportion of their capacity that they were expected to operate could not be estimated very closely. It would probably represent in the aggregate somewhat less than one half their capacity. While some additional exemptions were being ordered hourly to-day, the best estimate seems to be that during the period, embracing four regular working days, about one-half or a trifle less of the steel making and steel finishing capacity is operated.

The exemptions are wholly with respect to the production of material on Government order, but on the one hand they do not cover all war material while on the other hand there is some interlocking, whereby the operation of a department filling war orders may at the same time involve the production of some tonnage of the material.

### No Curtailment of Steel Production

The fact cannot be emphasized too strongly that this plant closing order does not really involve the loss of production of a single ton of steel. Whether the Fuel Administration realized this or not is not known and might not be to the point in any event. It is the actual fact that counts. For perhaps a twelvemonth, and very emphatically in the past few months, the production of steel has hung entirely upon the production of pig iron. In 1916 the country made 39,400,000 tons of pig iron and 41,400,000 tons of steel ingots. In 1916, chiefly the latter portion of the year, and in 1917, there was added steel making capacity rated at over 8,000,000 tons of ingots a year. In December, pig iron production was at the rate of 34,300,000 tons a year and steel ingot production at the rate of 37,200,000 tons a year. The ingot production was easily at 10,000,000 tons less than capacity, but the production was all that could be compassed with the supplies of pig iron and scrap available. The blast furnaces could make no more pig iron because they were not sufficiently supplied with coke. The blast furnaces remain in operation during this five-day period, and they are likely to receive larger rather than smaller supplies of coke by reason of other plants being closed. The pig iron produced will eventually be converted into steel, by reason of the excess capacity available.

### Eventual Gain

One of the objects of the Fuel Administration's order is to get coal through to vessels ready to sail. Another object is to clear the railroad congestion and pave the way for a better traffic movement. If the order accomplishes its purpose a result will be a better movement of coke to blast furnaces, consequently larger production of pig iron and in turn of steel.

The occasion for granting exemption from the closing order to departments making certain descriptions of war material is that these departments have been working at capacity and produce only so much irrespective of the supply of steel, so that their idleness would represent a loss in production of the particular material involved. Thus the first exemption order that reached Pittsburgh referred to the manufacture of seamless drawn steel tubing under 1½ in. dia.

### Other Remedies

The fuel saving order is in addition to other remedies that have been applied to right the industrial situatuion. Every effort is being made to improve conditions on the railroads. The embargoes referred to in last report are continued, preventing the shipment of much of the steel that is produced, the object being to clear the congestion on track. These embargoes, now in force for more than a fortnight, would have produced better results by this time had there not been very untoward weather conditions meanwhile. Originally there had been some hope of lifting them at the present date but all the opinion that railroad officials would vouchsafe early this week was that the embargoes would be continued to next week. In the past fortnight the production of finished steel in the Pittsburgh and valley districts has been little more than one-half the capacity, and the shipments have probably amounted to considerably less than one-half the production. In the past week there has been some curtailment forced through storage room for finished product being completely occupied. As the exception tests the rule, it may be mentioned that of all finishing departments in the general steel industry the tin plate mills probably have the greatest storage facilities, equivalent at the various plants to the storage of the entire output for from five to eight weeks, yet on an average the tin plate mill warehouses are stocked to about two-thirds of capacity, and one large plant, the Farrel works, was closed a week ago as its warehouse was completely full.

### Production and Transportation

Administrator Garfield's statement that the transportation that has been conducted. There is overproduction relative to the facilities that have been available for moving the material.

### INDUSTRIAL BANK SCHEME PROPOSAL

A REPORT has been issued by the Committee on Banking of the British Empire Producers' Organization, London, England, recommending a new scheme for a State-guaranteed bank for the financing of industry.

The general object is to afford readier financial support on sound principles throughout the United Kingdom and the oversea dominions and colonies for producers and manufacturers, and among other results it is intended that there shall thus be in any event no opening for German financial intrigue in obtaining control of any group of industry. It is claimed for the scheme that on the one hand it involves no departure from methods which have been successfully demonstrated on a national scale, and on the other hand it conflicts in no way with the ordinary business of joint stock banks, but is, on the contrary, calculated to increase their turnover.

The available capital would be provided in the shape of debentures and deposits with State guarantee. Further capital would be accumulated by the funding of profits, as apart from a small bonus to debenture-holders and depositors all surplus will remain in the bank. Provision is made for government by boards of trustees, on which both employers and employed would be represented.

It is proposed under this scheme that there should be a guarantee capital of 50 millions sterling, to be enlarged as demand shall arise, and that the guarantors should be:—The United Kingdom, £25.000.000; the Dominion of Canada, £6.000.000; the Commonwealth of Australia, £6.000.000; the Dominion of New Zealand, £2.000.000; the Union of South Africa, £2.000.000; Newfoundland, £1,-000.000; Straits Settlements and Malaya, Ceylon, British Guiana, Mauritius, West Indies, Rhodesia, Falkland Islands, Fiji and other British possessions, £8.000.000.

The declared objects are to strengthen and to extend producing and manufacturing industries already established in the Empire; to assist in the foundation and development of new industries therein; to assist by credit facilities in the sale of their products; to assist them in obtaining materials, machinery, and facilities from other parts of the Empire to those in the countries within the Empire by its citizens of control and utilization of its own products; the foregoing to apply only to companies, firms, and undertakings of British origin and whose registration is within the British Empire.

The Council will carry out the

# Enlarged Canadian Trade Intelligence Service

**Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.**

CHILE Valparaiso, British Consul General.

COLOMBIA Bogota, British Consul General.

ECUADOR Quito, British Consul General Guayquil, British Consul.

EGYPT Alexandria, British Consul General.

FRANCE Havre, British Consul General Marseilles, British Consul General.

INDIA Calcutta, Director-General of Commercial Intelligence.

ITALY Genoa, British Consul General. Milan, British Consul.

MEXICO Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul. Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA Caracas, British Vice-Consul.

BRAZIL Bahia, British Consul. Rio de Janeira, British Consul General.

# Canadian Commercial Intelligence Service

**The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.**

### CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address, Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Rey, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, 73 Basinghall Street, London, E.C.2, England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Anne's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Cantracom.

### CANADIAN COMMERCIAL AGENTS.

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—C. E. Sontum, Grubbegd No. 4 Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

### CANADIAN HIGH COMMISSIONER'S OFFICE.

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

### PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago | 37 50 |
| Standard low phos., Philadelphia | .... |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 33 00 |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | .... | .... |
| Victoria | .... | 50 00 |

### FINISHED IRON AND STEEL

| Per lb. to Large Buyers. | Cents |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in. base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 5 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 5 75 |
| Chequered floor plate, 3/16 in. | 13 20 |
| Chequered floor plate, ¼ in. | 13 00 |
| Staybolt iron | 8 50 |
| Bessemer rails, heavy, at mill | .... |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | 3 50 |

F.O.B., Toronto Warehouse

| | |
|---|---|
| Steel bars | 5 50 |
| Small shapes | 5 75 |

F.O.B. Chicago Warehouse

| | |
|---|---|
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

### FREIGHT RATES

Pittsburgh to Following Points

| | Per 100 lbs. C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 35.1 | 45.5 |
| Halifax | 35.1 | 45.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

### METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $30 00 | $31 00 |
| Electro copper | 33 00 | 31 00 |
| Castings, copper | 32 00 | 30 00 |
| Tin | 77 00 | 80 00 |
| Spelter | 10 50 | 10 50 |
| Lead | 9 75 | 9 00 |
| Antimony | 18 00 | 17 00 |
| Aluminum | 60 00 | 60 00 |

Prices per 100 lbs.

### PLATES

| | Montreal | Toronto |
|---|---|---|
| Plate, ¼ to | $14 00 | $10 00 |
| Head | 14 50 | 10 50 |
| Tank plates, 3-16 in. | 13 10 | 10 10 |

### WROUGHT PIPE

Effective Jan. 7, 1918.

| Size | Black Per 100 feet | Galvanized Per 100 feet |
|---|---|---|
| Standard Buttweld. | | |
| ⅛ in. | $ 6 00 | $ 8 00 |
| ¼ in. | 7 10 | 7 23 |
| ⅜ in. | 5 10 | 7 23 |
| ½ in. | 6 46 | 8 04 |
| ¾ in. | 8 17 | 10 29 |
| 1 in. | 12 07 | 15 32 |
| 1¼ in. | 16 38 | 20 59 |
| 1½ in. | 19 53 | 24 61 |
| 2 in. | 26 27 | 33 12 |
| 2½ in. | 42 12 | 52 94 |
| 3 in. | 55 08 | 69 24 |
| 3½ in. | 69 92 | 86 94 |
| 4 in. | 82 84 | 103 00 |
| Standard Lapweld. | | |
| 2 in. | 29 43 | 35 71 |
| 2½ in. | 43 88 | 54 11 |
| 3 in. | 57 38 | 70 76 |
| 3½ in. | 71 76 | 89 70 |
| 4 in. | 85 02 | 106 28 |
| 4½ in. | 96 52 | 121 29 |
| 5 in. | 112 50 | 141 34 |
| 6 in. | 145 90 | 183 36 |
| 7 in. | 190 40 | 238 00 |
| 8 L in. | 200 00 | 250 00 |
| 8 in. | 230 40 | 288 00 |
| 9 in. | 276 00 | 345 00 |
| 10 L in. | 256 00 | 320 00 |
| 10 in. | 329 60 | 412 00 |

**Prices—Ontario, Quebec and Maritime Provinces**

### WROUGHT NIPPLES

4" and under, 45%.

4½" and larger, 40%.

4" and under, running thread 25%.

Standard couplings, 4" and under, 35%.

4½" and larger, 15%.

### OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 21 50 |
| Copper, heavy | 22 50 | 21 50 |
| Copper wire | 22 50 | 21 50 |
| No. 1 machine composition | 21 00 | 20 50 |
| New brass cuttings | 16 00 | 17 00 |
| No. 1 brass turnings | 14 00 | 15 75 |
| Light brass | 10 00 | 10 00 |
| Medium brass | 14 00 | 14 00 |
| Heavy brass | 15 00 | 16 00 |
| Heavy melting steel | 21 00 | 20 50 |
| Steel turnings | 12 60 | 8 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 23 00 | 18 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 20 50 |
| No. 1 machine cast iron | 27 00 | 25 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 17 00 | 9 00 |
| Car wheels, iron | 26 00 | 25 00 |
| Steel axles | 38 00 | 30 00 |
| Mach. shop turn'gs. | 9 00 | 8 50 |
| Cast borings | 12 00 | 8 50 |
| Stove plate | 17 00 | 19 00 |
| Scrap zinc | 5 50 | 6 50 |
| Heavy lead | 5 00 | 7 00 |
| Tea lead | 5 00 | 5 75 |
| Aluminum | 27 00 | 25 00 |

### BOLTS, NUTS AND SCREWS

| | Per Cent |
|---|---|
| Carriage bolts, ⅜" and less. | 10 |
| Carriage bolts 7-16 and up. | net |
| Coach and lag screws | 25 |
| Stove bolts | 50 |
| Plate washers | List plus 20 |
| Elevator bolts | 5 |
| Machine bolts, 7-16 and over | net |
| Machine bolts, ⅜ and less. | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd. steel | 20 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | add 25 |
| Nuts, square blank | add $1 50 |
| Nuts, square, tapped | add 1 75 |
| Nuts, hex blank | add 1 75 |
| Nuts, hex tapped | add 2 00 |
| Copper rivets and burrs, list plus | 20 |
| Burrs only list plus | 50 |
| Iron rivets and burrs | 15 |
| Boiler rivets, base ¾-in. and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 57½ |
| Wood screws, O. & R., brass | 52½ |
| Wood screws, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

### MILLED PRODUCTS

| | Per cent. |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil Head Cap Screws | net |
| Flat ⅝ But. Hd. Cap Screws plus | net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. and semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and semi-fin. nuts over 1½ in., up to 2 in. plus | 10 |
| Studs | net |
| Taper pins | 40 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws, list plus | 20 |
| Collar screws, list plus | 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | 60 |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add $7 00 |

### BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $47 50 |
| Open-hearth billets | 47 50 |
| O H sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.

F.O.B. Pittsburgh.

### NAILS AND SPIKES

| | |
|---|---|
| Wire nails | $3 50 |
| Cut nails | 5 65 |
| Miscellaneous wire nails | 60 |
| Spikes, ⅜ in. and larger | $7 50 |
| Spikes, ¼ and 5-16 in. | 8 00 |

### MISCELLANEOUS

| | |
|---|---|
| Screw hooks | 60 |
| Solder, guaranteed | 0 |
| Babbitt metals | 18 to 70 |
| Soldering copper | 0 |
| Lead wool, per lb. | 0 15 |
| Putty, 100 lb. barrels | 4 75 |
| White lead, pure, per | 13 20 |
| Red dry lead, per cwt. | 15 50 |
| Gum Egyptic | 0 |
| Tarred slater's paper, roll | 0 95 |
| Gasoline, per | 0 |
| Benzine, per | 0 |
| Pure turpentine, single bbls. | 0 71 |
| Linseed | |
| Linseed oil, boiled, single bbl. | |
| Portland Paste, per | 2 50 |
| Sandpaper B & A | per doz. 20 |
| Emery cloth | list plus 20 |
| Sal Soda | 0 02 |
| Saltcake, per | 0 |
| Saltpetre, commercial | 0 |
| Rosin "D," per lb. | 0 03 |
| Rosin "G," per lb. | 0 03 |
| Borax crystal and granular | 0 15 |
| Wood alcohol, per gallon | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

### ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 |
| Plumbers' oakum, per lb. | 0 |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila Rope | 0 33 |
| New Zealand Hemp | 0 33 |
| Transmission rope, Manila | 0 |
| Cotton Rope, ¼-in. and up | 0 47 |

### POLISHED DRILL ROD

Discount off list, Montreal and Toronto net

### CARBON DRILLS AND REAMERS

| | Per Cent. |
|---|---|
| S.S. drills, wire sizes up to 52 | 30 |
| S.S. drills, wire sizes, No. 53 to 80 | net |
| Standard drills to 1½ in. | 30 |
| Standard drills, over 1½ in. | 30 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 20 |
| Bit stock | 25 |
| Ratchet drills | 15 |
| S.S. drills for wood | 30 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 40 |
| Sleeves | 40 |
| Taper pin reamers | net |
| Drills and countersinks list plus | 30 |
| Bridge reamers | 32½ |
| Centre reamers | 10 |
| Chucking reamers | net |
| Hand reamers | 10 |

### COLD ROLLED SHAFTING

| | |
|---|---|
| At mill | list plus 40% |
| At warehouse | list plus 50% |

**Discounts off new list. Warehouse price at Montreal and Toronto**

### IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 25% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings: Class B black, 24½c lb.; Class C black, 15¾c lb.; galvanized, Class B, 34c lb.; Class C, 24½c lb. F.O.B. Toronto.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $9 50 | $ 8 25 |
| Sheets, black, No. 10 | 12 00 | 10 00 |
| Canada plates, dull, 52 | | |
| Canada plates, all bright | 10 50 | 10 00 |
| Apollo brand, 10¾ oz. galvanized | .... | .... |
| Queen's Head, 28 B.W.G. | .... | .... |
| Fleur-de-Lis, 28 B.W.G. | .... | .... |
| Gorbal's Best, No. 28 | .... | .... |
| Colborne Crown, No. | | |
| Premier, No. 28 U.S. | 9 45 | 9 20 |
| Zinc sheets | 20 00 | 20 00 |

### PROOF COIL CHAIN.

| B | |
|---|---|
| ¼ in. | $12 35 |
| 5-16 in. | 11 85 |
| ⅜ in. | 11 50 |
| 7-16 in. | 10 90 |
| ½ in. | 11 20 |
| 9-16 in. | 11 20 |
| ⅝ in. | 11 00 |
| ¾ in. | 11 00 |
| ⅞ in. | 10 90 |
| 1 inch | 11 |
| Extra for B.B. Chain | 1 20 |
| Extra for B.B.B. Chain | 1 80 |

ELECTRIC WELD COIL CHAIN 5-8

| | |
|---|---|
| ⅝ in. | 6 35 |

Prices per 100 lbs.

FILES AND RASPS

Per Cent

COAL AND COKE.

Net ton f.o.b. Toronto.

BOILER TUBES

| | | |
|---|---|---|
| 1¾ in. | 43 00 | 36 00 |
| 2 in. | 50 00 | 36 00 |
| 3¼ in. | | 58 00 |
| 3½ in. | 77 00 | 60 00 |

and Toronto.

OILS AND COMPOUNDS.

| | |
|---|---|
| per gal. | 15 |
| Cylinder oil, Capital | 49½ |
| per gal. | 2 40 |
| Union thread cutting oil antiseptic | 88 |

TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 4 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |

WASTE.

| White. | Cents per lb. |
|---|---|
| XXX Extra | 21 |
| Prime | 21 |
| Grand | 19½ |
| Superior | 19½ |
| X L C R | 18½ |
| Mars | 18½ |
| X Empire | 17½ |
| Ideal | 17½ |
| X press | 16 |

Coloured.

| | |
|---|---|
| Lion | 15 |
| Standard | 13½ |
| No. 1 | 13½ |
| Popular | 12 |
| Keen | 10½ |

Wool Packing.

| | |
|---|---|
| Arrow | 25 |
| Axle | 20 |
| Anvil | 15 |
| Anchor | 11 |

BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30- |
| Standard | 10 |
| Cut leather laces, No. 1 | 1 9 |
| Leather in sides | 1 7 |

Washed Wipers.

| | |
|---|---|
| Select White | 11 |
| Mixed colored | 10 |
| Dark colored | 09 |

This list subject to trade discount for quantity.

RUBBER BELTING.

| | |
|---|---|
| Standard | 10% |
| Best grades | 15% |

ANODES.

| | |
|---|---|
| Nickel | .0 to .54 |
| Cobalt | 1.75 to 2.00 |
| Copper | 14 to 16 |
| Tin | 49 to 56 |
| Zinc | .23 to .25 |

Prices Per Lb.

COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars to 2 in. | 55 00 | 48 00 |
| Copper wire, list plus 10. | | |
| Plain sheets, 14 oz., 14x60 in. | 55 00 | 48 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 60 00 | 54 25 |
| Copper sheet, planished, 16 oz. base | 64 00 | 49 00 |
| Braziers', in sheets, 6x4 base | 55 00 | 48 00 |

BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in rod | 0 43 |
| Brass sheets, 24 gauge and heavier, base | 0 48 |
| Brass tubing, seamless | 0 55 |
| Copper tubing, seamless | 0 60 |

PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 06 |
| Emery glue | 15 to 20 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 45 to |
| Rouge, powder | 30 to |

Prices Per Lb.

LEAD SHEETS.

| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $18 00 | $18 00 |
| Sheets, 3½ lbs. sq. ft. | 18 00 | 18 00 |
| Sheets, 4 to 6 lbs. sq. ft. | 17 50 | 17 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

| | |
|---|---|
| Acid, boracic | $ 1. |
| Acid, hydrochloric | 05 |
| Acid, hydrofluoric | 14 |
| Acid, nitric | .10 |
| Acid, sulphuric | .05 |
| Ammonia, aqua | .08 |
| Ammonium carbonate | .1. |
| Ammonium, chloride | .14 |
| Ammonium hydrosulphuret | .40 |
| Ammonium sulphate | .07 |
| Arsenic, white | .12 |
| Copper, carbonate, anhy. | .35 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .70 |
| Iron perchloride | .20 |
| Lead acetate | .16 |
| Nickel ammonium sulphate | .12 |
| Nickel carbonate | .35 |
| Nickel sulphate | .15 |
| Potassium carbonate | .75 |
| Potassium sulphide (substitute) | 20 |
| Silver chloride (per oz.) | .65 |
| Silver nitrate (per oz.) | .55 |
| Sodium bisulphite | .10 |
| Sodium carbonate crystals | .06 |
| Sodium cyanide, 127-130% | .41 |
| Sodium hydrate | 04 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | 14 |
| Tin chloride | .60 |
| Zinc chloride | .60 |
| Zinc sulphate | .09 |

Prices per lb. unless otherwise stated.

objects by: Making advances by way of cash credits against such security or guarantee as the trustees shall deem sufficient; accepting drafts made against shipments or deliveries of industrial products or of materials; buying and selling bills of exchange against collateral security; issuing letters of credit; discounting trade bills, purchase of secured time payment accounts or by advances upon the same; to assist and to co-operate with other financial institutions in underwriting the share and debenture issues of present or future industrial undertakings; to collect and collate information likely to be useful to its customers.

## WILL INCREASE STEEL PRODUCTION 20 PER CENT.

AN increase of twenty per cent. in the steel production of Canada over that of last year is promised as the result of conferences held between the War Committee of the Cabinet and the Canadian steel manufacturers. The announcement is one which will, it is thought, be welcome alike to the Imperial Munitions Board and the Canadian railways.

The immense amount of steel required for the manufacture of munitions has prevented the railways from securing rails from the Canadian mills. The output has not been sufficient to meet the requirements of both the munitions manufacturers and the railways, with the result that the latter have stood aside. While in some cases they had contracts with the steel companies for the manufacture of rails, they have waived their claims to permit the fullest possible manufacture of munitions.

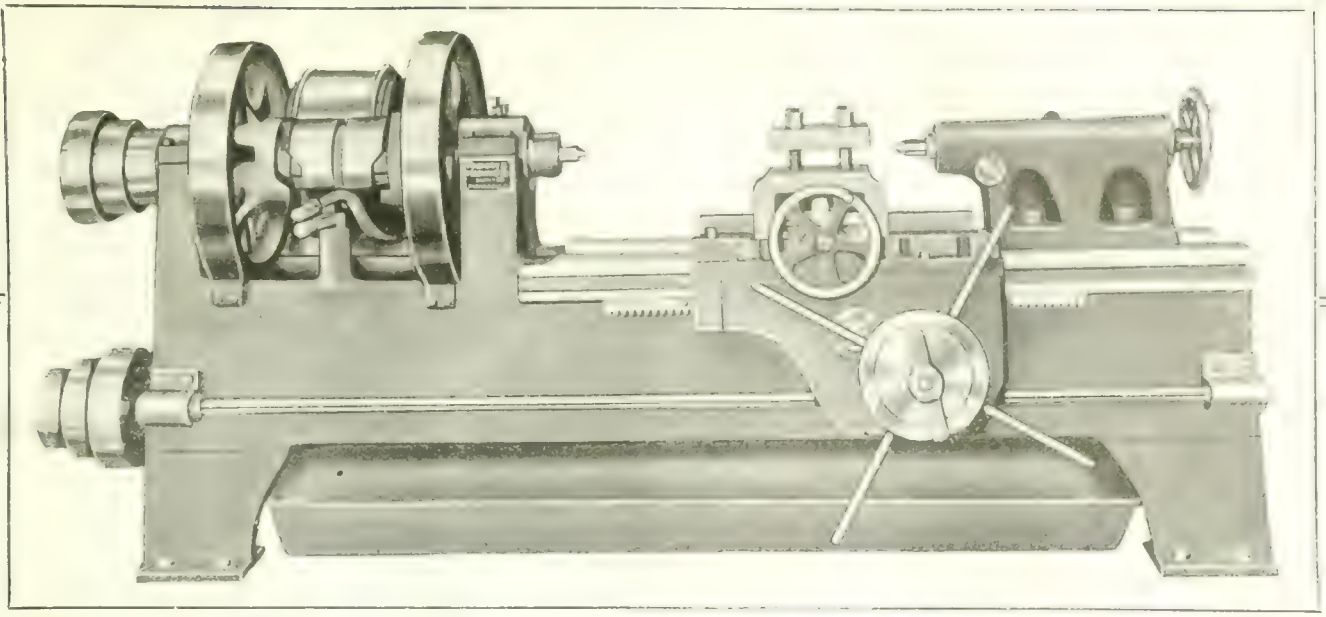
The railways, however, could not longer continue in this position. Their maintenance requires a supply of steel rails. It, therefore, became necessary for the Government to deal with the question.

The steel manufacturers were called into conference last week. The leading manufacturers of Canada were present, and the situation was fully explained to them. The manufacturers expressed an earnest desire to co-operate in every possible way, and, after conferring with the War Committee of the Cabinet, they met together and discussed the question of an increased production of steel. As a result of these conferences it is announced that the manufacturers have undertaken to increase the production of steel twenty per cent. over last year, provided the raw materials are available as usual. This decision is a source of considerable satisfaction to the Government since it helps to solve the problem of the steel supply.

## MARKET FOR PUMPS IN PARAGUAY

HENRY H. BALCH, United States consul at Asuncion, reports that there is a good market for small pumps in Paraguay. Inasmuch as there is no water-supply system for the city of Asuncion, which has about 80,000 population, or for any of the other cities or towns of the Republic, there is a constant demand for a limited supply of hand pumps, windmill pumps, electrical, and gas pumps to be used in wells for the purpose of supplying water to residences, business houses, public buildings, etc., in Paraguay. Aside from two breweries, three ice plants, three sugar refineries, some small bottling plants, and a very few other small plants which require pumps a little larger than those used by the average family, there is practically no market for any class except those used in supplying water from wells for ordinary family needs. The total value of all pumps imported into Paraguay in a year averages about $6.000, of which more than half represents imports from the United States. Germany hitherto has been the nearest competitor, followed by England.

**Boston Insulated Wire & Cable Co.** has been incorporated at Ottawa with a capital of $200.000 to manufacture wire and cables used for electrical and other purposes at Hamilton, Ont. The incorporators are: B. T. Burley, of Worcester, Mass.; H. B. Burley, of Brookline, Mass.; and G. W. Arnold, of Hamilton, Ont.



## The "MONTREAL LATHE"

For Boring and Turning 6" Shells.

*EARLY DELIVERIES*

***Send us your enquiry—Now.***

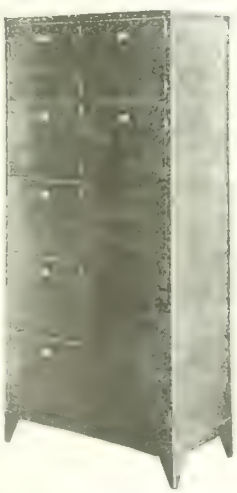
# The A. R. Williams Machinery Co., Limited

**64-66 Front Street West, TORONTO**

# DENNISTEEL

MADE IN CANADA

## Six-in-One Combination Locker



The newest idea in space-saving, fire-proof steel ward robe lockers.

Accommodates the clothing of six people in the general coat compartment and gives each a roomy space for hat, lunch box, etc., as shown.

Each private compartment has its own key, but all keys will unlock the larger compartment.

This locker is ideal where space is limited, as it occupies only three feet wide space, whereas single lockers of the same dimensions would take up a space nine feet wide. Identical units may be added as required. Beautifully finished in rich olive green baked-on enamel.

*Write for illustrated folder.*

THE DENNIS WIRE AND IRON WORKS CO. LIMITED

LONDON CANADA

# 35,000 Shells Nosed With One Nosing Die

and the die still working, and apparently good for several thousand more.

Can you beat that record? We know the above statement to be true, for the die is at work in our own shops, and our records prove that it has already nosed 35,000 4.5 H.E. shells. It is still doing good work, satisfactory to the Government inspectors.

This die is made of our special **Chilled Cast Iron**, harder than the best tempered steel on the wearing surface, but soft and tough elsewhere. That is why it wears so well. No other metal possesses this graded hardness of structure. And no other metal, we believe, will resist so well the hard wear and the temperature strains to which a nosing die is subjected.

## MARSH & HENTHORN, Ltd.

BELLEVILLE ONTARIO

*If any advertisement interests you, tear it out now and place with letters to be answered*

# INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

## ENGINEERING

**Windsor, Ont.**—The plant of the Studebaker Auto Co. has been damaged by fire with a loss of $50,000.

**Hamilton, Ont.**—The Swift Canadian Co. contemplate building a packing house here. Head office Chicago, Ill.

**Dundas, Ont.**—John Bertram & Sons Co. have let practically all the contracts for the new addition which will cost about $150,000.

**Joliette, Que.**—La Compagnie Canadienne de Papeterie which is building a paper mill here will be ready to begin operations shortly.

**Port Arthur, Ont.**—The new plant of the Port Arthur Pulp and Paper Co., with a capacity of 50 tons of pulp daily, is to commence operations in a few days.

**Sydney, N.S.**—The Sydney Foundry & Machine Co. contemplate moving their plant to a new site on the water front. A shipyard will probably be established at the new site.

**Walkerville, Ont.** — The Dominion Stamping Co. has awarded the contract for a forge shop and is in the market for machinery, including drop hammers. The new building and equipment will cost about $16,000.

**Toronto, Ont.**—Fire completely destroyed the Belmont garage, near stop 18, North Toronto, on Thursday morning. The building loss is estimated at $1,500, while motor cars, valued at $7,500, were also destroyed.

**Gowganda, Ont.**—According to latest reports efforts are being made to re finance the South Bay Power Co. and instal a plant at Hanging-Stone Falls. The initial development is understood to be for a unit of 350 h.p., which will be developed from Hanging-Stone Creek.

**Picton, Ont.**—The Town Council recently passed a Hydro enabling by-law. The present lighting plant is steam-operated and is the property of the municipality. It proposed to close down the steam plant and change the distributing system over to suit Hydro current.

**Gananoque, Ont.** — The Gananoque Spring and Axle Co. expect to have their axle-hammer shop in full operation in about ten days' time, as reconstruction necessary after the recent fire will be undertaken immediately the fire loss has been adjusted. The fire will in no way affect the company's spring business.

**Cobalt, Ont.**—Operations are being resumed on the Huronia mine in Gauthier Township. A number of men have left for the mine to commence repairing the mill and pumping out the workings. This mill, and from time to time more or less extensive operations have been carried on and, considering the amount of development work done, satisfactory results were encountered.

## MUNICIPAL

**New Liskeard, Ont.**—The by-law to raise $1,475 for the purchase of road machinery was carried.

**Chatham, Ont.**—Fire Chief Pritchard has recommended that the council purchase a 75-foot aerial truck.

**Ottawa, Ont.**—The ratepayers voted in favor of an expenditure of $150,000 on the proposed St. Patrick street bridge.

**Picton, Ont.**—The municipality propose to instal a motor-operated centrifugal waterworks pump of 1,000 gal. per min. capacity.

**Goderich, Ont.** — The Hydro-Electric Commission has offered to install a new pump at the sub-station here. The existing pump will be sold.

**Fergus, Ont.**—The ratepayers have voted in favor of granting a loan of $10,000 to James Wilson to assist him in rebuilding Monkland Mills.

**Midland, Ont.**—The Water and Light Commission are in the market for a motor-driven pump having a capacity of 1,500 gallons per minute. W. Dudley and A. W. Bell have the matter in hand.

**West Vancouver, B.C.**—The City Council has endorsed the action of North Vancouver City Council and its mayor in urging that a steel plant be established on the Pacific Coast to deal with ores from the province.

**Toronto, Ont.**—Fire Department estimates include an item of $29,400 for a combined hose, chemical and pump motor truck, and $17,000 for an aerial hook and ladder truck. Other new equipment totals $28,153, including equipment for trucks and halls.

**Ottawa, Ont.**—The City Council has adopted the recommendation of the Board of Control that application be made to the Ontario Railway and Municipal Board for leave to borrow $250,000 for the erection of a necessary fuel plant and for the purchase of fuel.

**Wellington, Ont.**—The town has passed enabling money by-laws. It is proposed to issue debentures for the sum of $10,000 for the purpose of buying out the existing lighting system and remodelling it. The Niles estate owners of the existing system has agreed to sell to the town for the sum of $3,000.

**Hamilton, Ont.**—The Board of Control has been informed that T. J. Stewart, M.P., and the local Senators would oppose any application Hamilton would make to the Finance Minister for permission to issue debentures to cover the cost of the new pumps that have been ordered for the waterworks. Mr. Stewart has opposed this scheme, and recently announced that an auxiliary electric supply could be obtained to operate electric units. It was decided to send a deputation to Ottawa to interview the Finance Minister, and ask him to permit the city to issue the debentures.

**London Ont.**—An addition to the hydro-electric power station on York street, to cost about $60,000, will be commenced this year, it was announced at the inaugural meeting of the Public Utlities Commission on Thursday afternoon. Estimates will probably be presented at the next meeting. The Canadian Westinghouse Co., of Hamilton will supply the electrical equipment which will cost $25,400. The present station is overloaded and the addition will provide for handling at least 15,000 more horsepower, making the maximum for the city about 25,000 horsepower.

## BUILDINGS

**Toronto, Ont.**—Permission has been granted by the city architect to the T. Eaton Co. for the erection at 75 Teraulay street of a one-storey brick shipping enclosure to cost $4,000.

**Toronto, Ont.**—The following items have been included in the Board of Education estimates for 1918:—Providing and improving the heating and ventilating apparatus, $4,000; new plumbing, $5,000; piping, wiring and fixtures for lighting, $5,000.

## PERSONAL

**H. R. Safford,** chief engineer of the Grand Trunk Railway, has been nominated for the vice-presidency of the American Engineering Railway Association.

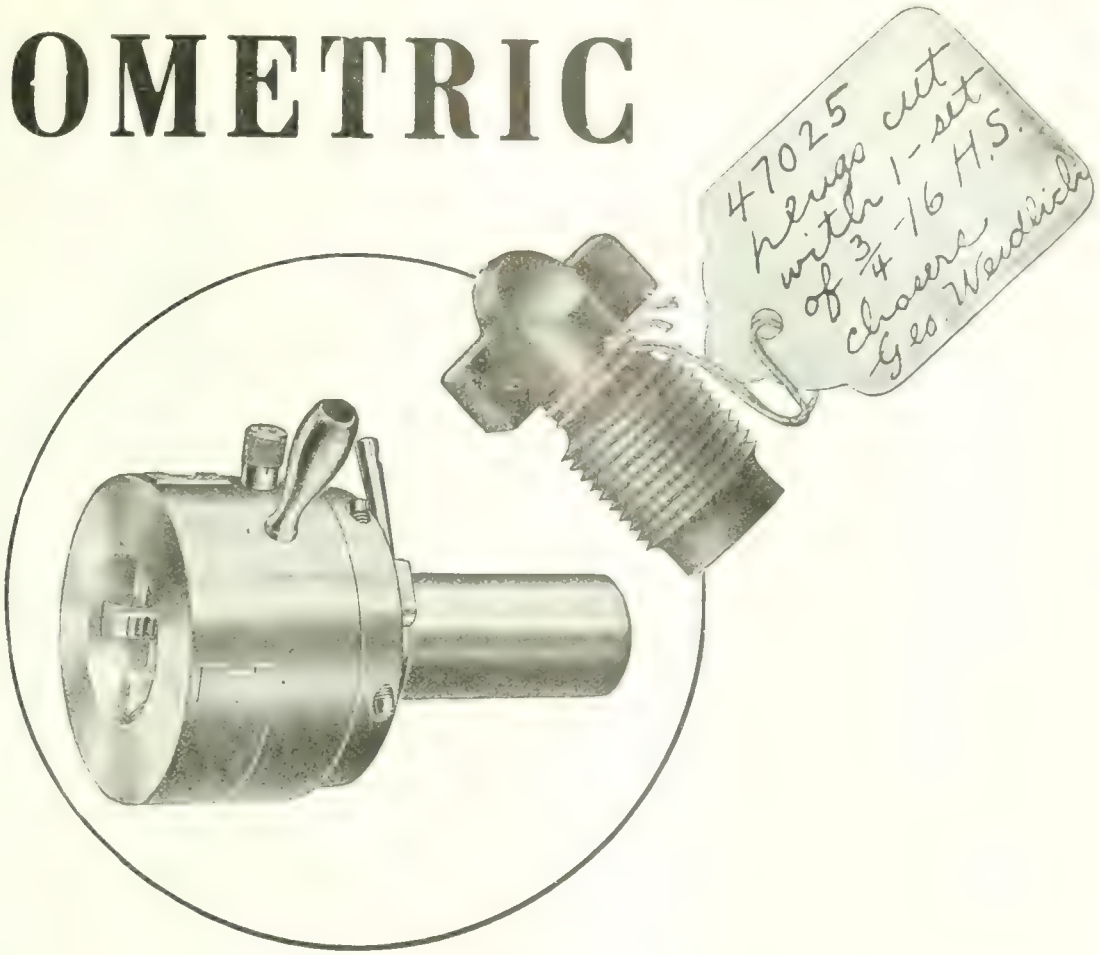
**Charles Spalding,** who was with the Gisholt Machine Co. for twelve years has been made general manager of the Amalgamated Machinery Corporation, Chicago, Ill.

**Fred W. Field,** editor of the *Monetary Times*, and a leading authority on financial and commercial matters in Canada, has been appointed British Trade Commissioner at Toronto with a territory that will probably embrace the entire Province of Ontario.

**Captain R. J. Durley, M.E.,** Montreal, has been made a member of the Order of the British Empire. Captain Durley, who is by profession a consulting engineer, specializing in heating and ventilation, holds a position in Ottawa under the Imperial Munitions Board.

**G. T. Milne,** British Trade Commissioner for Australia has been appointed senior British Trade Commissioner in Canada, in succession to Hamilton Wickes, who is for the present remaining

# GEOMETRIC




## One Set of Chasers in a Geometric Die Head has cut 47,025 of these Plugs

The man who has operated the Geometric Die Head says: "In all my twenty-five years' experience I have never known a die to cut as many threads as this set has cut on cast iron."

A quarter of a century of specializing in one line has brought Geometric Thread Cutting Tools up to the high water mark.

Arrange to do your threading with a Geometric. Let our catalogue tell you about it.

## THE GEOMETRIC TOOL COMPANY

NEW HAVEN, CONN., U.S.A.

*Canadian Agents:*

Williams & Wilson, Ltd., Montreal; The A.R.Williams Machinery Co.,Ltd., Toronto, Winnipeg and St.John,N.B.

bureau, in which capacity he will fol- duction of all articles purchased. This is a further step in the reorganization of the ordnance bureau.

**D. L. Derrone**, formerly identified with the Canada Cement Co., Montreal, engaged in the manufacture of munitions, for the Amalgamated Machinery Corporation, Chicago, is now works manager of Winslow Brothers Co., Chicago, specialists in architectural iron and bronze work for buildings, but engaged in making 6-in. shells.

**Peter Hay**, a prominent citizen of Galt, Ont., and well known as a machine knife manufacturer, died at his home in Galt on Jan. 14. He was born at Lauder, Scotland, in 1835 and came to Canada in 1857. Coming to Galt, he was identified with local steel industries before entering into business for himself in 1885. After conducting the business successfully for 30 years, the Peter Hay Knife Co. was organized and he retired from active management.

**Professor A. N. Talbot**, of the University of Illinois, has been elected president of the American Society of Civil Engineers. Professor Talbot is a graduate of the University of Illinois, class of 1881, and has been a member of the faculty of that institution since 1884. Since 1890 he has ben head of the Department of Municipal and Sanitary Engineering and in charge of theoretical and applied mechanics and has directed important investigational work in engineering materials, reinforced concrete, rail road track, hydraulics, water works, etc.

# TRADE GOSSIP

**The Dominion Steel Products Co.** of Brantford, Ont., has increased its capital stock from $500,000 to $1,000,000.

**The Canadian Cartridge Co.**, Hamilton, Ont., has been awarded a contract for the manufacture of brass cartridge cases for the United States which will keep the plant in operation for several months.

**The National Motor Show of Eastern Canada** is being held this week in Montreal under the auspices of the Montreal Automobile Trade Association on the third floor of the Almy Building.

**Bringing Coal from England.**—It is reported from Washington that the scarcity of coal in the United States has be- Atlantic ports.

During the past year there were only 161 suffered decrease by the lifting of rails to the extent of some 400 miles and sending the rails to France.

**The Herbert Morris Crane & Hoist Co., Ltd.**, Niagara Falls, Ont., announces that its plant at Niagara Falls is completed and is ready to turn out chain blocks, trolleys, travelling chain blocks, jib cranes and overhead travelling cranes.

**Chatham Building Permits.**—Building permits for the city of Chatham, Ont., for 1917 reached a total of $390,997. The total for the preceding year was $1,338,924, this amount including a permit of one million dollars for the erection of the Chatham plant of the Dominion Sugar Co.

**The Hydraulic Press Mfg. Co.** of Mount Gilead, Ohio, announce that their extensive new buildings are now occupied and the plant is again in operation to its full capacity. New and up-to-date equipment has been installed for the building of hydraulic presses, pumps and valves.

**Building Permits at Kitchener.** The building permits issued in Kitchener for the year totalled 207, and were estimated at $205,352. Forty-six new residences were erected valued at $117,925; eight business buildings, $47,900; 46 alterations or additions, $19,005, and 107 garages and smaller buildings, $20,522.

**Welland Building Permits.**—City Engineer D. Black reports that the building permits for 1917 reached a total of $211,334 as compared with $202,587 for 1916 which shows a satisfactory increase. The permits for last December however show a decline being only $1,000 whereas for the corresponding month of 1916 the value was $11,225.

**Sydney, N.S.**—That the building trade was good last year is evidenced by the fact that building permits in 1917 amount to about $415,00, while those issued in 1916 showed a total of slightly over $120,000. Included in last year's buildings is a fine eight-room brick school building on Argyle street, costing $56,000.

**Building Improved in City of Toronto.**—Normal building in the city of Toronto shows a substantial increase for the year 1917 as compared with the year 1916. In 1917 permits were issued totalling about seven and a quarter million dollars. Last year permits totalled $9,881,671, but these figures included the three-million-dollar permit for the Union Station.

**Montreal Board of Trade Officers.**—W. A. Black was elected president of the Montreal Board of Trade by acclamation last Friday. No opposition was made to any of the official positions, so that the rest of the "slate" were elected by acclamation, including John Baillie, 1st vice-president; George Sumner, 2nd vice-president, and W. A. Coates, treasurer.

**Lloyds Cut Insurance Rate.**—Lloyds underwriters last Saturday accepted war insurance on transatlantic cargoes at rates much below the flat rate of the Government, according to the "Times." This action probably is connected with the proposal to extend the Government's scheme, which in effect, would make such insurance on cargoes in British ships a Government monopoly.

**Lower Prices for British Steel Scrap.**—A new order reduces the maximum prices of British steel scrap, fixed by the Ministry of Munitions. On all classes, mixed or not with wrought iron or other material, except steel planings, turnings and borings, the price is changed from £5 5s. to £4 15s. per ton. Wrought iron scrap, mixed with steel or other material, is reduced from £5 5s. to £4 15s. per ton.

**Coal Tar Controlled in England.**—A cablegram from London says: "The Minister of Munitions orders that from Jan. 10 it is forbidden to take, accept or attempt to obtain delivery of any crude solvent naphtha or heavy naphtha except under license. From Jan. 15 no person shall burn or consume tar for firing, steam-raising or heating purposes. Dealings in coal tar subject to control of the Minister of Munitions."

**London Building Permits.**—A. M. Piper, building inspector for the city of London, Ont., reports that 843 building permits were issued during 1917 up to Dec. 31 having a total value of $837,890 compared with $926,125 for 1916 for 1,034 permits. There were 26 permits issued last December valued at $34,590, while for the corresponding month in 1916 31 permits were issued valued at $18,705.

**Record Mercury Output in U. S.**—Heavy increase in quicksilver production in the United States, largely used in war munitions manufacture, was announced recently by the U.S. Geological Survey, which placed the 1917 domestic output for the United States at 36,351 flasks of 75 pounds each. Its value is estimated at about $3,857,000. Not since 1883 had so much been mined. Production was 6,419 flasks larger than in 1916.

**Hydro Development in Eastern Ontario.**—The Ontario Hydro Commission propose to serve the towns of Picton, Wellington and Bloomfield, in Prince Edward County, by means of a 44,000 volt line from Trenton. A sub-station will be erected at Wellington, for serving Wellington and Bloomfield, and a 4,000 volt line will be built from Wellington to Bloomfield. A sub-station will also be erected at Picton to serve this town.

**Steel Freighter Launched at Vancouver.**—The steel freight steamer Alaska, built at the Coughlan yards, Vancouver, B.C., was launched successfully on Saturday morning in the presence of a large crowd. The bottle of wine was broken over the vessel's bow by Mrs. Koldrup, wife of the Norwegian Consul at Seattle. The Alaska has been under construction since last March. Her length is 427 feet and her gross tonnage 5,730.

**German Steel Output.**—The annual report of the German Steel League, the central organization of the industry, makes the significant admission that although the entire industry during the

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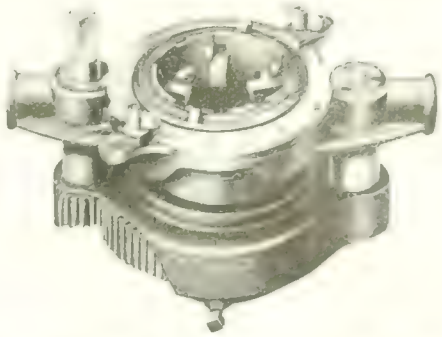

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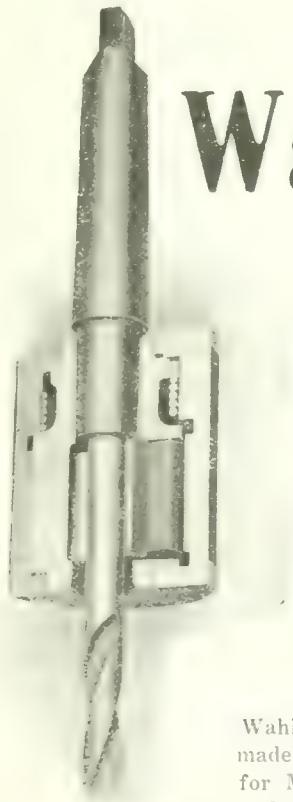

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**TORONTO, CAN.**

Customs Receipts Drop in December. [illegible] for the Dominion for the month of December show a decrease of [illegible] as compared with the same month a year ago. The total receipts for December 1917 were $5[illegible], as against $11884,[illegible] in 1916. The total receipts for the nine months of the fiscal year, ending December 31, however, show an increase of $19,650,882 over the same period in 1916. In 1916 they totalled $106,[illegible], while the total to date in 1917 was $126,263,[illegible].

The Canadian National Clay Products Association will hold their sixteenth annual convention at the Prince George Hotel, Toronto, on Tuesday, Wednesday and Thursday, Jan. 29, 30 and 31. A number of interesting papers will be read by prominent manufacturers and others. The annual banquet will be held at the Prince George Hotel, Wednesday night, January 30, with Joseph Russell, M.P.P. as toastmaster. Further particulars may be obtained from the secretary G. C. Keith, 435 Grace St., Toronto.

**McGill Professor Now Cabinet Minister.**—Sir Auckland C. Geddes, K.C.B. who has been Minister of National Service since last summer in the British Government, was for three years Professor of Anatomy at McGill University, Montreal. Professor Geddes came to Montreal from Dublin in 1913 but returned to England in 1915 and later received a commission in the Northumberland Fusiliers. He was later appointed to the General Staff and raised to the rank of Grigadier General.

**Canada Buying Rails in U.S.**—The railroads in the United States are more actively in the market for standard section rails. It is confirmed that the Steel Corporation has taken some business at $55 to $57 per ton, and one lot of 2,500 tons is reported to have been sold to Canada at a considerably higher price. Small lots of standard section rails for early shipment have sold between $73 and $78 per ton. For late shipment the Steel Corporation prices are now $55 for Bessemer and $57 for open hearth rails.

Officers Chosen by Civil Engineers.—The election of officers of the Toronto branch of the Canadian Society of Civil Engineers, held at their annual meeting at the Engineers' Club last week, resulted in the following selections: Chairman, Prof. Peter Gillespie; secretary-treasurer, George Hogarth; executive committee: J. R. W. Ambrose, Willis Chipman, E. L. Cousins, Prof. Haultain, E. G. Heuson and R. O. Wynne-Roberts Reports of committees were read and other general business [illegible].

Newfoundland Paper for U.S.—A new [illegible] from Newfoundland, the shipping of pulp and paper to the United States, is disclosed in the customs returns. About 30,000 tons, mainly for distribution in small towns in the eastern state, were shipped during the latter half of 1917. Shortage of trans-Atlantic shipping forced Lord Northcliffe to seek a market in the States for the product which formerly had been shipped from his mills to England.

**B. C. Schooners on Australian Trade.** Of the Canada West Coast Navigation Co.'s fleet the following have done a voyage from British Columbia: Mabel Brown to Sydney; Margaret Haney, to Bombay; Geraldine Wolvin, to Sydney; Laura Whalen, to Adelaide; Jessie Norcross, to Adelaide; and the Malahat to Sydney. On passage are the Janet Carruthers, which sailed on August 21 for Adelaide; the Esquimalt, sailing the same day for Melbourne, and the Marie Barnard, which left November 13 for Sydney.

**Brompton Pulp Co. Acquires Two Concerns.**—The Brompton Pulp and Paper Co. has acquired two American concerns, the Claremont Paper Co., of Claremont, New Hampshire, and Wyman, Flint & Sons Co., of Bellows Falls, Vermont, so it was announced in Montreal recently at the annual meeting of the shareholders of the Brompton Pulp & Paper Co. It was stated that the two concerns in question had been acquired on a very reasonable basis, and no new financing by the Bromptin Co. would be necessary to complete the transactions.

**British Government Extend Trade Commissioner Service.**—The appointment of F. W. Field as British Trade Commissioner for Ontario is part of a scheme of the British Government to extend and develop the trade commissioner service in the Empire. It is now proposed to increase the number of trade commissioners in several of the dominions and to appoint commissioners in India and some of the Crown colonies and protectorates. Canada has hitherto been served by only one commissioner, who has headquarters at Montreal. G. T. Milne has been appointed to the Montreal office.

**Toronto Customs Record Revenue.**—Customs returns at the port of Toronto for 1917 made a new high record. The total was $35,677,000, an increase of $3,897,800 over the returns for 1916. That such a substantial increase was recorded is all the more gratifying by reason of the fact that the 1916 returns were an increase of some thirteen million dollars over those of 1915. Compared with pre-war customs revenue, the returns now pouring in represent an increase of 100 per cent. The largest monthly return in 1917 was in May, when it amounted to $3,546,256. The gain in customs revenue is due to a combination of circumstances. Actual importations have increased to a considerable extent and the total has been added to by the general increase in the cost of goods of all kinds.

**The Quebec Bridge Contraction.**—During the extremely cold weather between Dec. 18 and 30, when the temperature fell from 15 degrees above to 20 below zero, the Quebec Bridge contracted four and a half inches. Lt.-Col. C. N. Monsarrat, chairman of the Quebec Bridge Commission, issued this information to correct an announcement published in a daily paper that the recent very cold snap had effected a contraction of nine feet in the structure. Col. Monsarrat said the contraction of four and a half inches with a drop of temperature of 35 degrees was in accordance with expectations, and further, that provision had been made in the structure for expansion and contraction of 36 inches, which is sufficient to take care of a range of temperature of 180 degrees.

**Gas Waste in Western Ontario.**—Enormous wastage of gas due to defective distribution, leaky mains, improper service pipes and inadequate burners in factories were the principal disclosures made on Thursday at the gas investigation before the Ontario Railway and Municipal Board at Chatham, Ont. The board received suggestions as to the most feasible way in which the wastage could be overcome, including a recommendation that a thorough inspection of the entire system of producers, distributors and wholesale and domestic consumers be made by experts. That the wastage in some instances attained the proportions of from 25 to 50 per cent. of the supply was the statement made to the board by Superintendent F. W. James, of the Union Natural Gas Co. He attributed the wastage largely to leakage and the poor facilities provided by manufacturers and other large users for burning the commodity.

## MARINE

**Vancouver, B.C.**—The first of the wooden steamers building at the Western Canada Shipyards will be launched some time this week.

**Esquimalt, B.C.**—The Princess Victoria is still on the slip-way at Yarrows, Ltd., getting a shaft renewed and undergoing a general overhaul. She will soon be ready to resume the triangular run.

**Quebec, Que.**—The Canada Steamship Lines are establishing a plant at Cap de la Madeleine, near Three Rivers, for the repair of ships. It is intended that this shall replace the one destroyed some time ago at Sorel, but it will be larger and better equipped. The municipality is being asked for exemption from taxation. Some of the Steamships' fleet is wintering there.

**Vancouver, B.C.**—First of the fleet of twelve wooden schooners built in British Columbia to return to this Province, the Jessie Norcross reached here on Jan. 10, with a cargo of sugar for the British Columbia Sugar Refinery at Vancouver. She made a quick passage from Fiji, encountering favorable winds most of the way across. The Jessie Norcross was launched at North Vancouver by the Wallace Shipyards on April 29, 1917, and loaded lumber at Genoa Bay for Port Adelaide, Australia. She is to load an-

other lumber cargo in British Columbia for the Antipodes.

## TENDERS

**Ottawa, Ont.**—Tenders will be received until Feb. 5, 1918, for the elevators and hoist equipment required in the re-construction of the Parliament Buildings. All tenders to be based on the execution, erection and completion, together with the furnishing of all material, tools, appliances, labor, etc., as required and described by the plans and specifications for elevators and hoist equipment. The work of this contract shall be proceeded with immediately upon the signing of the same and continued as directed, in such a manner as to insure the completion thereof by Dec. 31, 1918. Plans and specifications, and any other information required can be obtained at the office of the General Contractor, P. Lyall & Sons Construction Co., Ottawa.

**Ottawa, Ont.**—Tenders will be received until Feb. 5, 1918, for rolled steel casements and bronze covered frames and sash for the Parliament Buildings. All tenders to be based on the execution, erection and completion; together with the furnishing of all material, tools, appliances, labor, etc., as required and described by the plans and specifications for (a) rolled steel casements (b) bronze covered frames and sash. Separate tenders to be sumitted for "a" and "b." The work included under this contract shall be commenced immediately on the signing of the same, or at such time as may be directed, and be carried out in such a manner as to insure the completion therequired can be obtained at the office of the of by Sept. 30, 1918. Plans and specifications, and any other information regeneral contractor, P. Lyall & Sons Construction Co., Ottawa.

## CONTRACTS

**Toronto, Ont.**—The Ontario Power Co. has awarded further contracts in connection with the extensions to the plant at Niagara Falls. The Canadian General Electric Co. was given the contract for the two generators to be installed, while the turbines will be purchased from the Tallahassee Power Co. The pipe-line contract has already been awarded to the Pacific Coast Wood Stave Pipe Co. The Hydro Electric Commission controls the Ontario Power Co., and is financing the undertaking.

## RAILWAYS

**Calgary, Alta.**—A survey for a new railroad line from Medicine Hat, Alberta, south through Coutts to connect with the main line of the Great Northern at Great Falls, Mont., and open a new outlet for the great stores of Canadian wheat in the prairie provinces, is reported in progress. The survey is in charge of C. B. Miles, of Calgary, for the Alberta-Hudson Bay Railway, it is said, but such a line has long been considered by the Grand Trunk Pacific Railway and also by the Canadian Northern as a feeder for the Hudson Bay Railroad when it shall be completed.


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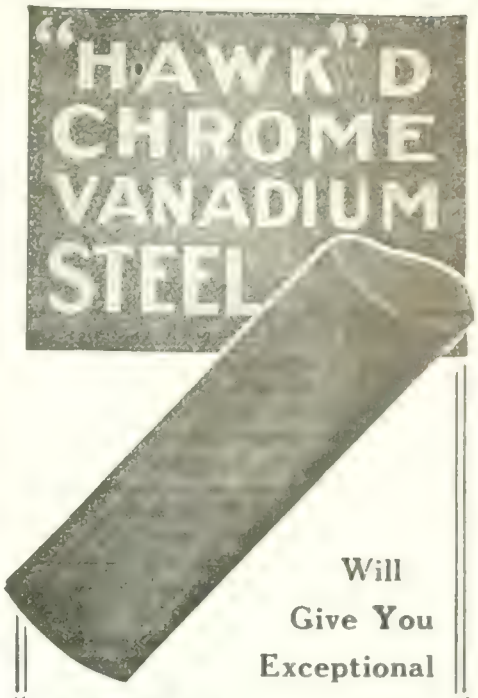


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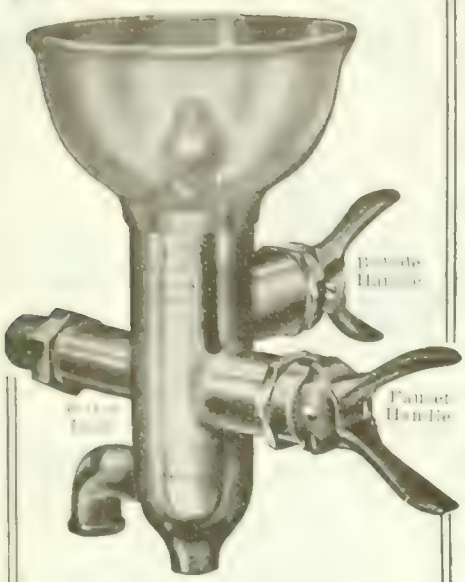

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Order

**Brantford, Ont.**—Freight service on the municipal railway line between here and Paris has been discontinued and the passenger service curtailed by half with the object of conserving Hydro power. Further curtailment of the street railway service within the city is also expected.

## INCORPORATIONS

**McKinnon-Columbus Chain, Ltd.**, has been incorporated at Ottawa by L. E. McKinnon, D. S. Brisbin and W. A. McKinnon, all of St. Catharines, Ont., to manufacture chain and metal products of all kinds at St. Catharines, Ont., with a capital of $1,000,000.

**The Beaver Truck & Tractors Co.** has been incorporated to manufacture motor trucks, farm tractors, fire apparatus and vehicles at Walkerville, Ont., with $500,000 capital stock. Edward P. Brownell, Toronto; Charles J. Stodgell and Henry P. Crocker, Walkerville, are interested.

**Canadian Die Casting Co.** has been incorporated at Ottawa with a capital of $300,000 to manufacture iron and steel products of all kinds. The chief place of business is Montreal and the incorporators are: Harry A. Bertram, F. H. Markey, and W. W. Skinner, all of Montreal.

## CATALOGUES

**New Publication on Plastic Fire Brick.**—Under the title, "How Anyone Can Make a Jointless Gas-tight Furnace Lining," the Betson Plastic Fire Brick Co., of Rome, N.Y., has published a 16-page illustrated folder showing how the plastic fire brick made by them is used in forming one-piece linings for steam boiler furnaces. The old lining of fire bricks or blocks is first removed and the plastic material is then placed in the form of chunks, consolidated with a mallet and smoothed with a trowel, occupying the same thickness as the old lining. The special mechanical process used in the preparation of this material is said to eliminate expansion and contraction with temperature changes, so that not only sidewalls, but also door arches, rear arches and arches for Dutch ovens and other forms of furnace can be formed as solid, monolithic structures. After the aterial has been dried and set by a slow fire for four or five hours, the furnace can be put into full service. No molds or special forms are used. The same material is used for forming baffles in water tube boilers.

### U. S. COAL EXPORTS TO CANADA

REDUCTION in exportation of coal from the United States suggested by Fuel Administrator Garfield will probably not affect the rank of the United States as a coal exporting country. A compilation by the National City Bank of New York shows that the United States, prior to the war, held third rank as a coal exporting nation, but, with Germany now cut off from the rest of the world, it has taken second place.

Great Britain, Germany and the United States have for many years supplied the bulk of the coal used in international trade. In 1913 the total amount of coal exported from coal producing countries was in round figures about 200,000,000 tons, of which approximately 40,000,000 tons was bunker coal, while a considerable portion of that classed as exported went to the world's coaling stations to be supplied to vessels. The value of the bunker coal used in normal times aggregates $250,000,000 out of a total of $700,000,000 worth passing out of the coal producing countries. In 1913, the year preceding the war, Great Britain exported coal of all kinds amounting to 93,000,000 tons; Germany, 40,000,000 tons; the United States, 29,000,000 tons; while Austria-Hungary was fourth with about 9,000,000 tons.

Much of the 200,000,000 tons exported before the war went to adjacent territories and a much smaller amount than is generally supposed went overseas. In 1917 the U. S. exported about 32,000,000 tons, of which more than 17,000,000 tons went to Canada, and about 8,000,000 passed into the bunkers of ocean vessels. Exports of coal to Canada for the past year were the largest in the history of this country, and the value is placed at $58,000,000, about one-fourth of the quantity being anthracite. The total value of all the coal exported and passed into bunkers for the year amounted to $113,000,000.

### GREAT HOPES IN PAPER TRADE

IN the rapid advancement of the pulp and paper industry in Canada since 1910, when total values of exports of pulp and newsprint have leaped from $7,000,000 to over $43,000,000 and may reach $60,000,000 in 1918, Canadian financiers and public leaders recognize one of the most promising avenues for overtaking part of the country's adverse trade balance, particularly in the United States.

Nearly $80,000,000 of new capital has been invested in the Canadian pulp and paper industry during the last seven years. The value of exported newsprint paper has advanced about one thousand per cent. While some fears have been expressed that the most serious check would come through exhaustion of the timber limits, the recognition of this possibility by the mills themselves has introduced greatly improved fire guarding, and assures the adoption of more conservative woods operations in future.

As not more than 10 per cent. of the total newsprint of mills in Canada is used by Canadian publishers, the main problem of all the mills is to find a profitable market for the remainder, almost 2,200 tons a day. Hitherto the United States has taken about every pound of pulp or paper that the industries could

produce, and with the exhaustion of Eastern States forest supplies, this pressure upon Canadian mills is bound to become more acute.

Canadian mills have made no attempt to sell Uncle Sam anything but newsprint, content to take the big share of the home market in the finer grades, such as book and writing papers. The latter trade has been turned toward Canadian mills more and more since British competition was made more difficult from shipping interference of recent years.

One of the great hopes of the Canadian pulp and paper trade is that the peace arrangements will include a preferential tariff scheme allowing them a privileged entry to the United Kingdom, Australia, South Africa and elsewhere. Australia makes very little paper of her own and imports heavily from almost every European country as well as Canada and the United States. Scandinavian factories, and those of Holland and Germany enjoyed a heavy share of Australian trade for many years past, while Canada received a trifling total.

South Africa offers a market chiefly in wrapping and bag papers, book papers and cheap bonds, which have hitherto been supplied from England cheaper than the Canadian mills could figure. In India only the most elementary grades of paper are used and have been brought from Germany, Australia, Belgium and England.

In the market of the United Kingdom Canada's paper manufactures as well as the raw materials of wood pulp have been heavily outclassed by Scandinavia. For example, in 1913 Sweden sold the United Kingdom $11,500,000 and Norway $6,000,000 worth of wood pulp against Canada's $900,000 worth. In paper for printing or writing Canada's sales to John Bull amounted to about $600,000, while the Scandinavian countries took total orders of over $6,000,000.

**Largest Locomotive in the World.**—The greatest steam locomotive in the world has been put into service by the Baldwin Locomotive Works, Philadelphia, Pa. It is so gigantic that its boilers had to be made flexible at three different joints so that the locomotive could turn around a curve. It is more than 100 feet long and weighs some 150 tons. Twenty-four driving wheels, each standing as high as an average sized man, afford its traction. The driving wheels are distributed along the length of the locomotive in sets of four pairs, the wheels of each set being coupled together and driven by two giant steam cylinders. Under full steam the locomotive can exert an 83-ton pull on cars behind it, which means that it can easily haul a freight train two miles long and 23,000 tons in weight over an ordinarily good roadbed at an average of fourteen miles an hour, and possibly more. Bad roads will retard it only slightly.


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are the result of over SIXTY YEARS' experience in spring making
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Is as nearly stretchless as is possible in a good belt.
On account of the impregnation process a very tightly woven duck can be used, which is partly responsible for the lack of stretch, but only partly. The impregnation of Balata Gum itself fills the pores of the strands of the duck and between the strands. As the duck is stretched during impregnation the gum keeps the fabric from contracting, and it remains in a stretched condition.
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Prompt Deliveries
on Gauges, Tools, Dies, Jigs and Fixtures.
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*Quotations cheerfully submitted.*
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Planer, 8 ft. long x 48" wide.
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Complete equipment for machining 45 H.E. Shell Nose Plugs, capacity 10,000 per day.
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# CANADIAN MACHINERY

## AND MANUFACTURING NEWS

*A weekly newspaper devoted to the machinery and manufacturing interests.*

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# Oxyacetylene Welding and Cutting: Methods and Apparatus

By Stuart Plumley

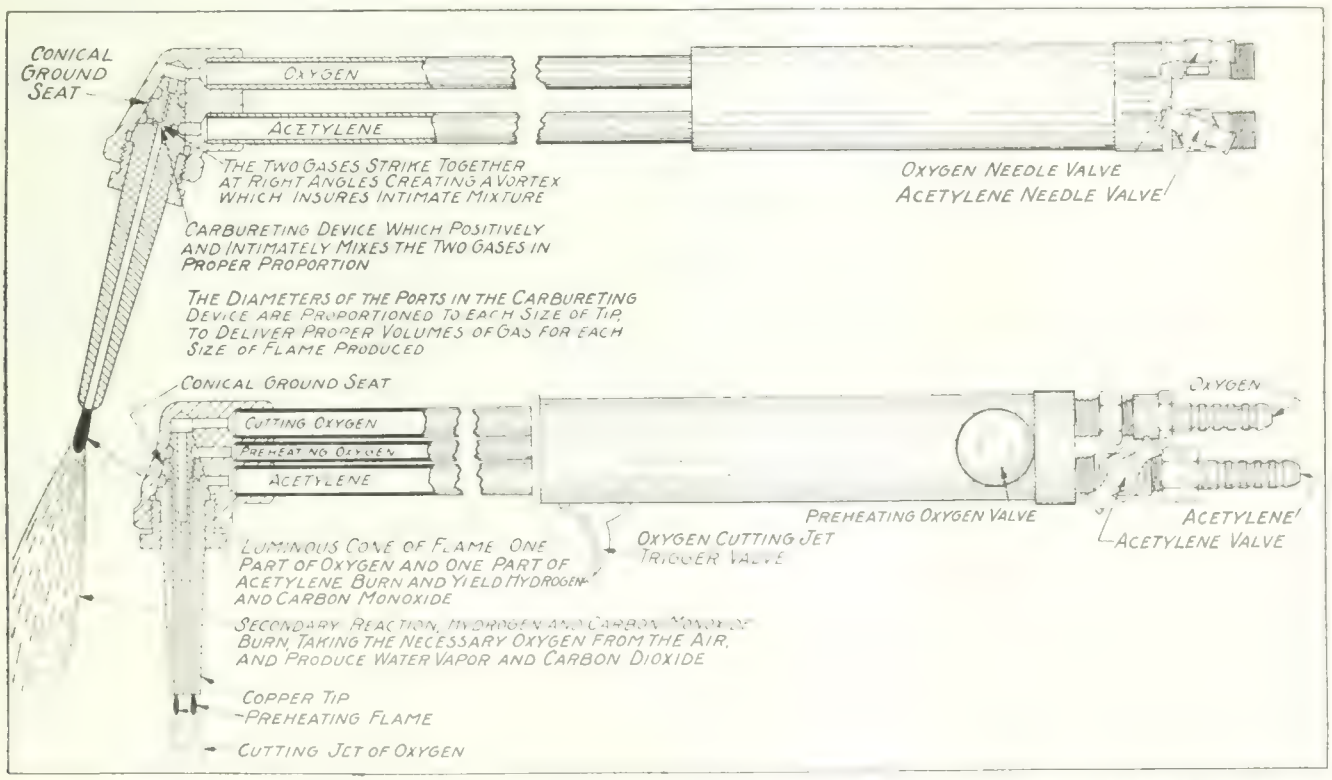
*The necessity for preheating castings is pointed out and methods of preheating are described. The design of welding and cutting torches also is considered and the operation of these devices is covered in considerable detail; likewise the necessity for using high-grade welding rods and other supplies is emphasized. Reference is also made to the large amount of welding work done on the machinery of damaged German vessels interned in the States.*

IN considering the subject of oxyacetylene welding at prior conventions of the American Foundrymen's Association, attention has been centered largely upon the various classes of work which have been accomplished with the process, and in generally describing the equipment and gases used.

The process has now been employed so many years that practically everyone has a fair idea of it, and generally understands the equipment and the things it will do.

There is, however, an unfortunate condition existing, especially in the New England states, which is brought about by a lack of practical knowledge of the process, and, in particular a lack of knowledge of the metallurgy of iron and steel as it affects a weld. Amng some of the foundries and machine shops in this district, the impression seems to have gained ground that the process produces only a hard, brittle union of the two parts to be welded, and that the weld cannot be machined; also that a weld in cast iron has no particular strength. Nothing could be further from the truth than this impression. It has been brought about by a lack of study of the process, by the use of very poor filling rods, and especially by the use of a great variety of apparatus, with which the market has been flooded which is improperly designed and constructed, and which is directly responsible for failures.

Under these conditions it seems opportune at this convention to consider the process, as applied to foundry work from a more scientific standpoint and with a better understanding of the various features of the apparatus and its use which bring about success in welding. These various factors cannot be given too much consideration. It is upon them that the success of the process in each individual foundry is dependent.


CONICAL GROUND SEAT
OXYGEN
ACETYLENE
THE TWO GASES STRIKE TOGETHER AT RIGHT ANGLES CREATING A VORTEX WHICH INSURES INTIMATE MIXTURE
OXYGEN NEEDLE VALVE
ACETYLENE NEEDLE VALVE
CARBURETING DEVICE WHICH POSITIVELY AND INTIMATELY MIXES THE TWO GASES IN PROPER PROPORTION
THE DIAMETERS OF THE PORTS IN THE CARBURETING DEVICE ARE PROPORTIONED TO EACH SIZE OF TIP, TO DELIVER PROPER VOLUMES OF GAS FOR EACH SIZE OF FLAME PRODUCED
CONICAL GROUND SEAT
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OXYGEN
PREHEATING OXYGEN VALVE
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ACETYLENE VALVE
OXYGEN CUTTING JET TRIGGER VALVE
LUMINOUS CONE OF FLAME ONE PART OF OXYGEN AND ONE PART OF ACETYLENE BURN AND YIELD HYDROGEN AND CARBON MONOXIDE
SECONDARY REACTION, HYDROGEN AND CARBON MONOXIDE BURN, TAKING THE NECESSARY OXYGEN FROM THE AIR, AND PRODUCE WATER VAPOR AND CARBON DIOXIDE
COPPER TIP
PREHEATING FLAME
CUTTING JET OF OXYGEN

FIG. 1. UPPER: GENERAL ARRANGEMENT OF A PROPERLY CONSTRUCTED WELDING TORCH. FIG. 2. LOWER: GENERAL ARRANGEMENT OF A PROPERLY CONSTRUCTED CUTTING TORCH.

### Preheating of Iron Castings

Iron castings should be carefully prepared for welding, and placed in such a manner that preheating may be accomplished without unnecessary handling. This preparation consists in cutting away the edges to be welded to an angle of 45 degrees on each side, to permit the operator to start welding at the bottom of the broken section.

As it is necessary to bring the temperature of the casting up to the point of maximum expansion very slowly and evenly, and as it is desirable to maintain this heat as nearly constant as possible during welding, it is usually best to place the casting in a rough brick enclosure so the heat may be properly confined.

Preheating should be accomplished either with a large oil or gas flame of moderate temperature, or with charcoal. A fuel oil, or kerosene oil burner, is perhaps the most convenient means for preheating. Two such burners operating through openings in the brick wall above mentioned will usually heat a casting evenly, without overheating any particular part.

During welding, these preheating burners may be shut off, if the heat is found to be too great for the operator, and, when the weld has been finished, they may be relighted and the casting again brought up to an even heat. It should then be completely covered with asbestos, heated slacked lime, hot ashes, or sand, and allowed to cool very slowly.

*Paper presented before the American Foundrymen's Association at Boston, Sept., 1917.

**Of the Davis-Bournonville Co., Boston, Mass.

the casting hard and brittle.

ing may be accomplished with an inexpart of or the whole casting. In this cause almost any fuel, like kerosene, fuel and does the work better than oxygen and acetylene. In some instances where the castings are large it would be im- the casting prior to welding so as to strained on cooling. Such preheating is always necessary where the casting is complicated or where there are several pansion and contraction would be re- panded, either in part or whole, before welding contraction, after the weld has been accomplished, will set up strains in some of the members, eventually, if not immediately, causing a break.

Care must always be taken, however, in preheating a casting to see that it is not heated so hot it will be warped out of shape. This is especially the case where there are machined surfaces, which must be kept true. Preheating slowly so that sudden temperature duced. Slow heating is essential espeof thin and heavy parts. Cooling in all instances, as stated above, should be accomplished as slowly as possible.

In the first instance, where the casting merely to save gas, the temperature to which this preheating may be carried makes very little difference, because this temperature will not ultimately affect the utility of the casting. If desired, it may be heated to a dull red heat. In the second instance, where the casting is complicated, or where there are machined surfaces, which must not be warped out of shape, the temperature of preheating must not be anything like as high as a dull red, but, on the other hand, it must be sufficient to expand the metal pro- place, it will not create a strain or break.

Definite rules for preheating are practically out of the question because in

### Proper Mixture of the Gases in the

the two gases, oxygen and acetylene, in proper proportions, and that it thoroughly and intimately mixes these gases.

In every oxy-acetylene torch, the two gases are brought together in some manner, the object being to produce a luminous cone of flame at the tip of the torch. If there is just enough acetylene, thoroughly mixed with the right quantity of oxygen, to produce complete combustion there will be, in the first reaction of the flame, no unconsumed oxygen or acetylene coming in contact with the weld, and the flame will produce very satisfactory results. But if there is an excess of oxygen, which cannot be consumed in the first reaction of the flame, this excess of oxygen of necessity plays upon the heated metal during the welding operation; and hence oxidizes or burns the metal. If there is an excess of acetylene instead of oxygen, the effect will, perhaps, be less harmful, but the increased amount of carbon which will be taken up by the metal tends to make the weld hard and brittle.

Before proceeding further with this discussion, it may be well to explain that in the oxy-acetylene torch we are consuming oxygen and essentially gaseous carbon. Acetylene contains approximately 93 per cent. carbon, the remainder being hydrogen, with exception of a few impurities, which need not be given consideration.

There are two definite stages of combustion in the oxy-acetylene flame; one is termed the luminous cone of flame. In this stage of combustion theoretically one part of oxygen and one part of acetylene burn, and yield hydrogen and carbonmonoxide. In the secondary reaction, which is usually called the enveloping flame, or the envelope, hydrogen and carbonmonoxide burn, taking the necessary oxygen from the air and produce water vapor and carbon dioxide. This secondary reaction forms an envelope of burning non-oxidizing gases, which practically surrounds the heated metal during the welding operation and prevents its absorption of oxygen from the air.

It is this enveloping flame and the complete combustion of the oxygen and acetylene delivered by a properly designed welding torch that makes it possible to produce efficient welds.

### Gases Will not Mix

The opinion seems to have become more or less prevalent in New England, with which the writer is specially familiar, that it is only necessary to lead the two gases together and to control them with two regulating valves in order to produce the required neutral flame. But, a great deal of experience has shown that this is not a fact. The two gases will not mix together intimately when brought into contact and passed through a channel. There must be some other means for mixing them and some definite way to deliver the gases in proper proportion. This is accomplished in properly designed torches by leading the gases through very small ports of proper diameter, so that the velocity in each instance is high. These ports are arranged at right angles to deliver the jets of gas in fast flowing streams, which strike together and produce a vortex.

In this manner the two gases are thoroughly and intimately mixed before they pass through the tip to the first stage of combustion. They are also mixed in as nearly the proportion of one to one as is practicable under working conditions, this proportion being determined by the diameter of the ports leading the gases together and the pressures at which they are delivered. It is, of

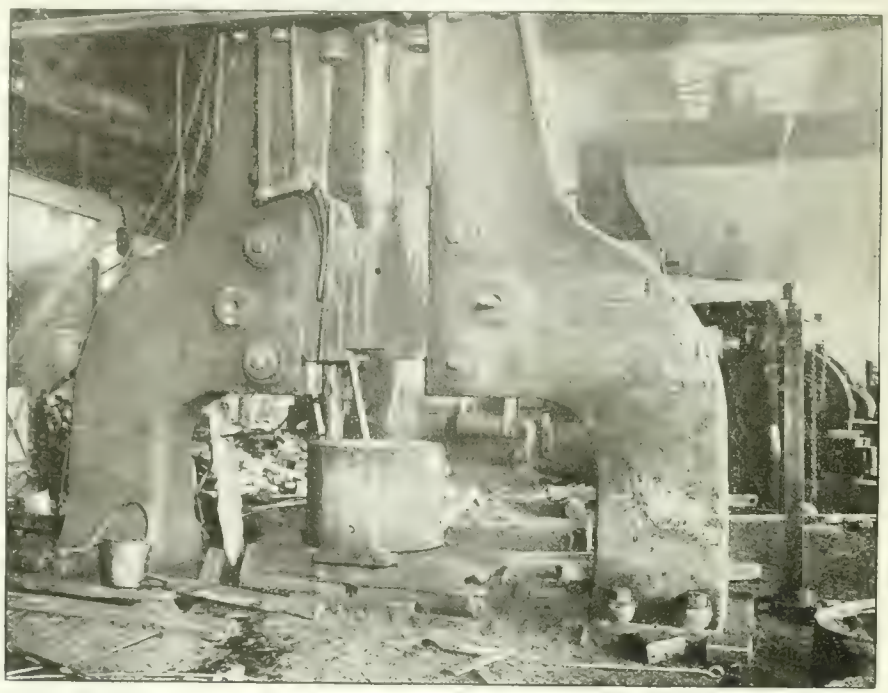


FIG. 3 LARGE STEAM HAMMER WITH WELDED LEG.

course, necessary that these pressures be each independent of the other, else the proportion would be out of control.

### Properly Constructed Torch

Fig. 1 illustrates a torch constructed upon these principles. The oxygen is led to the cast head of the torch through the upper tube under a pressure definitely controlled by the oxygen regulator. The acetylene is led to the cast head of the torch through the lower tube, the pressure being controlled by the acetylene regulator.

The interchangeable tips fit into the receptacle provided in the cast head of the torch by means of a ground joint, and each tip is arranged to produce a different size of flame for use upon different thicknesses of metal. In order that this may be accomplished, the size of the longitudinal bore through the tip and the diameters of the oxygen and acetylene ports must be in proper proportion so that at the pressures given by the regulators the right amount of each gas will pass through these ports. There is one oxygen port and two or more acetylene ports, the oxygen port being vertical and the acetylene ports horizontal. These ports meet at right angles at the upper end of the longitudinal bore through the tip. The streams of unlike gases, consequently, enter this longitudinal bore under high velocity and strike together, creating the vertex we have already described.

Fig. 1 clearly shows the luminous cone of flame produced and also the secondary reaction, or enveloping flame which surrounds the weld. The torch is held by the operator in such matter that the luminous cone of flame barely touches, or is a short distance away from the metal which is being welded. It will be very readily understood that if there is an excess of oxygen passing out of the luminous cone unconsumed, it will come in contact with the molten metal, which is being welded and cannot help but produce an oxidizing effect. This renders the weld much weaker than if complete combustion were attained.

It will, therefore, be appreciated that the design and construction of the torch is a very vital factor in the success of the process, and that a positively neutral flame must be secured. Many operators do not appreciate these facts and pay little or no attention to the character of the flame, and this results in failure which unfortunately cannot always be detected until the weld is placed under a strain.

A little thought on this subject will make it apparent that the two gases must be under a constant pressure to maintain the neutrality of the flame, and that this constant pressure is dependent upon the regulators attached to the sources of supply of oxygen and acetylene. It is, therefore, essential that both regulators be so designed and constructed that these pressures will be steady and even.

FIG. 1 A MORE DETAILED VIEW OF THE WELDED LEG

### Welding Supplies and Materials

In welding cast iron, aside from the importance of preheating and of thorough and proper mixture of the gases in the torch, there is another factor upon which the whole success of the weld is dependent. In making a cast-iron weld, whether the defect is a sandhole or a crack, the metal adjacent the break or hole must be chipped, or v'd, until the included angle between the faces of the break is 90 degrees. After the casting has been properly preheated and the torch applied, the sides of the break are melted away with the torch, and this entire opening slowly filled with cast iron fused into it by melting welding rods held by the operator. The operator ordinarily uses the cast iron rod as a puddling stick, with which he is able to work out slag, blowholes, etc.

The strength of the weld is dependent upon the composition of the welding rod used. It is a well-known fact that silicon in cast iron tends to promote the formation of graphite making the iron soft. Managanese and sulphur, on the other hand, have just the opposite effect. Cast-iron rods, therefore, should be high in silicon, and the grade of iron used in their manufacture must be of the very best. The rod must be cast in a heated metal mold in such manner that it is free from sand and is not chilled on the surface.

In New England, there are a great many cast-iron welding rods upon the market which contain very little silicon and are high in manganese and sulphur. They are also of a poor grade of iron of course are sold at a low price. The use of such welding rods tends to produce white or chilled iron, containing no graphitic carbon, making the weld intensely hard. The use of proper welding rods increases the amount of silicon in the weld, and decreases the manganese and sulphur, enabling the operator to produce a soft weld, which may be machined without trouble. It would, perhaps, surprise a good many people to know how many jobbing machine shops in Boston will turn down an iron casting if the machining upon it involves the machining of a welded part. Much of this trouble lies in the use of the cheaper grades of welding rods. Even some of the larger companies, who depend entirely upon purchasing agents to buy supplies, price being the only consideration, experience identically the same difficulty, because the welder is utterly unable to produce a satisfactory weld with a poor welding rod.

The manufacture of good welding rods cannot be carried out in an ordinary foundry, as the iron is not suitable for the purpose. The production of such rods is the work of a special foundry, properly equipped, and with accurate knowledge of the requirements.

A good scaling powder is, also, essential in making a cast iron weld. Melted cast iron has a great affinity for oxygen, which combines with it to form an oxide of iron, or slag. The oxide is lighter than the melted metal and does not melt at quite so low a temperature. As it rises to the surface, a great deal of it can be removed by scraping it away with the welding rod. The object of a flux in this connection is to provide a chemical which at the high temperature involved will break up the oxide into its component parts. Two chemicals in the flux combine with the oxygen in the slag, releasing the iron, and allow the oxygen to pass off in the form of carbon monoxide, or carbon dioxide.

When the torch is first applied to cast iron and the metal becomes fused, the molten metal from the two pieces to be welded will not run or melt together on account of the film of oxide covering

the metal clear and mirror like, and unmetal will quickly flow together in conjunction with the melted welding rod.

If, in the various foundries where cast-iron welding is being accomplished, the foreman or manager of the department would give more attention to the grade of cast iron rod he is using, his department would be far more successful in producing proper welds. It requires, as a rule, but a few cents worth of welding rods to complete a weld, and the value of an expensive casting may be dependent absolutely upon the strength of the material used. Therefore, a proper rod cannot be considered from a standpoint of price. The best grade of rod obtainable is by far the least expensive.

It is not the purpose in this paper to attempt to refer to or illustrate the many very important pieces of work which have been accomplished by the oxy-acetylene welding process. We are illustrating, however, a particularly interesting piece of work recently completed in Chicago.

Figs. 3, 4, 5 and 6 are reproductions of photographs of a steam hammer, the cast-iron leg of which was broken completely off. The break occurred on a Tuesday morning. On Tuesday afternoon preparation of the casting began. It was necessary to clip, or "v", the break clear around the leg. Welding was started on the following Friday and completed on Saturday night. The hammer was assembled Monday morning and put in operation the following Wednesday morning. It has been working day and night, since the break was repaired.

In all, the repair required 16 linear feet of welding in cast iron ranging from 2 to 3 inches in thickness; 2,000 cubic feet of oxygen and about 1,800 cubic feet of acetylene were consumed. The welding required the services of four men, each relieving the other.

Fig. 6 shows the leg lying flat on the floor of the shop, the break having been enclosed in a rough brick furnace. In this manner the heat was confined, and the temperature maintained to a very even degree. Preheating was accomplished with large fuel-oil burners. The job is interesting, because it will be readily appreciated that the tensile strength of the weld must, in this instance, have been sufficient to stand up under the very severe strain to which a machine of this type is subjected.

There are many, many other instances of similar work, but in the majority of them, where the castings are large and heavy, the principles of operation remain the same. Care and skill, good apparatus, and suitable welding supplies are required to make such work successful. The skill, however, is not beyond the in-

such skill can be attained without serious difficulty under proper conditions of instruction.

A very interesting application of the process on cast-iron was the welding of the broken cylinders of two of the interned German steamship which were recently taken over by United States gov-

liner, starboard second intermediate pressure cylinder.

Welding patch about 32 inches in starboard second intermediate pressure cylinder.

Welding patch about 32 inches in starboard high pressure cylinder.

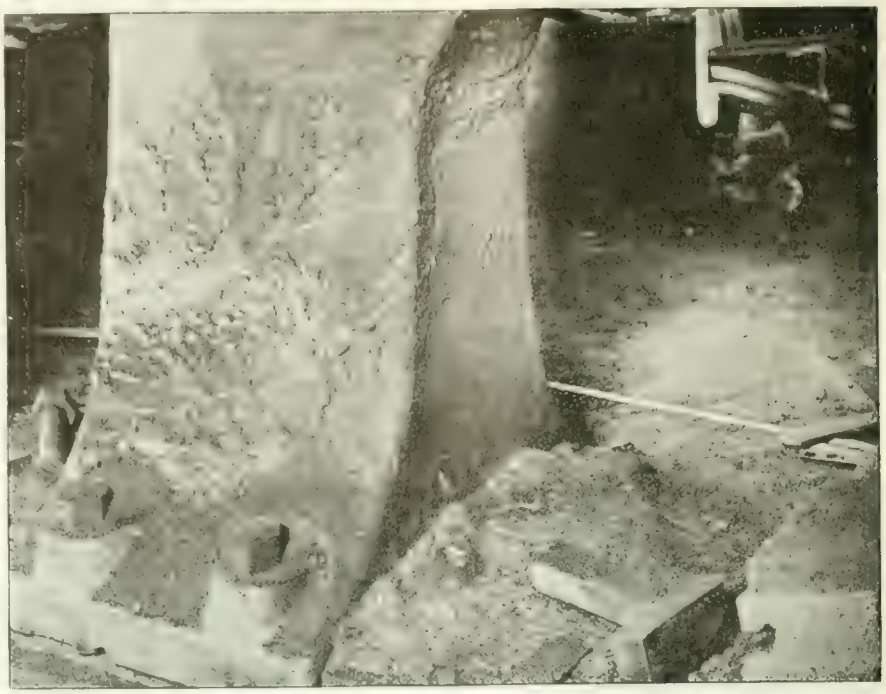


FIG. 5. CLOSE-UP VIEW IMMEDIATELY AFTER COMPLETION.

ernment, and repaired at a certain navy yard. These cylinders were badly broken. In many instances pieces had been entirely removed from them and disposed of. In such instances, it was necessary to recast new parts the shape of the broken ones and weld these new parts into place.

Perhaps, the only way the extent of the welding accomplished on these vessels may be appreciated, would be the consideration of the following list of breaks which were repaired:

**First Vessel.**

Welding crack about 19½ inches long in starboard low pressure cylinder liner.

Welding crack about 27½ inches long in port low pressure cylinder liner.

Welding four broken places each about 8 inches long on end of liners, two on port low pressure cylinder, one on port second intermediate pressure cylinder, and one on starboard second intermediate pressure cylinder.

Welding crack about 12 inches long in cylinder liner of starboard second intermediate pressure cylinder.

Welding about 33 inches on port high pressure cylinder.

Building up about 18 inches on patch on port first intermediate pressure cylinder.

Welding patch about 53 inches on port first intermediate pressure cylinder.

Welding patch about 46 inches on port second intermediate pressure cylinder.

Welding patch about 73 inches on starboard low pressure cylinder.

Welding patch about 73 inches on starboard second intermediate pressure cylinder.

Welding patch about 80 inches on port low pressure cylinder.

**Second Vessel.**

Welding two broken places on flange of elbow about 9 x 3 inches.

Welding flange about 57 x 4 inches on starboard intermediate pressure cylinder.

Welding slide valve of steam chest 9 x 4 inches on starboard intermediate pressure cylinder.

Welding crack about 12 inches in bushing of starboard second intermediate pressure cylinder.

Welding two pieces on end of flange about 13 x 5 inches on starboard second intermediate pressure cylinder.

Welding patch about 8 x 6 inches on cylinder

Welding flange about 39 inches on starboard high pressure cylinder.

Welding piece about 7 inches long in steam chest, valve of cylinder liner, starboard second intermediate pressure cylinder.

Welding patch about 54 inches on port second intermediate pressure cylinder.

Welding flange about 36 inches on port second intermediate pressure cylinder.

Welding flange about 48 inches on port high pressure cylinder.

This work was all accomplished between June 21 and July 23, approximately one month. It is difficult to believe that it could have been accomplished with any other process or by mechanical means.

Similar work was attempted with the electric arc, but did not prove as successful as with the oxy-acetylene torch. The use of the electric arc, as applied at other navy yards to similar work, necessitated a steel casting, the shape of the broken part, as the arc does not produce satisfactory results in connection with cast iron. The new cast-steel part was attached to the main body of the cast iron cylinder through the use of steel spuds screwed into the casting and set as close together as possible. It will be appreciated that such a joint would be partly a mechanical joint, and partly a welded joint, and could not be expected to be as efficient as a joint which was welded throughout.

As the oxy-acetylene torch is especially adapted to welding cast iron, the welding of these cylinders became largely a matter of proper preheating to take care of expansion and contraction. The weld possessed ample tensile strength, and the results were very satisfactory. All the cylinders were carefully tested under rigorous conditions and stood up under severe requirements.

It would be very interesting to show photographs of these broken and welded cylinders, which were taken at the time, but the necessary permission from the government has not been obtained. It is needless to say that repairs to the two German vessels in question have been made with much greater rapidity and at much less expense than if it had been necessary to replace the broken cylinders and parts with entirely new castings.

### Cutting in the Steel Foundry

The cutting process is now generally understood by the great majority of foundrymen. It is, of course, not applicable to the iron foundry, but is exceedingly useful in the cutting risers in the steel foundry.

Cast iron cannot be cut with the oxy-acetylene torch, but cast steel is quickly and easily cut at a very reasonable cost. It is so much more convenient to take the torch to the castings than to transport a heavy casting to the saws and strap it into position for sawing. Without doubt the cost of sawing a riser is less than the cost of cutting it with the oxy-acetylene torch, unless consideration is given to the time required to place the casting at the saw, and the much greater length of time required for sawing. When all factors are considered, including the output of the foundry, a cutting torch is found to be not only an economy but an actual necessity, and to-day there are very few steel foundries in the country where one or more cutting torches are not in continual operation.

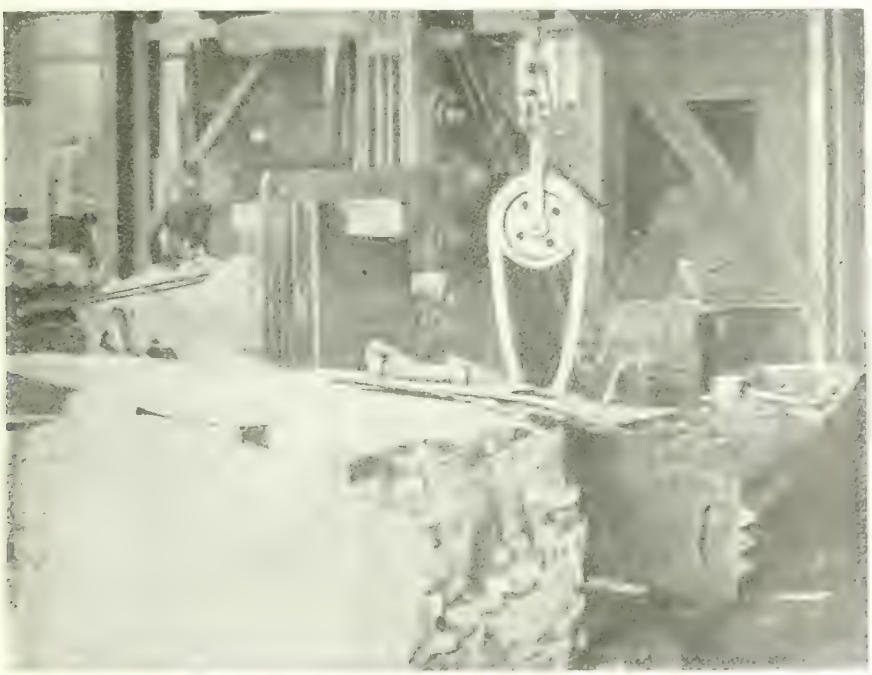


FIG. 6 PREHEATING LEG WITH ROUGH BRICK FURNACE TO RETAIN HEAT

In connection with cutting, as in welding, it is essential that the torch be properly designed and constructed in order to do the greatest amount of cutting with the lowest possible consumption of oxygen and acetylene. A properly constructed torch is illustrated in Fig. 2. As in the welding torches, the two gases are led together through very small ports, under high velocity, but as cutting is an oxidizing process, it is not necessary that the preheating flames be absolutely neutral in character, as is essential to good welding. It is, however, necessary that the gases be applied and the tip of the torch so arranged that the torch will cut cleanly and efficiently any thickness of riser to which it may be applied. This is accomplished with the torch shown in Fig. 2 through the use of interchangeable tips, which are furnished in many different styles, each style suitable for the class of work in view. For light and intermediate cutting, the greatest economy is obtained through the use of two preheating flames; for heavy cutting, where a good deal of sand is encountered, it is sometimes desirable to use four, or more, preheating flames.

In all probability, cutting apparatus gets harder usage in steel foundries than in other shops, partly due to the class of labor generally operating the torch and partly to the prevalence of sand in the riser, which causes the oxide to continually flare back. For this reason, to produce successful results and give efficient service, a cutting torch must be very substantially constructed. In general, cutting is far easier than welding and can be mastered by a man of very ordinary intelligence in a short time.

### Conclusion

The oxy-acetylene process in the past 12 years has made progress, which can scarcely be appreciated unless one is thoroughly familiar with each step as it has been developed. Perhaps, this progress is best expressed in terms of oxygen, as the consumption of oxygen is indicative of the use of both welding and cutting apparatus. It is safe to say that 12 years ago there was practically no oxygen consumed in this country, either for welding or cutting. To-day a rough estimate of the volume of oxygen consumed in connection with the process is between 40,000,000 and 50,000,000 cubic feet each month.

This development has been so rapid, however, that sufficient consideration could not be given to the proper instruction of skilled operators. In the past most men who have learned to weld or cut have done so despite the difficulties which they encountered and under conditions which did not produce the most successful results. It is without doubt appreciated that to-day there is more urgent necessity for skilled operators than for development along other lines. This need is being met by the establishment of welding schools where complete courses of instruction are given. The foundryman of to-day can profit most in connection with the process if he will give careful attention to the kind of instruction given his operators. Even in the case of a skilled welder, a few weeks in a welding school will bring out methods of operation with which he is not familiar, and will teach a great deal which will be new and useful. His efficiency and the efficiency of the process is largely dependent upon his own knowledge and skill in connection with his trade.

## CANADA GETS COAL SUPPLY

THERE has been much comment and speculation regarding how Canada would be treated under the restrictions recently placed on coal shipments by Dr. Harry A. Garfield, American Fuel Administrator. It was first thought that Canada would receive an allotment for the first three months of this year equal to the actual shipments during the first three months of last year. Later it was learned that licenses had been issued to American shippers for the export to Canada of only 40 per cent. of last year's actual shipments and that the Canadian Fuel Controller. C. A. Magrath, held licenses for another 40 per cent. of the amount, but these latter had to be approved by Dr. Garfield before they were valid.

### Licenses for Coal

A letter enclosing licenses for specified quantities sent to American shippers by the American Fuel Administration clears up the situation. Licensees are requested to "note especially the following points:"

"(1) C. A. Magrath, Fuel Controller of Canada, Ottawa, by arrangement with the United States Fuel Administration, has been granted a considerable tonnage, and he has the privilege for the period mentioned to call on this Administration to issue permits to any shippers who apply to him.

"(2) All coal leaving a United States port of exit after midnight December 31st, 1917, will be reckoned as part of your alloted tonnage for the months of January, February and March, 1918.

"(3) Shippers are required to report

allotments as given in the enclosed permit limits the amount of coal you are at liberty to export to Canada during the

### CAR SHORTAGE AFFECTS COAL SITUATION

HON. J. D. REID, Minister of Railways [illegible] that Canada's transportation system was greatly hampered as a result of the holding by American railways of some 22,000 cars belonging to Canadian railways. The Minister said everything was being done to have these cars released for Canadian service. Although special efforts seem to have been made by Mr. McAdoo, Director-General of American Railways, under the control of the United States Government, to have the bulk of these cars returned, so far nothing had really been accomplished.

"We have no shortage of motive power," added the Minister. "There are thirty-two new powerful locomotives ready to put into service as soon as they are required, while the seven thousand cars ordered in May last are at present in process of being delivered."

Referring to the possibility of transporting coal from the Crow's Nest line for consumption in Ontario, the Minister stated that it would be practicable next year. At present it would be impossible owing to the scarcity of cars. The long haul would also take considerable time. To bring coal from the West during the summer was possible, and, he would advise such a course. With coal coming from the West and the coal regions in the United States, Ontario would be amply provided for during the winter.

### GAS SUPPLY DEPLETED

THE investigation into the natural gas situation in Western Ontario before the Ontario Railway and Municipal Board at Chatham, Ont., last week, revealed the fact that the Tilbury-Raleigh gas field is being rapidly depleted, and that it will not be possible to supply all the demands being made on the producing companies for gas both for manufacturing and domestic purposes.

F. W. James, Superintendent of the Union Gas Co., in his evidence stated that with all manufacturing concerns cut off there will be a domestic supply good for some few years, but the supply is going down fast. He declared that for his company to cut off manufacturers and allow other producing companies working in the same field to send gas out for manufacturing would not materially lengthen the life of the field.

Gas from this field is sent as far east as Hamilton and Brantford by the Southern Pipe Line Co. and the Glenwood Oil & Gas Co., while the Union people send gas to Windsor, Chatham, Sarnia and a few smaller places in Essex and Kent counties. The Canadian Gas Co. also supplies gas for Wallaceburg and some for the Sarnia line.

It also develops that there are a number of contracts regarding the supply from the field and these will cause confusion. The Beaver Oil & Gas Co. had certain contracts, the Volcanic Oil & Gas Co. certain other contracts, the United Fuel & Supply Co. still others, and then the Union Oil & Gas Co. practically an amalgamation of all has still other contracts.

Contracts affect not only leases of land for production purposes, but also the delivery of gas to certain municipalities. It is contended that Sarnia, Windsor and Chatham each has original contracts with some one or other of the companies which give the right to all gas from certain sections.

The question which now arises is whether or not the original wells are exhausted and what the position of the Union Gas Co. is regarding these contracts, so far as wells are concerned which were drilled after the companies were all united.

### AMPLE SUPPLY OF STEEL FOR U.S. GOVERNMENT

STEEL manufacturers in the United States emphasize the fact that no delay has been occasioned to Government work of any kind for lack of steel, notwithstanding the compulsory cutting down of many mills in the last ten days. So diligent have the steel plants been in providing rolled products for all war contracts that most manufacturing plants have had surplus steel supplies to carry them over such barren spots in mill shipments as have occurred recently. Government needs will continue to be supplied first at all hazards, but as the worst is over, as far as furnace and mill operations are concerned, no uneasiness is felt concerning possible delay in war work at any point. Exception may possibly be made of the Chicago district, where curtailment of output has been most severe. Taken as a whole, however, Chicago industrial plants now are operating 30 per cent. of capacity. The Steel Corporation subsidiary plant operations in the Pittsburgh district are back to almost 50 per cent. of capacity.

Steel output, however, is again threatened by a famine in ferro-manganese which is likely to develop in sixty to ninety days if there is not a radical change in the situation. The most serious factor is the continual withdrawal of ships from the Brazilian trade and the United States to-day is largely dependent upon Brazilian ore from which to make manganese.

Stocks of manganese, which are not evenly distributed, are being steadily reduced and probably will be exhausted early in April if output does not gain over consumption in the next two months. Importations of British manganese are decreasing from month to month, and probably will be suspended altogether in a few months. The supply of manganese ore from Cuba and India does not compensate for the falling off in imports from South America. The steel works are using more spiegeleisen, which is a low grade manganese alloy, but the current supply is scarcely sufficient to eke out the decrease in manganese supplies.

Large steel companies that are producing manganese are better informed concerning the outlook for ferro-alloys than are small consumers and are making some effort quietly to provide for future needs. The smaller consumers seem strangely indifferent to the threatened shortage of manganese, if they have awakened to the seriousness of the situation. They are making no effort to cover future requirements and importers, in an effort to avoid creating excitement, are most conservative.

### REPORT OF BOILER INSPECTION IN ONTARIO

THE Boiler Inspection Department of the Trades and Labor Branch, Department of Public Works for the Province of Ontario, completed its year on Oct. 31. The annual report prepared by D. M. Medcalf, chief inspector of steam boilers, shows that a large amount of work has been done by the department during the past year.

**Work of Inspection by this Branch of the Department of Public Works, for the Fiscal Year Ending October 31, 1917.**

| | |
|---|---|
| New boilers inspected in the Province of Ontario | 235 |
| New boilers inspected in the United States | 53 |
| New boilers inspected in Rentrew, Scotland | 18 |
| Used boilers inspected for use in the Province of Ontario | 869 |
| Steam pans inspected | 2 |
| Rendering tanks inspected | 1 |
| Digesters inspected | 2 |
| Sterilizers inspected | 5 |
| Stokers inspected | 1 |
| Tanks inspected | 2 |
| Drums inspected | 1 |
| Pipe lines inspected | 2 |
| New boilers inspected in the Province of Ontario for use in British Columbia | 3 |
| Heating certificates issued | 185 |
| Designs of boilers surveyed and registered | 74 |
| Designs of boiler fittings surveyed and registered | 31 |
| Designs of digesters surveyed and registered | 2 |
| Designs of dryers surveyed and registered | 2 |
| Designs of pipe lines surveyed and registered | 40 |
| Designs of tanks surveyed and registered | 1 |
| Designs of retorts surveyed and registered | 1 |
| Designs of steam pans surveyed and registered | 1 |
| Designs of steam kettles surveyed and registered | 1 |
| Designs of superheaters surveyed and registered | 3 |
| Designs of steam domes surveyed and registered | 1 |

Recently a man bought a second-hand automobile, which turned out to be a cripple on four wheels rather than a pleasure vehicle. He was describing some of the patient's symptoms to a friend.

"I take it, then, that she rattles a good deal when you run her?"

"Rattles!" said the owner of the car. "She sounds like a skeleton having a shaking fit on a tin roof!"

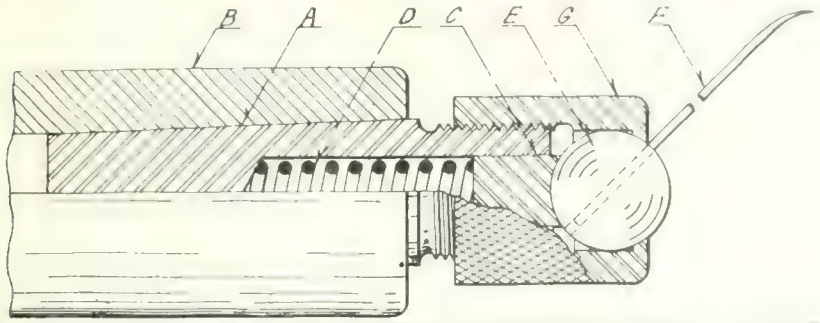
# PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

## CENTERING DEVICE

By R. Hamilton

MUCH of the ordinary run of machine shop work, particularly that done upon centres in the lathe, can be placed in the lathe and machining started, the only preliminary details required being the drilling of the centres in the end of the piece. The same might be said of face plate or chuck work where the piece can be trued up by means of a piece of chalk or lead pencil. However, in the setting of work in the lathe or other machines, where greater accuracy is involved, such as jobs where the work is laid out on the bench for subsequent machining, it is necessary to align the work from lines previously determined, and any variation in the setting up means a corresponding error in the finished work.




DEVICE FOR USE IN TAILSTOCK SPINDLE FOR CENTERING FINISH CYLINDRICAL WORK.

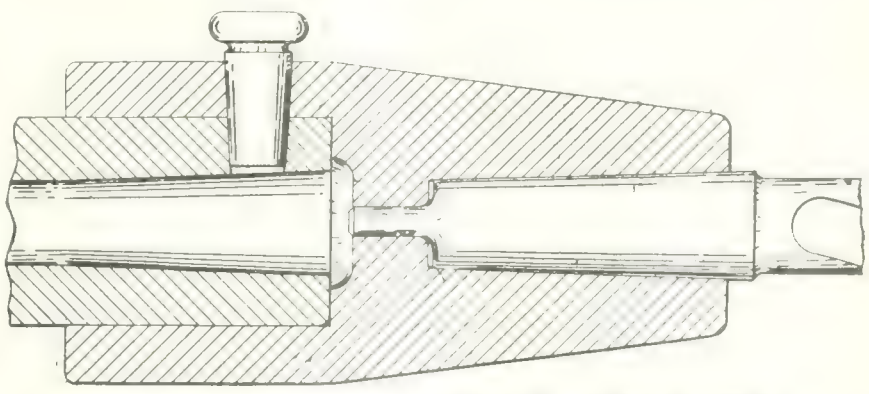
A simple device for setting up of finished cylindrical work, or pieces on which has been described an indicating circle, is illustrated herewith; it can be readily adjusted to any desired position by a slight pressure of the finger. The shank A of the attachment is fitted to the tail stock spindle of a lathe, or the spindle of a drilling machine. A hole bored in the front end carries a small plunger C and a compression coil spring D. The ball E, that carries the indicating wire F, is retained by the knurled nut G, and when this is screwed to position the reaction of the spring upon the plunger creates sufficient friction between the latter and the ball to retain the wire in any desired location and yet provides a convenient means of easy and instant adjustment.

## ACCURACY OF THE DEAD CENTRE

By J. H. R.

WHEN work is being performed in the lathe, that requires to have a central hole drilled, it is the general practice to secure the drill in the tail stock spindle, either directly in the centre chamber or by means of a special socket, the female part of which carries the shank of the drill while the male portion is inserted in the hole usually occupied by the dead centre. This latter method is the one generally adopted. Frequently, however, the pressure of the cut is so great that it overcomes the friction in the tapered socket and slippage results. This invariably takes place in the tail stock spindle and tends to destroy the accuracy of this essential part of the lathe. Should these conditions occur very often the hole becomes scored, and when work is being turned on the centres it may be found that accurate results are impossible. The centre may appear to fit very well but the unavoidable wear that takes place when a drill socket slips will eventually destroy the alignment and also the rigidity of the dead centre when it is placed in position.

To eliminate the trouble that has often arisen from this cause the holder here shown was constructed and used with very good results. By this method nothing is ever placed in the centre hole but the dead centre, and by keeping this free from dirt its accuracy is always maintained and the fit of the dead centre remains constant. The holder is made to fit snugly on the outer portion of the spindle while the tapered bore on the forward end is made to fit the shank of the drills being used. The holder is prevented from revolving by means of the tapered locking pin.



ADAPTER TYPE OF DRILL SOCKET FOR USE ON TAILSTOCK SPINDLE

## CUTTING COMPOUND ON CAST IRON

By H. Middleton.

THROUGHOUT all of our training and experience we have heard of cast iron as a metal to be worked dry, except for tapping. We all know what a drop of oil will do to a finishing cut on a cast iron surface—even the laying on of a semi-greasy finger will produce a spot that the flat finishing tool "skates" over.

But in threading grey iron castings cutting compounds of the milky kind have come into everyday use. Take the manufacture of pipe fittings, for instance, and the compounds have entirely upset accepted ideas. Taps and dies on that work are run at a high rate of speed and are kept flooded with the liquid. And the tools stand up longer at present rates than they did at the old speeds dry. The production meanwhile has been doubled.

On milling the use of compound has not been so successful. One firm that did a great deal of end and straddle milling on cast iron parts experimented with the compounds with a view of increasing speeds and decreasing cutter wear, but found that while the compound kept the cutters cool at high rates of speed, the accuracy of the work was sacrificed. The effect on the work was to glaze the cast iron surface and dull the cutters.

## GRIPPING AND LOCATING METHODS FOR MACHINING LINK

By F. H. Mayoh

IN manufacturing the connecting link shown in Fig. 1, which has a radial groove cut in it, some interesting tools are used, especially so for performing the second operation which consists of facing one side of the bosses, facing the groove pad and turning the groove. In performing this operation ten parts are handled simultaneously. The first operation consists of milling the two bosses on the side opposite to the groove while

the third or last operation consists of [illegible] the holes in the [illegible].

Referring to Fig. 1, which shows the connecting link and its principle dimensions, the first operation (machining the bosses opposite the groove pad) is accomplished on a vertical milling machine using a large surface mill. In holding the piece at this time advantage is taken of the draft angle on the forging.

The fixture used in holding this piece Fig. 2 is clamped to the milling machine table, the work is held between two vee blocks one of which A is securely held in [illegible] and dowels while the other vee block B is adjustable and is used for clamping purposes, this being operated by screw C. Gripping the work between these two vee blocks securely [illegible] the same as the blocks are beveled to conform to the upper draft angle of the work at X. In milling these bosses the cross-feed of the machine is used as by feeding the work in the direction of the arrow both faces are machined at the same time, the cutter being large [illegible] to cover both bosses.

The second operation shown in Fig. 3, is accomplished on a lathe, the work being [illegible] by the draft angles on the two bosses. Refering to the illustration A is a special face plate screwed on the spindle nose, B is a steel ring held by means of screws to the face plate. This ring has ten notches X cut into it to receive ten pieces of work.

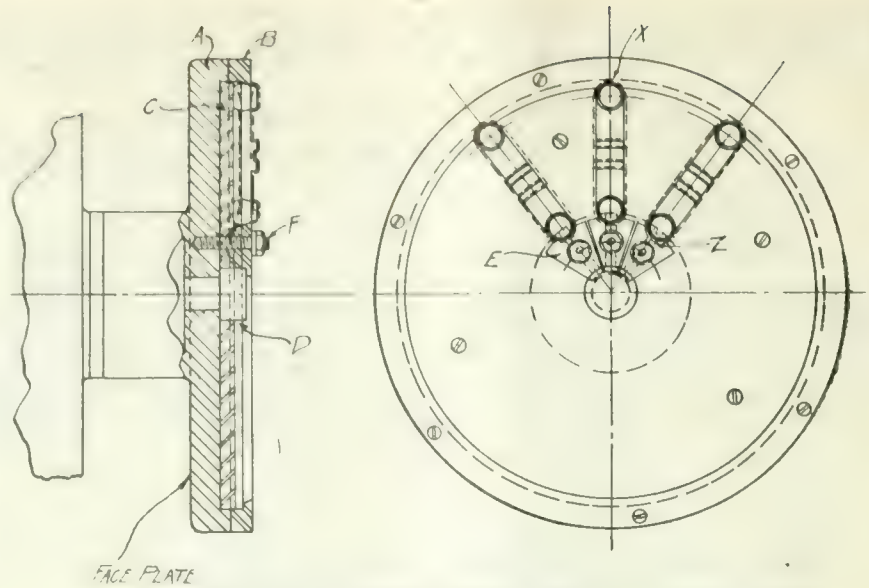



FIG. 3. FIXTURE FOR TURNING RADIAL SLOT AND FACING BOSSES.

The steel ring C is used as a seat against which the bosses that were finished in the first operation are clamped. This is also held to the face plate by screws. In the center of the face plate a plug D is driven while ten clamps E (one for each piece) with clamping screws and nut F complete the fixture. Each piece is securely clamped separately in the manner shown, while the tongue Z in the clamps prevents them from turning.

With this holding arrangement each piece is properly located so the axis through the bosses will pass through the center of the lathe spindle, and this also brings the pad for the radial seat in the correct location. The bosses and the radial seat being in the same plane, these are faced by tools in the rear cross-slide block while a tool in the front cross-slide block is used for turning out the radial groove. The tool used for machining the groove is of the narrow cutting-off type and is fed across the width of the groove, minus the width of the tool using block for gauging the depth of the groove and also for the width of same.

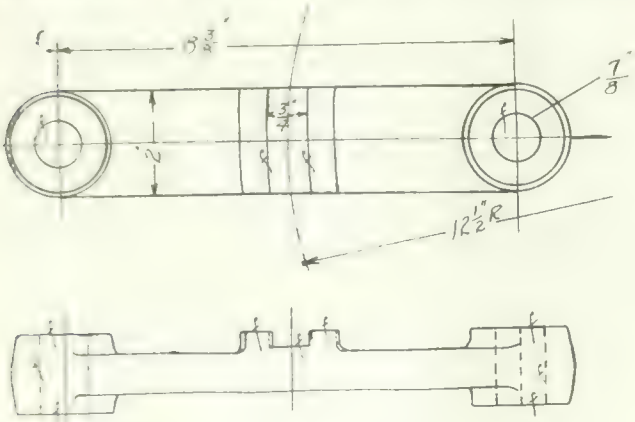



FIG. 1. DROP-FORGED LINK OF MACHINE STEEL WHICH IS TO BE FORGED

Having completed the milling and turning operations we next proceed to bore and ream the two holes in the bosses. This is done on a drill press, using the template Fig. 4 for guiding the drill and reamer. The fixture Fig. 2, which was used while milling the work is again used for holding the work. In this operation the work is held in much the same manner as shown in Fig. 2, except the grooved side Z is up, just the opposite to what it is shown. The template is placed on the work using the groove A Fig. 4, for locating purposes. Two pins B and C locate the template sideways. In drilling the holes these are first spotted by a drill that will fill the bushing which is reamer size. Following this a drill 1/64 small is run through the bosses and this is followed by reaming to standard size.

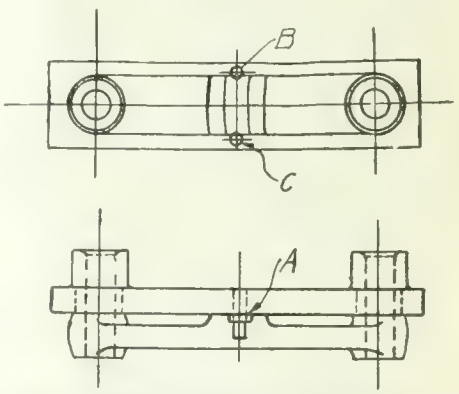



FIG. 4. TEMPLATE FOR DRILLING AND REAMING BOSSES.

Tooling up the link in this manner produces very good work and is a reasonably fast method of machining the same.

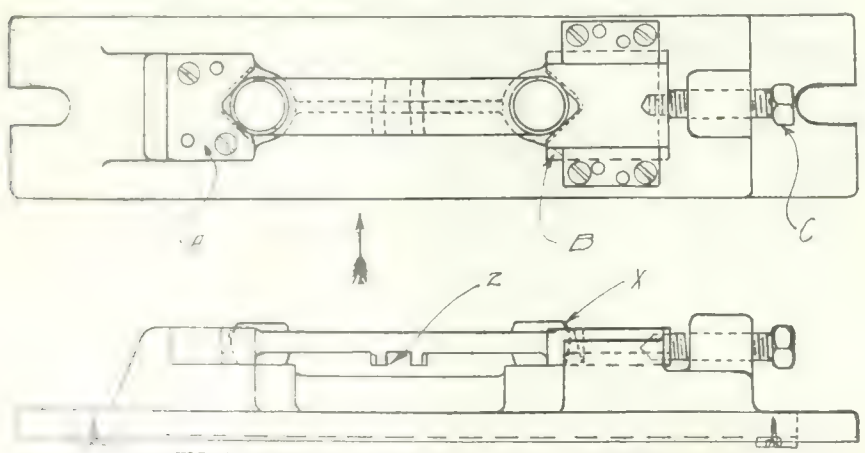
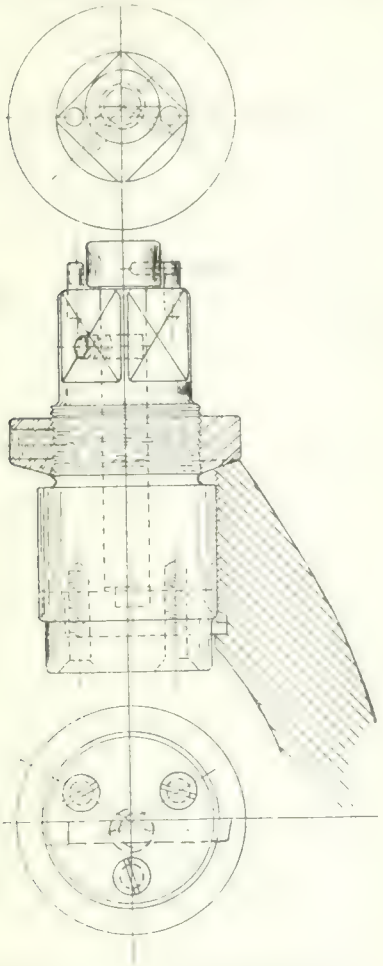



FIG. 2. METHOD OF MILLING FACE OF BOSSES.

## HAND TOOL FOR SHELLS

By G. M. Dick

IN the manufacture of 6 inch shells we sometimes have a litle trouble with the distance from the bevel to the exploder



FACING TOOL FOR CONTAINER SEAT.

container seat being too short. This was sometimes caused by having to take a slight cut off the bevel to make it true with the thread. We made up a hand facing tool as illustrated to use on the inspection bench. The body is made to fit inside the thread and the pin with the eccentric end is given half a turn to push out the tool into the undercut. A wrench is placed over the square and the tool revolved until the stop nut rests on the bevel. The pin is then given half a turn back to draw in the cutter and the tool taken out.

## THE FAILURE OF HARDENED PARTS

By D. A. Hampson.

THE scrap pile tells many a story for him who reads, and none is plainer than that of broken hardened parts, such as punches and dies, forming and bending tools, etc. So many men will go right on and make new parts exactly like the old, with no real study of the reasons for breakage, blaming the trouble on the steel or the design which makes the piece so frail.

The design has only a partial bearing on the trouble. In re-making the parts it is nearly always possible to change sharp corners to filleted ones, thereby increasing the strength—often doubling it. But the greatest trouble is in making supporting sections too hard, so hard that they break at the least sideways blow or strain. Unless a part actually cuts or forms, there is no excuse for it to be hard. Every section that does not so come in contact with the stock should be drawn to a purple or a blue. The easiest way to do this on light pieces is to use a Bunsen burner.

## SPACING OF HOLES

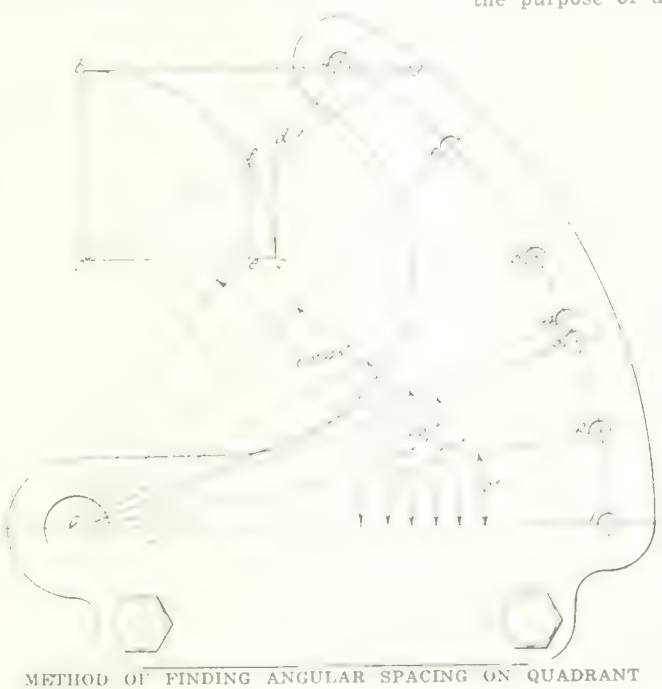
IN the spacing of holes it is often required to set them a certain distance apart on the arc of a circle so that the movement from one to another will register a definite number of degrees. In the sketch of the quadrant here shown it is required to locate several holes for graduating purposes, on the arc of a circle having a 6 inch radius, so that a lever (not shown) will revolve a shaft through the different angles indicated, namely, 10, 20, 22½, 30, 45 and 60 degrees. The simplest method to obtain the lengths of the various chords (the center distances between the holes), is by the use of the trigonometric tables which give the sines for the required angles. In the tables of trigonometric functions the values given are invariably derived from a circle of one inch radius. In the skeleton sketch above are shown the more important functions of a right angle triangle on which the tables are based, thus.

O-B equals the radius.
O-E equals the cosine of the angle.
E-F equals the sine of the angle.
C-D equals the tangent of the angle.
B-G equals the cotangent of the angle.

In order to calculate for the desired angle it is necessary to divide the isosceles triangle, formed by the two radii and the chord, into two right angled triangles, half the chord being the short side and the radius the hypotenuse. As the table values are given for a one inch radius, it is necesary to multiply these values by the radius of the specific problem to obtain dimensions required. The value for the sine of 5 degrees is given as .08716; this means that the distance E-F for an angle of 5 degrees, and the radius O-B of one inch, would be .08716 inch long; therefore, as the problem here shown has a radius of 6 inches the sine value for 5 degrees would be .08716 multiplied by 6 equals, .52296 inches. Then twice this length would equal the length of the chord, or the distance apart of the centers 1 and 2. This same process is followed for determining the chords of each angle, or the base of the isosceles triangle. The values will be found to be,

1-3 equals 2.084 inches.
1-4 equals 2.341 inches.
1-5 equals 3.106 inches.
1-6 equals 4.592 inches.
1-7 equals 6.0 inches.

It will be noticed that the last angle of 60 degrees gives a chord of equal length to the radius, thus forming an equilateral triangle 0-1-7.

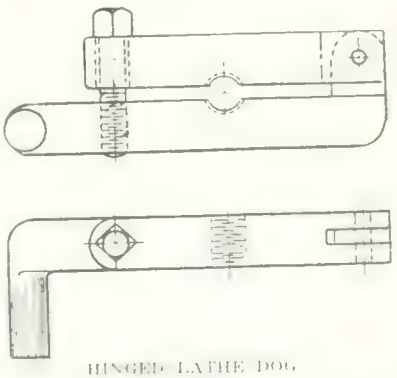


METHOD OF FINDING ANGULAR SPACING ON QUADRANT

## A HINGED LATHE-DOG

By J. E. Cooley.

A SIMPLE form of lathe-dog used for the purpose of attachng to the threaded ends of shafts is shown in the accompanying sketch. It is made from square shape stock of any suitable thickness hinged together on one end and made adjustable by means of a set-screw as shown.



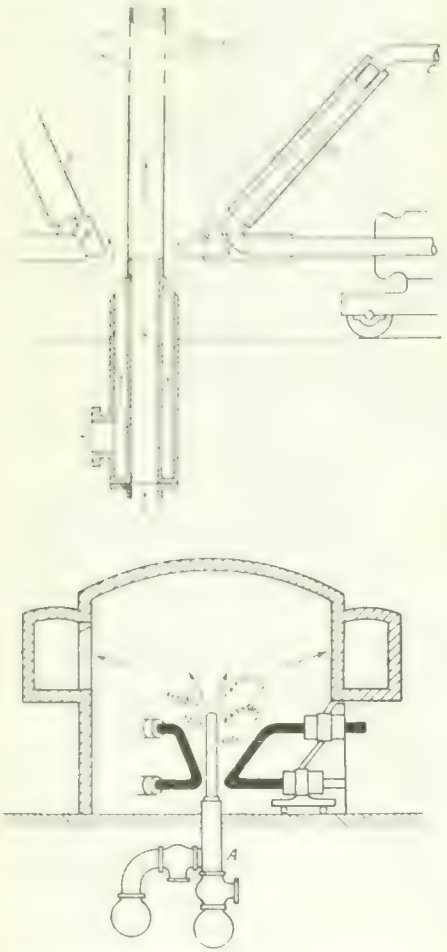
HINGED LATHE DOG

The object of the design is to save time, as in the case with most of such devices in present use in screwing the dog on the threaded portion of a shaft. It is only necessary to raise the set-screw which enlarges the hole sufficiently to allow for inserting the dog over the thread body, then clamping it down into the threads and tightening the screw.

### NEW PROCESS FOR EXTRACTING NITROGEN FROM AIR

[illegible] fixation of atmospheric nitrogen is being undertaken on a commercial scale in Sweden. The process to be employed bears the name of a well known inventor, Mr. Kilburn Scott, and depends on the action of intense electric arcs to liberate the nitrogen from the air and accomplish its fixation for commercial purposes in the form of nitric acid gas.

The operation is carried on in a special fire brick lined furnace in which



ARRANGEMENT OF ELECTRODES IN APPARATUS FOR FIXATION OF NITROGEN FROM THE ATMOSPHERE.

are mounted the three horn-shaped electrodes spaced at 120 degrees to one another and surrounding a central air supply pipe. Each horn electrode approaches close to, but does not touch, the central pipe at its lowest tip and diverges sharply upwards. The general arrangement is shown in the accompanying illustration reproduced from the patent specification.

An alternating 3-phase current is utilized, each electrode being connected with one of the supply wires. The air pipe [illegible] forms the neutral point of a star-connected 3-phase system of which the three alternating but practically continuous arc flames represent the load on the system. The arcs are driven upwards by three blasts of [illegible] from the same tube of the central pipe. The inner tube projects upwards to a point about level with the top of the electrodes and at this point there are three more nozzles supplying air under pressure. These blasts provide the cold zone which is necessary for the fixation of nitric acid gas. The air which drives the arcs upwards is preferably at a high temperature, but the air which emerges from the top of the pipe must be as cool as possible.

Due to the intense heat to which the pipe and electrode parts are subjected, provision is made for renewing parts that are liable to be burned away. The cold air pipe is surrounded by a tube which is easily renewable, and the electrodes C which are made of steel tubing through which cooling water is circulated, have renewable clips D to protect them.

The mixture of nitric acid gas and cool air is drawn off through large sized openings and passes to flues which connect with the various furnaces.

The initial installation is of 1,000 electrical horsepower capacity which will be increased if the results come up to anticipation. It is claimed on behalf of the process, that it enables nitric acid to be produced with considerable profit, the output per kilowatt year being 1½ tons, which at the prevailing prices for electric power and manufactured product leaves a good margin of profit.

### MEANS OF PRODUCING HEAT FROM ELECTRICITY

THERE are two ways of producing heat from electric energy—by means of resistance and by means of an arc—and heat can be produced for use by either of these methods from direct or alternating currents, single or polyphase and at any commercial voltage. Hence, practically all heating devices in the market can be operated from any available source of current. Of these two methods, that of producing heat by means of resistance (aptly termed the "Joulean Effect" since it is based on Joule's Law) is almost universally employed; about the only exception is that of the use of the arc in arc welding and arc furnaces.

#### Alternating Current

Moreover, due to prevalence of alternating-current supply throughout the country as well as its greater flexibility and efficiency when used over the wide range of voltages required by the various processes of application, alternating current is used in the great majority of cases. The use of the transformer with its many available taps makes possible the attainment of varying temperatures with an ease and efficiency that cannot be approached by the use of direct current, and as the heating unit load is practically noninductive and can be used in polyphase as well as single-phase circuits, the use of alternating curent for this work gives a unity power factor in almost every case and possesses many advantages over direct current. For instance, in order to obtain the low voltage used in spot welding from a direct-current supply, it would be necessary to employ a rheostat in connection with a specially wound low-voltage generator with the attendant large losses, while by the use of alternating current these voltages are readily obtained from practically any commercial supply circuit by means of the transformer.

One of the many advantages of electric heat is that it is susceptible of graduated and automatic control as to localization, time and temperature, to an extent and nicety impossible with any method of combustion. This is true whether the control be by hand or automatic, although automatic control permits of greater refinement than does hand control.

#### Control Methods

Varying heats, high, low and intermediate, are obtained with hand control by switching devices which connect the heating units or groups of units in series, in parellel or in series-parallel, much in the same manner as a four-motor street-railway equipment is handled, while if an alternating current is used, this same effect is also obtained by use of the delta-Y connection with constant voltage on the supply.

These different heats occur in certain well-defined and distinct steps according to the wattage produced by the various connections and grouping of the heating units, although in cases of small current demand, gradations between these steps can be obtained by means of a rheostat in the case of direct-current supply, and by varying the voltage on the secondary side of the transformer when alternating current is used.

In carrying on the various processes of industrial heating there is always a certain definite temperature that will produce the best results in the shortest time; which is best suited to any particular phase of the process, and it is the ability of electrically controlled units to not only meet and maintain this specific temperature to a nicety, but also to vary within a fraction of a degree with the temperature requirements of the various phases of the process, that makes the electric control stand out as superior to that employed by any method of combustion heating.—Society for Electric Development Bulletin.

**France Would Buy B.C.-built Ships.**—The agitation begun in British Columbia for the revocation of the Dominion Government's decision to disallow shipbuilding in Canada to the order of foreign interests makes the fact that ninety-six auxiliary powered schooners have recently been bought in the United States by France of special interest. It is said that if the Imperial Munitions Board would allow ships to be constructed in Canada for registry other than British, the shipyards of this Province would have no difficulty in getting plenty of contracts from French interests.

# Comparison of Working Costs of Principal Prime Movers*--II.

By Oswald Wans

*High thermal efficiency does not [illegible] ... data are seldom complete and render difficult the justification of claims and working costs advanced by advocates of respective prime movers. The engine of lower thermal efficiency may, therefore, [illegible]*

THE quantity of lubricant necessarily varies widely in practice, even in similar engines, due partly to the differences in manufacture and to the care or negligence on the part of the attendant. To cover amply these factors, the charges should be of a liberal nature.

The accompanying curves, Fig. 4, give representative consumptions for new oil, no allowance having been made for filtering and re-using the oil. The saving effected by filtering is worthy of consideration, for it is possible by this means to reduce materially the oil bill. It should be noted, however, that filtered oil cannot be recommended for use in cylinders, unless enriched by about 30 per cent. of new oil. It will be observed that as the total quantity of oil is given, it must include both cylinder and bearing oils. For internal-combustion engines, it is customary to use one grade for both purposes, whereas two qualities are usual for steam-engines in which approximately one-third of the total quantity will be required for the cylinders and that remainder for bearings, etc. The adoption of one grade of oil has a practical advantage in preventing the use of the wrong oil for, say, the cylinders, a mistake likely to have serious results in an oil or gas engine.

### Water Supply

In many localities a plentiful and gratuitous water service is not available, and the cost of the necessary supply becomes a matter of moment. With a free and suitable supply the water may be returned, directly after use, to the source, thus obviating the cost of a cooling plant. Frequently, however, the local charges render necessary a closed system whereby, with little loss, the water can be used repeatedly. For the smaller internal-combustion engines, up to 50 b.h.p., cooling tanks are very general, but for larger powers a cooler, of, say, the tower type, becomes necessary. The tower cooler is equally applicable for cooling condenser water and possesses the advantage of simplicity and low cost, but owing to its bulk is not always adaptable. When the requisite space is not available, a more costly form of cooler may be a necessity, but such cases are not general and must be considered individually.

In the Expenditure Curves, Fig. 1 (page 309), the cost of a cooling tower is included for international-combustion engines above 50 h.p. and for surface, but not jet condensing steam-engines. In the latter case it is assumed that the water is run to waste. The water lost by evaporation, in passing through the cooler, may be taken as 5 per cent. of the total water in circulation.

There may be a further loss due to leakages, but in a well-kept installation the loss on this account is negligible. This cooler loss holds good for steam-engines and internal-combustion engines, but there is a further loss in a suction-gas plant in the water required for supplying steam to the gas-producer and in the effluent from the cleaning plant. The former water is of course not recoverable, and the latter can be and is sometimes used several times before disposal. Unless special provision is made, the water is prone to foul the circulating pump and pipe-lines, and, when ultimately disposed of, is apt to arouse suspicion in the municipal mind owing to its more concentrated nature, and this applies particularly to wood refuse fuel.

Often the cleaning water can be taken continuously from and returned to a neighboring pond or river without charge. It may be remarked that the effluent after once passing through the cleaning plant is of a harmless nature, and if turned into a sewer or a river all traces of tar must be removed, as this appears to be the bete noire of local authorities.

The following table (page 108) gives the total quantity of water in service and the make-up water necessary to replace the cooler and cleaning plant losses. The latter quantities only need be considered in working costs, for the cost of the initial supply of water is negligible.

### Sundry Stores

The payments arising from these items are small, and are generally covered by a charge of 0.01d. per rated b.h.p.-hour for any of the prime movers under consideration.

### Labor

The charges under this heading should include not only the attendant's time during running hours, but also that needed to clean, grind in valves, etc., and generally to keep the installation in good condition. In the case of steam and suction-gas plants the time spent in handling the fuel and removing the ashes must be covered. The attendance time is fairly uniform for similar installations, and generally speaking is on a minimum basis. Usually it is not necessary to employ highly skilled labor, nevertheless sufficient should be paid to command the services of the intelligent

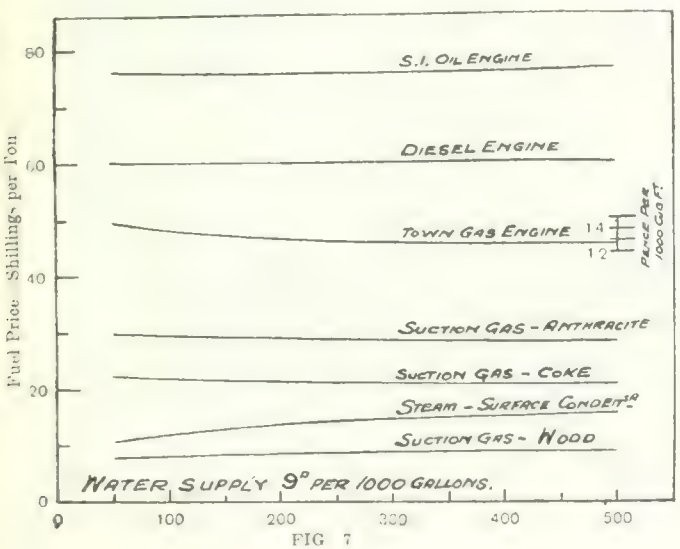
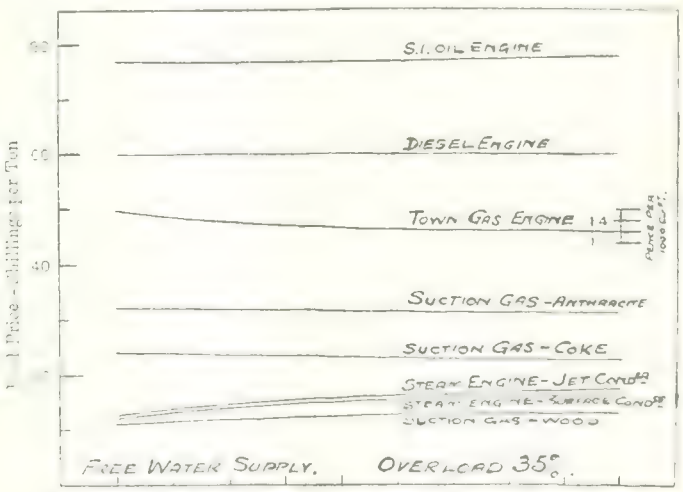


FIG. 7



I.H.P.—Mean Working Load.
FIG. 8

*Read before the Institution of Mechanical Engineers, London, Oct. 19, 1917.

locality, due mainly to the fluctuations in the prices of water and fuel. The cost of lubricating oil and labor may vary but

*Water Consumptions.*

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | A | B | C | D | | |
| | 15-55 | | | | | | | $2\frac{1}{4}$-$2\frac{3}{4}$ | $2\frac{1}{4}$-$3\frac{1}{4}$ |
| | | | 0.5 | | | | | 0.325 | 0.325 |
| | | | | | | | | 0.275 | 0.275 |
| | | | | | | | | 0.375 | 0.375 |
| | | | 1.5 | 1.75 | | | | 0.375 | 2.2 |
| | | | | | | | | 0.375 | 5.87 |

The following formulae give a fair indication of the time that is spent solely upon the prime movers within the scope of this paper:—

engine plants .....0.8+0.0047 b.h.p.
Suction gas (coal and coke fuel)..0.6+0.0041 b.h.p.
S.I. and Diesel engines.....0.3+0.0036 b.h.p.

These expressions give the labor in hours per rated working load per hour. Thus for a 100 b.h.p. suction-gas plant using wood fuel, and 100 b.h.p. town-gas engine, the labor would be respectively 1.27 and 0.37 hours per hours run.

### Repairs

The annual charge should provide amply for wear and tear and such breakages as are not covered by insurance. The actual annual payment may form an appreciable portion of the running costs, and must in some cases exceed the estimated amount in view of the small provision made. This applies particularly to internal-combustion engines. There is little difficulty in citing instances of gas and oil-engines in which the repair bill over, say, 5 or 6 years, has not exceeded 2 per cent. per annum of the engine cost. Such a figure, however, should not be taken as a basis. If the cost of repairs were entirely dependent upon wear and tear, 2 per cent., there is no doubt, could be taken as a general rate.

Although internal combustion engines have proved themselves to be thoroughly reliable in service, it is nevertheless a fact that they are more prone to minor mishaps than steam engines, and due allowance must be made for a well designed gas or oil-engine, ample margin for this contingency is given by an annual charge of 3 per cent. of the engine cost.

The following are the repair charges allowed for in the Working Cost Curves, Figs. 5-6:—Diesel and S. I. oil engines, town gas engines—3 per cent. of engine cost; suction-gas installations, 3 per cent. of engine and producer costs; steam installations, 2 per cent. of engine, boiler

the annual working costs of the engines under consideration. These costs will be

not sufficiently to affect materially the annual charges. Further, the variation would be common to all installations, so that the relative working costs for practical purposes would be unaltered. The position with regard to the water and fuel supplies however, is quite different. In some districts a free water supply may be available, and in others the charge may be high, whilst the price of fuel, particularly oil, varies considerably from time to time and with the locality, thus rendering these two items almost the ruling factors of economical working.

In order to establish a relationship between the fuel prices that may be paid, and to show the influence of the water charges upon these prices, the curves, Figs. 5 and 6, have been plotted. The curves A to F, 5, give the annual charges with water at 9d. per 1,000 gallons, and in Fig. 6 it is assumed that the water supply is free, but none of these curves include the cost of fuel. The curves G represent the total annual working cost of a Diesel engine using fuel-oil at £3 per ton. It follows, therefore, the total amount that may be spent annually upon fuel to give even running charges for any one of the remaining installations is represented by the length of the ordinate between the curve G, and the cost curve of the particular engine considered. From the total fuel cost thus obtained, the maximum prices that may be paid can be easily computed, and have been plotted in curves Figs. 7 and 8, whilst the fuel prices given by those curves for plants of 250 b.h.p. mean working load are given below:—

| | Price of Fuel Curve Fig. 7 per ton | Price Ratio | Price of Fuel Curve Fig. 8 per ton | Price Ratio |
|---|---|---|---|---|
| Diesel engine.....60 | | 0.79 | 60/ | 0.785 |
| Solid injection oil engine .....76/ | | 1.0 | 76/6 | 1.0 |
| Suction Gas:— | | | | |
| Anthracite .....29 | | 0.38 | 31/6 | 0.41 |
| Coke .....21/ | | 0.27 | 23/ | 0.3 |
| Steam Engine:— | | | | |
| Wood ..... 8/6 | | 0.113 | 12/ | 0.157 |
| Jet Condenser .. .. | | ... | 16/ | 0.21 |
| Surface Conden..14 | | 0.184 | 15/ | 0.195 |
| | per 1000 cu. ft. | | per 1000 cu. ft. | |
| Town & gas engine 1/1 | | 0.014 | 1/1 | 0.014 |

In the curves, Figs. 5 to 8, the engine possessing the highest thermal efficiency, namely, the Diesel engine, has been taken as a convenient basis using fuel oil at £3 per ton. Reference to these curves shows that the relative fuel prices for the several installations are fairly uniform for the range of power under consideration. The widest variation is that shown for the steam plants due to the comparatively higher initial cost and lower thermal efficiency of the smaller powered engines. It should be noted that the fuel consumptions represented by the curves, Fig. 2, are favorable to the steam-engine and apply to compound condensing installations using superheated steam, that is to say, they are best practice figures. It may be said with certainty, therefore, that, in general practice consumptions as much as twice those represented are not unusual, thus nearly halving the fuel prices shown by the fuel price curves, Figs. 7 and 8, and further limiting the districts in which the use of the steam-engine can be defended on the score of minimum working costs.

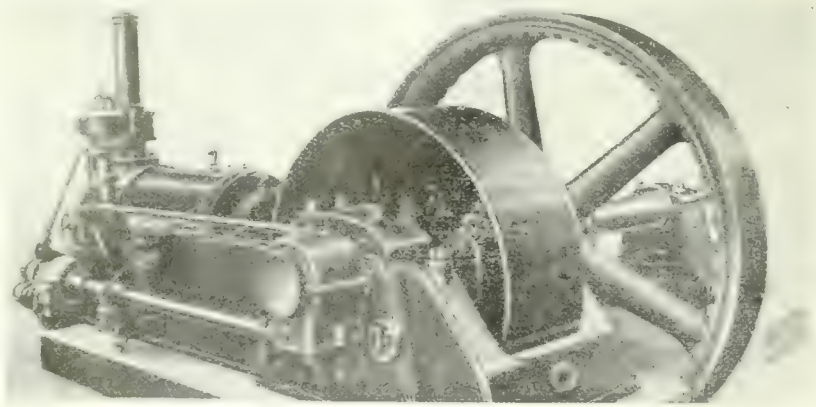


FIG. 9. SOLID-INJECTION HIGH-COMPRESSION

As the power increases a higher price may be paid for coal, and the steam-engine becomes a more serious rival of the suction-gas plant; nevertheless, for installations up to 500 b.h.p. working load the latter well holds its own, for it is possible to obtain even running costs with fuel ranging in price, according to the power, from two to three times that permissible for a steam-plant. The price allowable for town-gas is practically constant at 1s. 1d. per thousand

cubic feet, and consequently confines the use of the town-gas engine to cities in which gas is procurable at this low rate.

| | Calorific Values Assumed | | |
|---|---|---|---|
| Anthracite | 14,500 | B.Th.U. per lb. | |
| Coal (Boiler) | 13,500 | " | " |
| Fuel Oil | 18,000 | " | " |
| Wood Refuse | 5,800 | " | " |
| Town Gas | 540 | " | 1,000 cub. ft. |

Turning now to the high-compression solid injection-oil engine. A high price may be paid for fuel-oil, namely, £3 16s. per ton as compared with £3 for the Diesel engine, or a price some 26 per cent. higher, notwithstanding the higher thermal efficiency of the latter engine. The lower capital expenditure and other running charges of the solid injection-engine are responsible for this result. The future of the oil-engine must be obviously dependent upon a regular supply of uniformly low-priced fuel-oil, and it is to be feared that past irregularities in these respects have to a certain extent militated against their more extended application.

### Fuel Supply Problem

The problem of the supply of a uniformly low-priced fuel-oil is one that is well worth the serious consideration of the large oil companies, and it is satisfactory to note that during the twelve months prior to August, 1914, one company had gone a long way to establish a feeling of security amongst users of oil-engines by offering fuel at an average price of £3 per ton, and were prepared to contract for a regular supply over several years. There seems to be every probability of these conditions again becoming general after the war. An adequate supply of fuel oil, in view of the high thermal efficiency of the oil engine, is of the utmost importance to manufacturers, for it offers a means by which minimum working costs may be obtained. It is usual in the supply of electrical and hydraulic energy for power purposes, for the suppliers to charge specially reduced rates, and it is suggested that a similar procedure might be followed with advantage in the case of fuel oil.

With the fuel oil at £3 per ton, the price of coal must not exceed on the average £1 5s. and 12s. per ton respectively for suction gas and the larger steam plants over 250 b.h.p. in order that the total annual running charges do not exceed an oil-engine of the solid injection type, clearly indicating the wide field of action of this type of engine. The cheaper grades of fuel oil of not less than 0.95 sp. gravity alone are considered, as the charges of engines using the more costly and refined oils are appreciably higher and therefore commercially inferior. In Fig. 9, page 342, is shown a high-compression oil-engine of the solid-injection type, capable of handling the cheapest fuel-oils with an economy in conformity with the curves, Fig. 2 (page 309).

Considering lastly the refuse suction-gas plant, the price of the fuel ranging as it does from 11s. to 13s. per ton, even with a free water supply, limits its use to industries in which the wood or other refuse mentioned below is a waste product of the industry, for it is seldom possible to obtain a constant supply at these rates. Under this condition refuse installations are unquestionably the cheapest form of power. The illustration, not shown, shows the producer of a 300 b.h.p. suction-gas installation working entirely upon sawdust, shavings, wood blocks, etc. A producer of this type will also handle such refuse fuels as various kinds of husks and nut shells ,bark, spent tan, plum stones, etc.

The use of suction-gas as a heating agent is yet in its infancy, but very satisfactory results have already been obtained in laundries, woodwarking factories, tinsmiths' shops, etc. The gas is drawn from the producer through a purifier and pumped to a gas-holder, from which it is piped under slight pressure to any part of the factory, and by the aid of an air-mixer and burner used in a similar manner to town-gas. This feature is worthy of consideration, for it adds to the general utility of the suction-gas installation, and may in some cases effect an appreciable economy in the working costs. The plant, supplies gas for heating purposes in addition to that required for power. The possibilities of the system suggest many applications in which economies could be effected.

An objection sometimes advanced against the adoption of the internal-combustion engine for certain classes of works as, for example, tanneries, laundries, cotton mills, factory heatings, etc., is its inability to provide a steam-supply. This difficulty has, however, been met to a large extent by the exhaust heated boiler which is capable of supplying about 2 lb. of steam, from and at 212° F. per b.h.p.-hour of the engine. The steam being generated from the exhaust heat that would otherwise be wasted may be truly stated as costing nothing beyond the small additional charges due to depreciation and interest upon capital. The illustration, Fig. 10, herewith shows a boiler working in conjunction with a 250 b.h.p. suction-gas engine, and is capable of supply about 500 lb. of steam per hour, which is equivalent to the saving of 65 lb. of coal per hour.

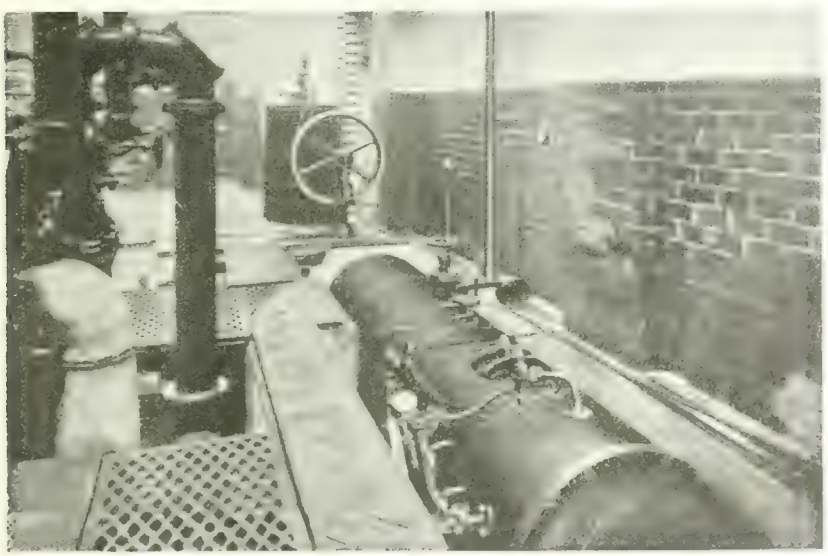


FIG. 10. BOILER HEATED BY EXHAUST FROM 250 BRAKE HORSE POWER SUCTION-GAS ENGINE

### Conclusion

It is evident from the foregoing that statements to the effect that a certain class of engine is the most economical requires qualification. It has been shown that the cost of fuel has a deciding influence upon the working cost, although that due to the necessary water-supply may be serious in some districts. Now, as the cost of fuel is regulated largely by railway and shipping freights, it is clear that the distance from the source of supply has an important bearing upon the kind of fuel, and it follows the type of engine that should be installed.

The maximum permissible prices that may be paid in any locality are indicated generally by the ratios giv more particularly by the curves and 8 page 341. The application of these price rati that each type of engine has its lar field of action in which it can be used with commercial advantage, provided due regard is paid to the local conditions, or in other words, an exclusive claim to minimum working costs cannot be rightly made on behalf of any one of the prime movers under consideration.

The relative fuel prices do, however, indicate that the scope of the steam-engine is less than the oil-engine, for in the best practice of the former the price of coal for the larger installations of 250 h.p. and upwards may not exceed on the average one-fifth of the price of fuel-oil for an engine of the solid injection type and one-fourth for Diesel engines, and appreciably less for smaller powers. Between these extremes stands the suction-gas plant, for which the price of coal and coke may be respectively twice and 1½

It is obvious, therefore, that the commercial superiority of a prime mover is [illegible] mal efficiency, but by the local conditions regulating the price of fuel. From the purely engineering point of view this is not entirely satisfactory in that, however thermally efficient an engine may be, the ultimate test is a commercial one involving the market price of fuel, which [illegible] from the commercial standpoint.

The whole problem is one that cannot but force itself more and more upon manufacturers with the keener competition that may be expected in the near future, and unless correctly solved must tend to handicap any industrial concern as the result of the higher establishment charges that must necessarily follow. The right solution not only benefits the manufacturer, but also affects an economy in the national resources by preventing the waste of fuel so frequently met with in practice, suggesting that minimum costs are either not sought or that the regulating conditions are not fully appreciated by those responsible.

## WELDING OF LOCOMOTIVE FIRE BOXES

THE importance of oxy-acetylene and electric welding in relation to the iron and steel industry was amply demonstrated at the December meeting of the Canadian Railway Club in Montreal, when the subject of the evening was a paper on "Oxy-Acetylene and Electric Welding and Cutting Processes in Locomotive Works." The subject matter of the paper, (a reprint of which appeared in a recent issue of this publication), dealt largely with the application of these two processes as practised at the Point St. Charles shops of the Grand Trunk Railroad. While the paper in itself was of a highly interesting character, it was the discussion that followed which impressed all present with the rapid development and growing importance of this method of construction and repair in relation to locomotive and marine activity.

While the ever widening scope of this art was recognized and appreciated by those present, it was its adaptability to firebox work that brought forth the interesting and instructive arguments [illegible]

The point or points, upon which the discussion revolved were the debatable used in places where these joints would be exposed to the excessive heat of the fire on the one side and subjected to the high steam or water pressure on the other. From the statement of Mr. Dyer it is interesting to note that the Stratford shops use the oxy-acetylene process, while the electric process is the one adopted at the Montreal shops; the method in either case for general purposes being the butt welded joint. Apparently, considerable success has been attained from the butt welding process, as gathered from the experience of the Grand Trunk officials.

### Prefers Lap to Butt

In direct contrast to this, however, Mr. Barry, of the St. Lawrence Welding Company, stated, that after a lengthy period of practical experience in the handling of firebox work, of a wide and varied character, it was his firm opinion that, irrespective of the process used, the lap weld was to be preferred over that of the butt weld. He also stated, however, that a satisfactory job might be accomplished by either methods, according to the skill and ability of the operator; but that this was a factor so uncertain that no guarantee could be given, even by the most experienced operator, that the weld was "perfectly sound."

He cited an instance where a tank head had been welded by the oxy-acetylene process by means of the butt method and had stood a test of 50 per cent. over the working pressure without the least sign of a "weep." Nevertheless, after being three weeks in service the head suddenly blew out, and upon examination it was found that, while the external appearance was in every respect perfect, the weld had not been made through the entire thickness of the plate. The head had come away so suddenly that no previous warning was given, but fortunately no one was hurt. Mr. Barry contended that had this been a lap joint, with the pressure tending to keep the surface in contact, that the head could not have come away before first giving some warning. He said "The factor of safety is something that cannot be overlooked. The question of safety is much more important than a firebox going out of service."

Apart from the advisability of using either method of weld, the problem of the man operating the blow pipe is probably the all-essential factor in the successful accomplishment of oxy-acetylene welding; the same also applying to the manipulation of the arc in the electric process. In speaking on the ability of the operator to do efficient work, Mr. Royer of the Welding and Supplies Company said, "One of the principal drawbacks in connection with the process of oxy-acetylene welding is the long time it takes to educate men to weld properly. A poor operator is liable to either stick the added metal to the plate or to burn the metal, and it takes time for the men to properly handle the blowpipe so as to neither get adhesion or burning, and to judge the correct temperature when to start the weld."

### Need of Trained Men

A common fault of the beginner is to keep the flame of the blowpipe playing too long in one particular spot, thus localizing the heat and preventing the proper fusing of the adjoining metal, with the additional possibility of burning the steel or other material. The flame of the blowpipe should be kept continually moving with a slight elliptical motion, so as to distribute the heat evenly at the portion being welded. Speaking further, Mr. Royer said, "There is no doubt that a considerable amount of boiler work can be done very satisfactorily, if the men are properly trained, however, discrimination should be exercised in boiler work, in using only reliable welders on jobs where failure would be dangerous, and apprentices and beginners can be used on those parts where failure will not produce accidents. If a shop could get efficient welders, it would save thousands of dollars in maintenance costs."

Mr. Buckland of the C.P.R., speaking on the effectiveness of the weld in relation to the ability of the operator, said "A blacksmith will not take a piece of metal and try to weld the tip of it to the tip of another piece. He wants the metal properly heated to produce a successful weld. I think we should pay more attention to selecting good men for this class of work. If you are making a weld in a firebox on a long narrow strip, you localize the heat along that weld and it cools rapidily, and there must be an initial strain on that weld, which should, to my mind, be removed by slight annealing after the weld has been made." This brought out the fact that in the repairing of marine boilers in Europe, the practice of hammering the weld with a small hammer, immediately after the weld had been made and while the metal was still redhot, was extensively adopted. This was intended to take the place of the rolling process to which the plate was originally subjected. Following this hammering process the entire welded portion and its surrounding parts are annealed by bringing it and the adjoining sections to a cherry red by means of the blowpipe. By this method it has been claimed that the strength of the joint would be increased from 85 to 95 per cent. of the strength of the plate.

### Clean Metal Essential

One of the objectionable features in reference to lap welding, as emphasized by Mr. Buckland, was the extreme possibility of the presence of scale on the sheet, which if not previously removed would undoubtedly result in a very poor weld. To overcome this it would be necessary to take off all the scale and see that the sheets are properly prepared.

In answer to a question from one of the members in connection with the improvements that had been made in getting away from the double thickness of

metal, on or adjoining the fire line, Mr. Barry said, "We do not put patches in fireboxes that come in line with the fire. Anyone who does that should not be allowed to use the boiler. The reason is that the fire causes such an amount of expansion and contraction that the weld cannot last. You have to get above the fire line a foot or more, and the higher you get above the fire line the better the patch will hold. Any weld alongside of the fire line is going to burst sooner or later—generally sooner."

### Educational Research Needed

With the process of oxy-acetylene and electric welding occupying such an important position in the metal working industries it would appear that the time is opportune for the formation of some form of research bureau to thoroughly study the many questions that are involved in this comparatively new but rapidly developing science, with the purpose of putting the practice on a more certain basis regarding the efficiency of the work and the education of the men that are necessary for the production of reliable and satisfactory work. At present the art is greatly curtailed owing to the lack of knowledge on the part of the majority of operators regarding the fundamental principles pertaining to the technical characteristics of the processes. It would also appear that for men to become thoroughly efficient at this work they must acquire considerable knowledge pertaining to the physical nature of the different metals upon which they are required to make welds. The chemical reaction that must necessarily accompany the fusing of the two metals and the addition of the filling rod must change the nature of the weld from that of the metal in the body of the plate or object being welded, and it is this change that eliminates the possibility of placing a known factor of safety on this particular class of work.

## U. S. GOVERNMENT RECOGNIZES RESEARCH WORK OF COLLEGES

THE attitude of the U. S. Government in respect to enlistments of engineering research students is revealed in the ruling of the office of chief engineer, as recently announced by the United States Bureau of Education.

The new regulations permit of all resident graduate students in engineering who are candidates for an advanced engineering degree being placed on the inactive list until they have completed their educational training. In the interim they shall be registered as enlisted in the Enlisted Reserve Corps of the Engineer Department.

This ruling would indicate that the Government recognizes the importance of research work to the future welfare of the nation, and is taking steps to foster and encourage the more extended establishment of research fellowships in colleges and universities.

The Engineering Experiment Station, as established by the University of Illinois in 1903, maintains fourteen of these research fellowships, tenable for a period of two consecutive years. These are open to graduates of approved American and foreign universities and technical schools, and carry an annual stipend of $500. Not more than half the time of the Research Fellows is required in connection with the work of the department to which they are assigned, the remainder being available for undergraduate study, and at the end of the course, if all requirements have been met, the degree of Master of Science will be conferred.

Research work is undertaken in architecture, architectural engineering, chemistry, civil engineering, electrical, mechanical and mining engineering, municipal and sanitary engineering, physics, railway engineering and in theoretical and applied mechanics. In all these various branches of engineering investigations are carried on in problems of importance to engineers and to the manufacturing and industrial interests of the State.

## ELECTRIC LOCOMOTIVES MAY SUPERSEDE STEAM

Actual want of any commodity provides the most direct appeal possible for its conservation. The use of electricity, instead of steam, on those portions of Canada's railways adjacent to water-powers would materially reduce our dependence on the United States for coal. In 1916, the railways of Canada used 8,995,000 tons of coal, or about 61 per cent. of our total production. A writer in "Conservation" remarks that the increased price of coal may soon compel us to use hydro-electric energy extensively as a railway motive power.

Certain American railway companies have carried out extensive experiments in electrification within the past two years and many of the results are of more than ordinary interest. On its Rocky Mountain division, the Chicago, Milwaukee & St. Paul replaced its steam locomotives by electric. Electricity is decidely superior to steam in operating efficiency, especially in cold weather. Electric power made it possible to operate more trains over the same tracks and that, without the need for "helper" locomotives. Again, there was a great saving in terminal and round-house facilities, and the rolling stock was not subjected to as much wear and tear as when steam was used. This latter fact was largely due to the superior braking qualities of electric-drawn trains. Air brakes were not used on grades, except in cases of emergency. In fact, it was found that as much as 11.3 per cent. of the power consumed during the period of the test was generated by the trains themselves on the down grades. The experiment was so satisfactory that the company has decided to instal electric equipment on its Cascade division as well.

In a region so lacking in coal and so rich in water-power as is Central Canada, we may expect that, in time, the increase in the cost of coal will, in favorable situations, induce the electrification of part of our steam railway mileage. If the coal now consumed by railway locomotives could be turned to other productive uses, an important step would be taken in making Canada more independent of the American coal market. Concurrently with that advantage, the country's trade balance would be considerably improved.

## MARKET FOR WOODWORKING MACHINERY IN ITALY

A United States Consular report has the following to say in regard to the woodworking machinery market in Italy:

The use of woodworking machinery in Lombardy (consular district of Milan), is extensive. In fact the woodworking industries are well developed, the most important being furniture, doors, blinds, carriages, automobiles, other vehicles, frames, mouldings, fixtures and planing-mill products. These machines are almost exclusively supplied by other countries. Only one plant in Italy turns out woodworking machinery. It is in Mondovi, Piedmont, and supplies only 5 per cent of the total trade. Before the war, 70 per cent was supplied by Germany, while the other machines sold were French, American and Italian.

The fact that only a few American machines were sold in normal times is explained by the keen competition of the German manufacturers, and their favorable prices and terms. One concern offered terms on the basis of instalment rates up to three or four years.

The present demand for woodworking machinery for the private trade is limited as several factories are closed. On the other hand, important sales are made to the Government. Offers to the Italian Government, it is understood, are to be addressed to its representatives in America.

The user of woodworking machinery rarely orders the machine direct from the manufacturer, especially when he is not thoroughly acquainted with it. The business is handled by representatives in Milan. American machines are usually sold here through general agents in London and Paris. Before the war only machines for making wheels and blinds were sold. The dealers here state that the best method of increasing the sales [illegible] by appointment of general Italian agents in Milan.

Both native and imported lumber is used in Lombardy. The wood grown in Italy is oak, elm, chestnut, olive, ash, cherry, maple, poplar, fir, pine, larch and linden, while the varieties imported are mahogany which is received from Cuba, Porto Rico, and Honduras; cedar, from Brazil; ebony, sycamore, etc., from Africa; and poplar, pitch-pine, fir, and oak from the United States and Canada.

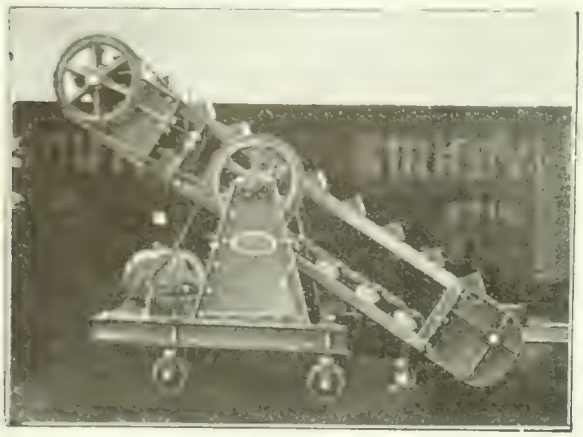
[illegible] weighing over 300 kilogrammes is 9 lire gold per quintal. When prices are quoted, they should be accompanied by actual freight rates to Genoa. Catalogues should be printed in Italian.

# PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

### A PORTABLE ELEVATOR

MANY [illegible] in handling the handling or transport of materials could be performed with [illegible] and other [illegible] a large saving in labor, but in many of these cases the installation of a fixed or elaborate conveying system would not be practicable or justifiable, owing to the changing venue of operation or the irregular, possibly infrequent, and not always calculable periods when its use would be required. Such conditions are admirably met by the use of portable elevators or conveyors. They can be brought into use as and when required; they can be moved from place to place with the greatest ease, and they can be arranged so that the work of loading and unloading can be carried out by merely reversing the running.



PORTABLE COAL ELEVATOR.

The accompanying engraving shows a small portable coal elevator of this type which is manufactured by the firm of E. Bennis & Co., Bolton, Lancs. It is 10 ft. long between centres of the drums and has buckets 8 in. wide.

[illegible] mounted on a portable truck in such a manner that the angle of the elevator can be altered if desired. The truck is built out of mild steel sections and is carried on four rollers. All the rollers are attached to pivoted axles. [illegible] a square so that it can be turned round with a spanner, and provision is made for locking the wheels in four positions. The elevator is driven by two chain drives. Two sprocket wheels are placed on the pivot shaft. One of these sprockets is driven direct from the motor, and the other sprocket drives the elevator shaft, so that the relative centres of the shafts are maintained irrespective of the angle of the elevator. When in operation, the elevator is pushed up to the coal heap, and the coal trimmed forward to the buckets.

### BALL BEARING LATHE CENTRE

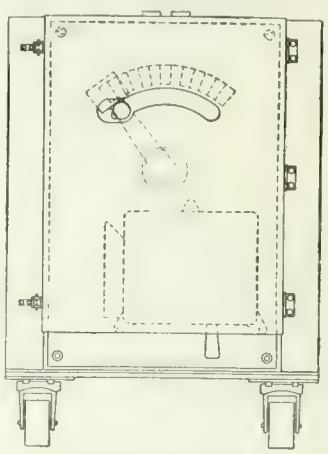
THE accompanying illustration shows a type of ball bearing lathe centre which has been designed by J. A. Moller, New Rochelle, N.Y. It consists of a revolving stem centre and conical bearing, which latter is threaded to screw into the housing and is adjustable in the housing with a lock ring. Located in the centre of the stem is a tri-thrust ball bearing which transmits the end thrust from the stem to the housing and allows the stem to revolve freely and with the least friction. This feature will commend the use of the ball bearing centre in high-speed engine lathe production work.

Positive oil supply is secured by providing a large oil chamber in the housing, which may be filled with oil by removing the headless set screw shown in the cut. Channels and drip retainer provided in the cone bearing allow the oil to circulate freely and ensure a liberal supply of oil to the bottom of the bearing. The ball thrust bearing is supplied with oil by a central oil duct cut in the housing.

The shank is in one piece with the housing, and is supplied with an extension rod for knock-out, which can be cut to different sizes as required. This centre is also made with stem bored to receive differently-shaped points as shown in the illustration to the right.

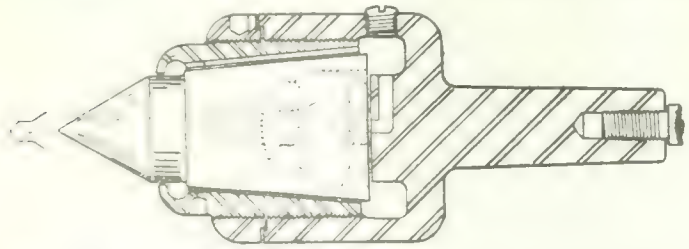
### PORTABLE OUTLET PANELS FOR ELECTRIC WELDING SERVICE

FOR an electric welding outfit to be of its maximum service, it must be so arranged that it can be taken to the work no matter where it may be located. For instance, in a railroad shop there should be outlets adjacent to each stall in the roundhouse, one or more on the washing tracks outside and others in places through the shop. In a boiler shop there should be an outlet on every other column and in a large machine shop there should be an outlet adjacent to each of the larger machines in order that work may be done in filling up blow holes and other defects on large castings with the minimum amount of crane handling.

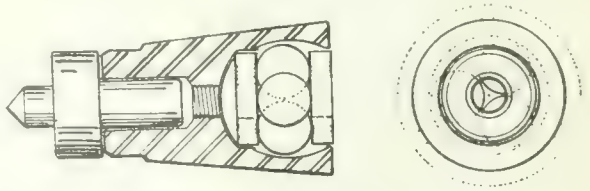


PORTABLE OUTLET PANEL FOR ELECTRIC WELDING SERVICE

One solution of the problem would of course be to locate a panel outlet of a suitable type wherever it is anticipated that electric welding might be desired. However, this is rather an expensive proposition and many electrical engineers would prefer to accomplish the same result in a simpler manner. The accompanying engraving shows a recently developed portable outlet manufactured by the Westinghouse Electric and Manufac-



[illegible] WITH CONICAL ADJUSTMENT [illegible] WHILE RUNNING



SECTION OF CONICAL STEM WITH POINT BORED OUT TO RECEIVE INTERCHANGEABLE POINTS TO SUIT VARIOUS CLASSES OF WORK

turing Company which takes care of this situation with a minimum of expense and with all the simplicity of the familiar distributing system for storage battery charging.

Two types of portable outlet panels are furnished, both being mounted on light trucks. They consist of a control panel mounting a handle trip railway type circuit breaker having overload release with magnetic blowout, and a 13-point face plate connected to a resistor mounted in the rear of the panel. The face of the panel is protected by a metal cover through which the handles of the rheostat and circuit breaker project. The resistor is made up of grids and is protected by a cage of expanded metal. Type E panel is intended for metal electrode welding, only, having a capacity of from 80 to 170 amperes. With this outfit one metal electrode holder and one shield are supplied. For a wider range of work a Type F panel should be used. This will handle metal electrode work from 80 to 160 amperes, and light graphite electrode work up to 300 amperes. The outfit includes one metal electrode holder, one graphite electrode holder and one mask.

In installing an electric welding system using these portable panels, the best method is to place the arc welding motor generator set at some central point. Where suitable low resistance ground connection can readily be made throughout the shop, as for instance, where metal floors or cast iron bedplates are in general use or in a railway shop where the track system can be used, only one connector need be extended to the various receptacles. The iron floor plates may be arc-welded to each other and isolated sections tied together by an iron rod or heavy copper cable, while the track rails may be bonded by arc-welding the fish plates to the rails. Receptacles should then be provided at suitable points throughout the shop of a capacity appropriate for the service for which they are intended. These receptacles may readily be mounted out of doors if they are provided with protection from the weather. Only single pole receptacles and a single wire cable to the portable panel need be provided. This cable should be of sufficient length so that the panel may be placed as near as possible to the work in order to save steps and valuable time for the welding operator. The flexible cable leading from the panel to the electrode holder should be as short as is consistent to the class of work to be done.

Where metal floors or tracks are not available, the ordinary two-wire system of distribution with double-pole outlets and two-wire cables should be provided.

## CIVIL ENGINEERS CHANGE NAME

THE final session of the 32nd annual meeting of the Canadian Society of Civil Engineers, held in Montreal, which closed on Jan. 23, proved to be the last held under that name. When the voting came, it was found that a very large majority of the members were in favor of changing the name to "The Engineering Institute of Canada."

Following this came the election of officers, when H. H. Vaughan, vice-president and managing director of the Dominion Bridge Co., was elected president, to succeed J. S. Dennis.

The following officers were also elected vice-presidents: T. H. White, Vancouver; J. M. R. Fairbairn, assistant chief engineer of the C.P.R., Montreal; Prof. H. E. T. Haultain, of the University of Toronto, and R. F. Hayward, of the Western Canada Power Co., Vancouver.

Past presidents—F. C. Gamble, Victoria, B.C.; G. H. Duggan, Montreal; J. S. Dennis, Montreal.

Council—J. R. Ambrose, Toronto; N. E. Brooks, Sherbrooke; Prof. E. Brown, McGill University; A. R. Decary, Public Works Department, Quebec; H. Donkin, Halifax; A. E. Doucet, Quebec; Walter J. Francis, Montreal; Prof. P. Gillespie, Toronto University; J. H. Kennedy, Vancouver; C. D. Lafleur, Ottawa; D. D. Lewis, Victoria; H. Longley, Woodman's Point, N.B.; G. A. McCarthy, Toronto; D. H. McDougall, general manager, Nova Scotia Steel Co., Sydney, N.S.; E. G. Matheson, Vancouver; L. A. Thornton Regina; John Murphy, Ottawa; J. M. Robertson, Montreal; Jas. White, Ottawa; Wm. Pearce, Calgary; D. A. Ross, Winnipeg; R. A. Ross, Montreal; H. R. Safford, Montreal, and Julian C. Smith, general manager of the Shawinigan Water & Power Co., Montreal.

## WILL INCREASE COAL PRODUCTION

THE War Committee of the Cabinet, Ottawa, has decided to take steps to increase the coal production in Eastern Canada, and in that connection the most recent returns show that the present output is [illegible]. It is practically all from Nova Scotia, and while there are collieries at Springhill, Stellarton and Inverness, the great percentage of production is from the mines in and adjacent to Sydney. As the seams are already developed the problem of augmenting the output is largely one of securing the necessary labor. Recently some unrest among the miners was reported and a member of the Government went down to Sydney and squared away matters. Any dispute will be referred to arbitration. If sufficient men can be secured at least a 50 per cent. increase in output [illegible] for by next season.

By way of more immediately relieving the situation, there is a probability of curtailing the operation of some of the less important industries down East, and diverting westward part of the coal in their bunkers.

## B.C. MANUFACTURERS WANT MORE WAR ORDERS

AT A meeting of the British Columbia Manufacturers' Association held in Vancouver last week, strong exception was taken to the action of the Dominion Government in not giving a fair proportion of war orders to the west coast province, it being stated that during the four years of war, not more than $20,000,000 out of a total expenditure of $1,800,000,000 in contracts had been given to British Columbia manufacturers, exclusive of the shipbuilding program. As a remedy it has been proposed that the various municipalities in the province unite in sending a strong man to Ottawa and keeping him there until what is considered a fair share of this business makes its way to the coast.

In the course of an address before the members of the association President Cunningham stated that it had been a considerable time since any commercial war orders had been received in the province with the exception of a few small orders for food supplies, although strong representations had been made to headquarters in Ottawa. While Vancouver firms had tendered for the supply of boots, he said that [illegible] lotted to Quebec. The recently-elected B. C. members of the Dominion House will be approached on the subject of war orders and these men on arriving at Ottawa for the session of the House will be asked to make insistent demands that a more equitable division of contracts be made.

## MATERIAL FROM U.S. FOR SHIP BUILDING

ARRANGEMENTS have been made, it is understood, whereby a supply of ship plates and steel shapes for the construction of the first vessels to be laid down under the Dominion Government's recently announced shipbuilding programme will be procured from the United States. In view of the present lack in Canada of facilities for the rolling of such material, it was necessary to enter into negotiations to obtain it from the United States. Alex. Johnston, Deputy-Minister of Marine, and Charles Duguid, the naval architect of the department, have been in Washington to discuss the question with the United States authorities. They were assisted in their negotiations by Sir Charles Gordon, formerly of the Imperial Munitions Board, and now of the British Purchasing Commission in the United States. They are stated to have been successful in making arrangements, details of which have not yet been made public, but which are said to be satisfactory to the Government.

Most of the shipyards of the Dominion are occupied at present. Ships now under construction, however, will be launched from time to time, beginning about June. It will then be possible to lay the keels of the first of the Government's projected standardized merchant fleet upon which an expenditure of some sixty million dollars annually is contemplated.

In order that British and Canadian requirements may be met it has been decided that no further orders for ships other than for British or Canadian registry shall be taken in the Dominion. At present there are some vessels being constructed under Norwegian orders.

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## MORE STEEL AND LESS INSPECTION?

MORE than ordinary importance attaches to the conference which took place last week at Ottawa between the leading steel makers of Canada and the War Committee of the Cabinet. Following the conference, the announcement was made that an increase of from 20 to 25 per cent. in steel production had been promised by the steel men, provided the raw materials are available as usual.

The extent to which this proviso may become necessary would seem to depend on the degree of co-operation which the Imperial authorities are disposed to extend to our steel makers. That the steel makers should feel confident enough of their ability to promise such an increase is sufficient proof in itself that they realize the urgent need for more steel, a need which becomes more and more pronounced as the United States program develops, with the possibility of future restrictions on supplies from that source.

The nature of the proceedings would seem to indicate also that, in the eyes of the Imperial authorities, Canada's own needs must be entirely subordinated to their demands. No Canadian with the welfare of the Empire at heart will hesitate to make sacrifices when necessary; indeed the actions of many prominent men in all walks of public life have demonstrated their willingness to meet such conditions; the question of just how far such an understanding should influence and control the industrial and manufacturing activity of the Dominion is a point, however, regarding which Canadians themselves should be allowed a reasonable degree of self assertion.

The railways are not only overburdened with traffic in excess of all previous records, but have to handle this [illegible] with decreased equipment, depleted staffs, lessened [illegible] many vital grades by the call for military service, and [illegible] accelerated track conditions which are fast approaching the critical point.

In other words, the ability of the country to produce and handle the requisite volume of business to insure economic conditions necessary to its continued participation in the war will soon be, if it is not now, just as dependent on internal trade conditions as on munitions output; or, to express it differently if more cogently, we can not burn the candle at both ends and get all the light at one end.

If munitions must be produced at all costs the manufacturers of the country ought to know it, but the country ought not to be made to suffer through the inordinate and over-exacting demands of an officialdom thousands of miles away.

The question of what constitutes inspection has been a live topic both with steel makers and shell manufacturers ever since munitions came to Canada, and the extent to which a rigorous, unbending, and what is claimed to be a blindly applied system may seriously interfere with the efforts of producers is, we believe, great enough and vital enough to warrant instant and complete recognition from those in authority at Ottawa who are qualified to present the true state of affairs to the British War Office.

Those familiar with the efforts of our steel makers know that they have done everything humanly possible to increase output and overcome initial defects. During the past three years they have not hesitated to spend money lavishly to increase output and maintain quality, and as experts in their own business are entitled to more than ordinary consideration when they claim that, if intelligently applied, the present requirements of the Imperial authorities could be easily met, and the required increase of 20 to 25 per cent. obtained through a reduction of discards.

The question of just how far any particular defect interferes with the acceptability of an ingot or bar of raw material has been pretty conclusively decided by eminent metallurgists, especially in England. Certain marks known as shadows or ghost lines were very fully investigated during the early stages of the war by one of those specialists, and while, to the best of our recollection no definite decision was arrived at regarding their cause and effect, their influence on the metal was not considered sufficiently detrimental to justify rejection. That this decision deserves full consideration is shown by the report that such material is accepted in the United States, and they, according to Secretary Baker's statement before the Senate War Committee, Monday, were advised by British experts what to do and what not to do.

The necessities of the moment are pressing. High costs compel efficiency on the part of the manufacturer. Specifications containing stated conditions are also efficient if applied with a due knowledge of conditions and appreciation of results involved. Engineering leaders as a class are probably the most honest of producers as their product can be judged from a purely scientific standpoint with no human element entering thereinto. But in order to judge such product a fair knowledge of the science involved is desirable.

The personnel of the inspection staff in many parts of Ontario at least has not conformed to this primary requirement, and the report that such non-technical and unscientific fields as real estate, insurance, window-trimming, etc., have been utilized as recruiting grounds for inspectors casts more than a passing shadow on the various government departments and officials involved, whether their acquiescence has been active or passive.

# INDUSTRIAL NOTABILITIES

NORMAN ALAN HILL, general manager, Carriage Factories, Ltd., Excelsior Life Building, Toronto, was formerly consulting efficiency engineer to Berger Mfg. Co., Canton, O.; Stark Rolling Mill Co., Canton; Canton Culvert & Silo Co., Canton; B. F. Shaw Co., Wilmington, Del.; Arlington Co., New York, as well as various shipbuilders, engineers and allied firms.

Mr. Hill was born in Baltimore, Md., Sept. 7, 1882, son of Thomas and Harriet Louise (Westcott) Hill, and received his education at the Friends' School, Baltimore;

NORMAN ALAN HILL

West Jersey Academy; Lafayette College; graduating from University of Pennsylvania (B.Sc., 1904); post-graduate, Pennsylvania University and Columbia University (Mechanical and Electrical Engineering).

In March, 1912, he came to Canada, and practised industrial engineering until Sept., 1914, when he returned to Baltimore; on Oct. 1, 1917, he was appointed general manager of Carriage Factories, Ltd., of Toronto and Montreal, with two factories at Brockville, one at Orillia, one at Montreal, and one at Alexandria.

Mr. Hill is a member of the Society of Industrial Engineers, and as such has made reports, etc., for the Council of National Defence of the United States.

He married Emily Turnbull, daughter of John Nunn Heflebower, Dec. 11, 1907, and has two sons.

His club membership includes the Beta Theta Phi Fraternity Club, of Philadelphia, and his recreations are motoring, motor-boating and boxing.

Mr. Hill's residence is 24 Douglas Drive, Toronto, Ont.

# Ship Plate and Shapes Assured for Government Vessels

*[illegible] severe weather continues—Official statement awaited regarding size of ships to be built by Government—Steel prices unchanged generally —Machine tool trade quiet*

**The [illegible] severe weather continues to adversely affect the railroads and little headway can be made in relieving the freight congestion until conditions improve. Prevailing conditions are restricting manufacturing operations and production is being curtailed. Supplies of coke continue deficient and steel companies are unable to operate at full capacity. The cold weather is also affecting operations at the mills. It is understood that the Government has been assured of a sufficient supply of plates and shapes for the first vessels to be constructed under the new program. No official statement has been issued in regard to the size of the ships to be constructed but it is reported that arrangements are being made for keels to be laid down some time in June. Existing shipyards will be utilized for the carrying out of the Government program. Nothing further has been said regarding the proposed plate mills being established in Canada, but it is not unlikely that action will be postponed in view of the fact that plates can be obtained in the States. There have been no changes in prices of steel products this week. There is no improvement in the pig-iron situation, the freight congestion and severe weather continue to hamper operations at the furnaces. The scrap metal market is quiet and quotations are unchanged. The fixed price of copper, in the States, at 23½c per pound, has been extended until June 1st. This has caused some disappointment in the trade as it had been hoped that the price would be advanced to 25c in order to stimulate production. The tin situation continues acute with no relief in sight. Prices of all non-ferrous metals are unchanged. The machine tool trade has been rather quiet this week. The necessity of obtaining licenses at Washington on importations from the States is holding up some business. Deliveries from the States are getting more backward with rising prices.**

TORONTO, Ont., Jan. 29.—Another snow storm and the continued cold weather has again tied up traffic on the railways and has caused considerable inconvenience to manufacturers throughout the province. The freight congestion, more acute on account of the cold weather, is preventing the free movement of raw materials. The shortage of raw materials is also adversely affecting the industrial situation and in some cases manufacturing operations are being restricted and output consequently is curtailed.

### Steel

The situation in the iron and steel trade has not improved, in fact conditions are if anything worse due to the continuance of the severe weather. Steel plants and foundries in this district are badly in need of coke and production is being curtailed by reason of the shortage which is becoming more acute, due to the freight congestion. There is little hope of the proposed increase in production of steel materializing for some weeks as little improvement can be looked for in the transportation situation until the weather moderates for a long enough period to enable the railways to catch up with arrears in car shipments and clear the terminals. Under prevailing conditions the steel companies cannot even approach anything like maximum capacity let alone increasing it, therefore full supplies of coke are absolutely necessary before any attempt can be made to increase the steel production to the required tonnage. The situation is undoubtedly serious, but conditions are such that relief measures are difficult to put in force. The shortage of cars and severe weather [illegible] trouble, while the cold weather hampers operations at the ovens, thus reducing

A report from Ottawa states that arrangements have been made whereby a supply of ship plates and shapes can be obtained from United States for the first vessels that will be laid down under the proposed Government programme. It is understood that the first vessels will be laid down about next June. The existing shipyards will be utilized for this construction, Government ships being laid down as berths become vacant. No vessels for neutrals will hereafter be built in Canada. In view of the above arrangement it is problematical if plate rolling mills will be established in Canada in the meantime owing to the high cost and the long time that would elapse before the mills could be installed and in operation. Conditions in the steel trade across the line are not much easier in spite of the drastic measures that have been taken to relieve the fuel situation and the shortage there will affect consumers in Canada. The demands of the U.S. Government are growing heavier and are fully sufficient to keep all the the producing plants actively employed. There has been a serious falling off in the output of steel in the States the last few weeks and the continued severe weather has made matters worse. The output has probably been reduced 50 per cent. due to the weather conditions and shortage of raw material. Consumption either directly or indirectly for war purposes is absorbing practically all the steel that can be produced, leaving very little material for consumers not working on war contracts. The most serious aspect of the situation is the shortage of pig iron which is as acute as ever, due to the failure of the coke supply. Current business has been very small, but deliveries have been smaller, due to the traffic situation and the fuel shortage. Hence, it is expected that another increase in unfilled tonnages will be reported for the month of January. Earnings of the last quarter of 1917 are expected to show a decided falling off from those of the third quarter, while there is expected to be a further decrease shown in the current three-months period.

### Pig Iron

The cold weather continues to hamper furnace operations and there is no improvement in the coke situation. Cars are held up on account of the freight congestion and the movement of coke is light, intensifying the already acute shortage of fuel. As a result of this, the production of pig iron has been considerably curtailed during the last few weeks and furnaces are getting further behind on deliveries which is causing anxiety among consumers. Across the line there is little if any improvement in the situation and there is no perceptible increase in the production of iron.

### Scrap

There is no perceptible change in the old materials market, business continues quiet and prices are the same as quoted last week. Dealer's stocks of most scrap metals are low, due largely to the shortage which prevails and also because there is no inducement to carry heavy stocks on account of the unsettled outlook. Consumers are only buying hand-to-mouth owing to the prevailing impression that prices may decline. Prices of non-ferrous scrap are weak but heavy melting steel and old cast iron are firm.

### Machine Tools

Business has been rather quiet this week in machine tools in this district, and the orders that have been placed have been small. The fact that no machine tools can be imported from the States except under license is curtailing busi-

ness to some extent because it is practically impossible to obtain a license at Washington unless the machinery is required for munitions plants or shipyards. The embargo thus cuts off a certain amount of business which would in the aggregate help to swell the volume of sales. Deliveries on some tools are getting more backward which is tending to discourage buyers while high prices are also a factor in the situation. Dealers continue to complain of shipments being held up in transit.

### Supplies

Business continues brisk and prices firm. Difficulty is being experienced by dealers in obtaining some lines of machine shop supplies manufactured in the States and deliveries are uncertain. The continued high cost of practically all raw material precludes the possibility of price recessions, the tendency being upward rather than down. There are no price changes of importance to note this week.

### Metals

There have been no important developments in the metal markets except that President Wilson has approved the recommendation of the War Industries Board that the price of copper shall be continued until June 1, although this caused some disappointment in the trade, no change has come over the copper situation. What little tin there was in the States has been commandeered for the use of the Emergency Fleet Corporation, causing some concern by the trade. The lead market remains firm but spelter, antimony and aluminum are quiet and unchanged.

**Copper.**—The price of copper fixed at 23½c last September by the War Industry Board will be continued in effect until June 1st. The recommendation of the Board has been approved by President Wilson. The government's decision has caused some disappointment in the market as it has been predicted in many quarters that the price would have been raised to 25c to stimulate production as a number of mining companies are reported to be unwilling to undertake extensive additions to their work unless a higher price was paid for copper. The supply of the metal is not enough for full needs at the present time, but some industries have curtailed their buying and thus no serious shortage has been seen. It is said in the copper industry, however, that if there should be any revival of general activity in the lines which use the most copper a decided shortage in spot supplies would be quickly seen. Local copper prices are unchanged, lake and electrolytic being quoted at 31c and casting at 30c per pound.

**Tin.**—The tin situation in New York is more acute and trading has practically ceased on account of the uncertainty in regard to future developments in the market. The U.S. Government has commandeered all tin in New York warehouses which has created some concern in the trade although little disturbance is expected as all the tin had been sold and was being held for consumers' account. Local situation is unchanged and quotations are nominal at 80c per pound.

**Spelter.**—The market continues dull and little interest is being shown in spelter. In the primary market efforts have been made to have the U.S. Government agree to an established price of 10c but so far nothing has been done. Local price 10½ per pound.

**Lead.**—The market remains firm and quotations unchanged. The lead situation is unchanged and so far as supplies are concerned is likely to remain so. The indications are that prices also will not undergo much change, because the leading producers are understood to be opposed to advancing prices at the present time. Local price 9c per pound.

**Antimony.**—The market is quiet again with an easier tendency and the price is unchanged at 17c per pound.

**Aluminum.**—The market is quiet and easier with no change in the situation. Local price 60c per pound.

### CANADIAN GOVERNMENT PURCHASING COMMISSION

**The following gentlemen constitute the War Purchasing Commission appointed by the Canadian Government: Hormidas Laporte, Montreal, chairman; George F. Galt, Winnipeg; William P. Gundy, Toronto. Thomas Hillier is secretary, and the Commission headquarters are at Ottawa.**

## New York

NEW YORK, Jan. 26.—Manufacturers who have received recent contracts for war munitions from the United States Government have placed supplementary contracts for shop equipment and other industrial concerns that expect to close for shells and shell accessories are tentatively in the market for machine tools. The Emergency Fleet Corporation has also released additional orders for cargo boats and the shipyards are buying machinery as a result.

### Recent Contracts

For the Government nitrate plant at Mussel Shoals, Ala., the Air Nitrates Co. of New York has purchased 15 electric and transfer cranes. The Neptune Meter Co. of Long Island City, which has a fuse contract from the Government, has placed orders for tools. The Worthington Pump & Machinery Corporation has bought additional machinery for its Hazleton, Pa., plant, and the Bartlett-Hayward Co., Baltimore, which is making shells for the Government, has placed supplementary orders for machine tools. The John Thompson Press Co., New York, which expects a Government contract for projectiles, is testing the market for tools. The Zenith Carbureter Co., Detroit, has bought 20 machines in the Cleveland market for munitions work.

### Shipbuilding Prospects

Although shipyards have been sadly handicapped by railroad embargoes, labor difficulties, and unfavorable weather, they have continued to make preparations for greater activity in the next few weeks. The Federal Shipbuilding Co. has purchased 11 travelling cranes for its Newark shops from the Milwaukee Crane & Manufacturing Co., and has also purchased $100,000 worth of heavy tools taken from the plant of the Stewart-Warner Speedometer Co., Long Island City, which plant was recently taken over by the Government for the manufacture of gas masks. Only a few of the tools were commandeered by the Government, the other machinery being offered in the open market through Carpenter & Woodward. It is claimed that the equipment is worth about $500,000 at present market prices. The Atlantic Corporation, Portsmouth, New Hampshire, which is to build ten steel ships for the Emergency Fleet Corporation, is enlarging its plant to execute the contract, and is now buying equipment which will cost in the neighborhood of $1,000,000.

On the Pacific coast the machinery trade is receiving supplementary orders from shipyards. The Moore Shipbuilding Co., which has a contract to build 16 more steel freight boats for the Government, is building two more shipways and buying necessary plant equipment. The Union Iron Works, San Francisco, has been authorized by the Shipping Board to build four additional slips at its Alameda plant to construct more ships for the Fleet Corporation.

### Export Handicapped

Export trade in machinery, outside of Government purchases for France, is almost entirely suspended. The latest Government inquiry is for 25 chain hoists for the American Ordnance Base Depot in France. New York agents who are buying for the Italian Government are anxious to place additional contracts for machine tools, but can obtain no promises for definite shipment, as the manufacturers and dealers are already overwhelmed with domestic orders mainly for the Government, either directly or indirectly. Some war plants in Italy cannot be completed because neither corrugated steel sheets nor machinery can be obtained in this country. Orders for machine tools placed over a year ago for Italian plants have not been filled; some of the tools have been commandeered by the United States Government. Over 100 similar cases are reported. It is an interesting fact that one large Italian gun shop has been entirely built from American steel and equipped with machinery from the United States. The equipment alone has cost $6,000,000. It is expected that some of the manufacturers in Italy now engaged in producing war equipment will make an effort to manufacture agricultural implements after peace has been declared.

## Washington

WASHINGTON, Jan. 26.—While par- [illegible] has been [illegible] in Washington during the past week. Commercial and industrial men of the United States have been in a quandary as to the future status of their business.

Dr. Garfield's fuel order closing down all factories not engaged in war work has resulted in serious cramping of industries and on top of this has come an order from Director-General of Railroads McAdoo placing an embargo on all freight, except coal and food, on the two principal carriers east of Pittsburgh. According to reports received here the fuel order was very generally obeyed, not without serious protest, however. There have been intimations that it might be found possible to abrogate the order before April 1, as at first planned, but continued severe weather discounts this hope. Many factories have taken opportunity of the enforced shut down to make repairs.

### Munitions Director Wanted

With President Wilson fighting bitterly Congress is still waging a war to secure a Director of Munitions. Business men throughout the entire nation are supporting this move and maintain that greater centralization of power would result in better co-ordination of the American industries making munitions of war. Secretary of War Baker, a strong opponent of the Director of Munitions plan has already taken a step in that direction by the appointment of Edward R. Stettinius as "surveyor general" of all army purchases. Stettinius has been a member of the firm of J. P. Morgan and for several months previous to the entrance of the United States into the war was engaged as the chief purchasing agent of the Allies in the United States. His name had been mentioned as a possible man to fill the cabinet office of the proposed Director of Munitions.

### Shipping Board Troubles

Controversy over the shipbuilding possibilities of the United States goes merrily on. Advocates of a Director of Munitions maintain that such an officer would have power over shipbuilding and would be so able to centralize the power that the tonnage capacity of the United States might be increased by at least 1,000,000 tons a year. The investigation into the Shipping Board, being conducted by the Senate, has brought about a wholesale reorganization in the department of design of the Shipping Board. Because certain testimony given before the Senate committee tended to show that he had not been entirely in full co-operation with [illegible] resigned and in justification of their chief eight of the subordinate designers resigned at the same time. The testimony [illegible] ...es which had no shipyards but were and testified that the lack of labor and proper living conditions has held the operations of the United States in ship construction down to seventy per cent. of their capacity.

### Coal Zones Include Canada

Dr. Harry A. Garfield, Federal Fuel Administrator, has in view a new plan for the distribution of coal which will necessarily affect Canada. Dr. Garfield plans to divide the country into twenty zones. Each zone must draw its coal supply from within the zone. Statisticians are now at work in an attempt to fix zone lines in order that there may be a balance between the supply and the demand within the zones. Details of the plan have not been finally completed, but it is understood that Canada will be included in one of the zones. According to the best information Canada will be placed in a zone which will include Ohio, Indiana and a part of Pennsylvania. This will mean that Canada's coal supply must come from this zone and will necessitate the changing of contracts held by some Canadian manufacturers for coal in other zones. Dr. Garfield has before him a plan which will allow present contracts to be fulfilled, but no future contracts can be made with dealers outside the zone. It is believed that Dr. Garfield will consider Canada as a part of the United States rather than rating it as a country to which coal is exported, because the export coal will be ordered drawn from those coal fields nearest the Atlantic ports, whereas he favors Canada's coal supply coming from fields near the lake ports.

### Fisheries Adjustment Begins

The Canadian Fisheries Board here adjusting the question of rights of fisheries in the United States and Canada will begin hearings in Boston on Jan. 31. Later they will go to the Pacific Coast for a series of hearings.

Secretary of the Interior Lane has announced that the Nenana coal lands in Alaska will be opened for leases within a few weeks.

The Navy Department is calling for bids on valves, air, gate, steam, water, high and low pressure, for delivery at the Puget Sound Navy Yard. Bidders desiring to offer bids should apply to the Navy Purchasing Bureau, Navy Department, Washington, D.C., asking for schedule 1660. Applications may also be made for the schedules, which contain full details, to the nearest navy yards. Bids are also being asked for miscellaneous hardware, such as chains, locks, wire cloth and so forth. These specifications are described in schedules 1660 and 1661, which may be procured through the same sources.

The iron and steel market in the United States has been greatly upset by the Fuel Administrator's closing order according to reports received here. Estimates placed before government bureaus indicate a shortage of approximately twenty-five per cent. due to the closing order and a general shortage in pig iron from blast furnaces.

## Pittsburgh

PITTSBURGH, Pa., Jan. 26.—During the five-day period ending midnight Tuesday, Jan. 22, covered by Fuel Administrator Garfield's plant closing order, the blast furnaces operated as far as they were able to operate. The Bessemer steel-making departments were all closed, except that two or three resumed Monday morning by reason of the tin plate mills having been given an exemption late Saturday night. The open-hearth steel departments generally were closed, but 20 or 25 per cent. of the normal tonnage was turned out in connection with exempted finished products. Finishing departments generally were closed, the exempted departments representing only a very small percentage of the total capacity. The exemptions as a rule were not received until after departments had closed, some of them not coming until Saturday night, and resumption was difficult. Some were even received Monday and Tuesday, and, therefore, proved of significance only as to the nine following Mondays on which plants generally are to be closed.

While the plant closing order caused a great deal of comment and considerable excitement, it was to the steel industry only an incident. Steel mills are accustomed to sudden closings for one thing, while shipping conditions have been so extremely bad that the steel industry was disposed simply to hope for the best in connection with this drastic order. While there was much criticism of the order in many circles at the outset, there was practically none at any time in the steel industry. The criticism elsewhere has largely died down, as the necessity for the order has come to be appreciated.

### Traffic Conditions

In the first week of the month the majority of railroads serving the Pittsburgh and valley mills placed embargoes against the receipt of freight for most points, with a few exceptions. Shipments were accordingly greatly curtailed. A fortnight ago hopes were entertained that these embargoes would be removed by the end of last week. Instead of that the plant closing order announced Thursday was tacit notice that nothing of the sort could be expected. Wednesday of this week Director-General of Railroads McAdoo, upon recommendation of Mr. A. H. Smith, president of the New York Central and regional director of the Eastern roads, instructed Mr. Smith to order embargoes against the receipt of all freight, except perishables, fuel and war material, on the Pennsylvania lines east of Pittsburg, the Baltimore and Ohio, east of the Ohio River, and the Philadelphia and Reading. This order served to extend somewhat the scope of the previous embargoes, and it is taken to indicate that the railroads will grant practically no permits to ship through the embargo. The roads had not been issuing many permits, however.

While the curtailment in the shipment

of coke has increased progressively, until blast furnaces in the central west in the past week or two have been operating at only 50 to 70 per cent. of capacity, the conditions as to shipment of finished steel have become such that the greatest restriction is in that quarter. The mills can ship less finished steel than they are able to produce even with the restricted supply of pig iron. On an average shipments of Pittsburgh and valley mills in the past two or three weeks have represented only about 50 per cent. of capacity. The production has been a trifle more than that, but not much more, as so much material has accumulated in mill warehouses and yards that various departments have already been forced to curtail production.

### Coke and Blast Furnaces

Shipments of Connellsville coke in the week ended January 19 are reported by the Connellsville "Courier" at 247,487 net tons, against 290,718 tons the preceding week, an average of about 350,000 tons a week in 1917, and an average of 421,000 tons in 1916. The blast furnaces could have stood a slight decrease in shipments, as new by-product coking capacity has been put in operation, but not a great deal. It is positively asserted that there is an ample supply of labor in the coke region, and that the curtailment in shipments is due entirely to car shortage.

Strenuous efforts have been made of late to improve conditions on the railroads, but on account of extremely adverse weather conditions results do not show as yet. Shippers are now doing their part in eliminating the cross movements, about which there was so much complaint recently, as they resulted in much coke being hauled a greater distance than necessary, incidentally congesting some yards. Several important interchanges have been effected, these being in essence an exchange of customers between coke works, and matters are well in hand in this respect.

### Weather Dominant Element

While the various efforts that are being made to relieve traffic conditions are interesting, and more or less important in their way, practical men in the coke, blast furnace and steel industries are all thinking much more of the weather than of these human efforts. They insist that the weather is the dominant element, that conditions would not have become nearly as bad if the winter had not been an unprecedentedly hard one, and that there is going to be important and rapid improvement in traffic conditions as soon as the weather becomes half favorable. It is a matter of the progress of the calendar, however. The weather has grown worse to-day, colder and with more snow, and with predictions by the Weather Bureau of another cold wave. In a few weeks, however, it is reasonably certain there will be fairly mild weather, such as will permit the railroads to get into working order again. The measures being taken are relieving congestion to an extent, and they prevent further congestions arising, so that when locomotives become able really to pull trains there will be fairly clear track for them.

### Market Prospects

There is, of course, no market at present. No one is thinking of buying or selling pig iron or steel products, except that there is a little activity in second half foundry iron at prices subject to revision to any new Government schedule that may be put out after March 31. Buyers are specifying rather slowly on regular contracts for steel products, and are not particularly urgent about shipment of material already specified, even though their receipts have of late been greatly diminished. The future of the market hinges upon the relation between the effect the traffic blockade has had upon production and the effect it has had upon consumption. If favorable weather results in production of steel at or near capacity and consumptive demand does not increase steel will be a drug upon the market. If the consumptive demand increases proportionately with the production there will be a firm and active market. There are many who believe this will occur, but there are some who think that eventually the increase in production will be greater than the increase in consumptive demand.

Government orders are being placed substantially at the same rate as formerly, there being large tonnages let from week to week, but except in a few instances the details are withheld.

## MIDLAND SHIPBUILDING CO.

THE Midland Shipbuilding Co. of Midland, Ont., although devoting its energies principally to repair work, will shortly lay the keel of a steel freighter which will be 261 feet long, 43 ft. 6 inches beam, and 23 feet deep. The company is repairing the C.P.R. steamer Athabasca which was damaged late in the season by ice. Twenty new plates are being replaced in her bow.

The forward end of the steamer Mariska is undergoing extensive alterations, a new forecastle and steel deckhouse being built upon her and equipped.

A new steel deck-house is also being built forward on the steamer Glenlyon of the Great Lakes Transportation Co., including captain's and mate's accommodation. A new steel deck house [illegible] and various minor repairs are being made in the hull.

All the big beams and stanchions are being removed from the Western Star, of the Great Lakes Line, which is being reconstructed to the Herriman type of lake cargo steamers. The wood-work in the after cabin is being rebuilt and the engines and boilers overhauled.

The W. C. Franz, of the Algoma Steamship Co., will appear in the spring as a Herriman type of lake carrying steamer.

The boilers and engines of several other ships in the harbor are being overhauled. Though reconstruction work is taking up a great part of the company's time, the management is looking forward to commencing operations on the new ships as soon as the steel arrives, and it is expected daily.

## TENDERS WANTED

TENDER forms and specifications have been received from D. H. Ross, Canadian Trade Commissioner, Melbourne, for equipment required by the Department of the Navy, Melbourne, and the Postmaster General's Department, Brisbane, Queensland. These tender forms are open to the inspection of Canadian manufacturers at the Department of Trade and Commerce, Ottawa. (Refer File No. 1729 O.) Particulars of the requirements are briefly outlined thus: The tender addressed to the Director of Navy Contracts, Navy Office, Melbourne, is as follows:—Supply and delivery of one motor driven hydraulic pump for Garden Island, Sydney, N.S.W. Date of closing April 5. Tenders addressed to the Deputy Postmaster General, Brisbane, Queensland, are as follows: Schedule. No. 432. Fifteen miles, 550 yards silk and cotton insulated switchboard cable, as specified; 990 yards paper-insulated, rubber covered cable, as specified; 8,880 yards lead-covered, paper-insulated telegraph cable, as specified. Date closing Feb. 27.

## TRADE ENQUIRIES

THE following enquiries have been received by the Department of Trade and Commerce, Ottawa. Further particulars may be had on application.

34. **Electrical supplies.**—A firm in Barbados handling electrical supplies would be glad to communicate with Canadian manufacturers of such supplies.

37. **Raw potash feldspar.**—A Midlands, England, company asks to be placed in communication with Canadian producers of raw potash feldspar, favourably situated for export to the United Kingdom.

38. **Vulcanizing machinery.**—A manufacturing firm in St. John's, Newfoundland, asks to be put into communication with Canadian exporters of machinery for vulcanizing automobile tires.

39. **Marbleized tin.**—Canadian manufacturers of marbleized tin in size 20 by 40 inches are asked to communicate with a Newfoundland inquirer.

## MAIMED SOLDIERS TAKE 94 DIFFERENT COURSES

THE elasticity of the work offered by the vocational training branch of the Military Hospitals Commission in its efforts to meet the needs of every soldier who returns to Canada so disabled as to require a new vocation adapted to his altered condition can be measured in some degree by the figures lately compiled showing that 94 different courses are now being taken.

The work is largely individual although in some courses greatly in demand

classes are conducted. These include motor mechanics, tool-making, draughting, book keeping and commercial work, shoe-making, agriculture, etc., and sometimes the enrolment in certain classes is over a score.

The courses are listed under five heads, agricultural, trades, professional, mechanical and miscellaneous. Some are being taken in universities, some in factories, some on the land, some in the schools specially established by the M.H.C. All are roads to independence and a new livelihood.

### Many Moulds

The vocational experts are not trying to turn maimed men into a few set moulds but to afford every man the particular training required to best utilize his previous experience and secure his future. This aim is accountable for the breach between a course in saxaphone instruction given to a Montreal piano teacher whose shoulder was shattered in France and boiler-making for a day-laborer with mechanical ingenuity who lost a leg.

### Valuable Abilities Developed

Some men must receive the necessary instruction in a university. If this is so, the vocational experts arrange for them to have the course. Other men will regain independence by learning in some factory a trade related to their previous occupation. Still others will go on the land. Wherever they can be most efficiently and economically trained the course is given with the realization that the man's most valuable abilities are to be developed not only for his welfare but for Canada's.

## SOUTH AFRICA'S IRON AND STEEL INDUSTRY

IT is quite conceivable that, before many years have elapsed, Pretoria will develop into a great industrial centre for the production of iron and steel, and become a "Sheffield" in miniature. It has, of course, always been known that abundant deposits of iron ore of a quality which makes it extremely valuable from the commercial point of view exist in the Pretoria district; but it is only recently that the Corporation has taken the definite step of leasing to a local company a small portion of the ore-bearing area.

The company in question has been promoted by Mr. C. F. Delfos, of the well-known engineering firm of Delfos, Ltd., Johannesburg and Pretoria, who are, of course experts in this branch [illegible] the ore, as also that found near Barkly West, in the Cape Province, will shortly begin operations. Inquiries have, however, been received from other quarters and from other persons who desire to take a much larger share in the mining of iron in this region; but the [illegible] Ordinance of

(Continued on page 122)

# Enlarged Canadian Trade Intelligence Service

**Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.**

CHILE—Valparaiso, British Consul General.

COLOMBIA—Bogota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT—Alexandria, British Consul General.

FRANCE Havre, British Consul General. Marseilles, British Consul General..

INDIA—Calcutta, Director-General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL Lisbon, British Consul.

RUSSIA Moscow, British Consul General. Petrograd, British Consul. Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA—Caracas, British Vice-Consul.

BRAZIL—Bahia, British Consul. Rio de Janeira, British Consul General.

# Canadian Commercial Intelligence Service

**The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.**

### CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address, Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM Harrison Watson, 73 Basinghall Street, London, E.C.2, England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Anne's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Cantracom.

### CANADIAN COMMERCIAL AGENTS.

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—C. E. Sontum, Grubbegd No. 4 Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

### CANADIAN HIGH COMMISSIONER'S OFFICE.

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

### PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago | 37 50 |
| Standard low phos., Philadelphia | .... |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 33 00 |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | .... | .... |
| Victoria | .... | 50 00 |

### FINISHED IRON AND STEEL

| Per lb. to Large Buyers. | Cents |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in. base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 5 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 5 75 |
| Chequered floor plate, 3/16 in. | 13 20 |
| Chequered floor plate, ¼ in. | 13 00 |
| Staybolt iron | 8 50 |
| Bessemer rails, heavy, at mill | .... |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | 3 50 |

F.O.B., Toronto Warehouse

| | |
|---|---|
| Steel bars | 5 50 |
| Small shapes | 5 75 |

F.O.B. Chicago Warehouse

| | |
|---|---|
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

### FREIGHT RATES

Pittsburgh to Following Points

| | Per 100 lbs. C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 35.1 | 45.5 |
| Halifax | 35.1 | 45.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

### METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $33 00 | $31 00 |
| Electro copper | 33 00 | 31 00 |
| Castings, copper | 32 00 | 30 00 |
| Tin | 77 00 | 80 00 |
| Spelter | 10 50 | 10 50 |
| Lead | 9 75 | 9 00 |
| Antimony | 18 00 | 17 00 |
| Aluminum | 60 00 | 60 00 |

Prices per 100 lbs.

### PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¼ to ½ | $12 00 | $10 00 |
| Heads | 12 50 | 10 50 |
| Tank plates, 3-16 in. | 13 10 | 10 10 |

### WROUGHT PIPE

Effective Jan. 7, 1918.

| Size | Black | Galvanized |
|---|---|---|
| Standard Buttweld. | Per 100 feet | |
| ⅛ in. | $ 6 00 | $ 8 00 |
| ¼ in. | 5 10 | 7 23 |
| ⅜ in. | 5 10 | 7 23 |
| ½ in. | 6 46 | 8 03 |
| ¾ in. | 8 17 | 10 29 |
| 1 in. | 12 07 | 15 22 |
| 1¼ in. | 16 33 | 20 59 |
| 1½ in. | 19 53 | 24 61 |
| 2 in. | 26 27 | 33 12 |
| 2½ in | 42 12 | 52 94 |
| 3 in. | 55 05 | 69 23 |
| 3½ in. | 69 02 | 86 34 |
| 4 in. | 82 84 | 103 00 |
| Standard Lapweld. | | |
| 2 in. | 29 43 | 35 71 |
| 2½ in. | 43 88 | 54 11 |
| 3 in. | 57 38 | 70 76 |
| 3½ in. | 71 76 | 89 70 |
| 4 in. | 85 02 | 106 28 |
| 4½ in. | 96 52 | 121 29 |
| 5 in. | 112 50 | 141 34 |
| 6 in. | 145 90 | 183 36 |
| 7 in. | 190 40 | 238 00 |
| 8 L in. | 200 00 | 250 00 |
| 8 in. | 230 40 | 288 00 |
| 9 in. | 276 00 | 345 00 |
| 10 L in. | 256 00 | 320 00 |
| 10 in. | 329 60 | 412 00 |

**Prices—Ontario, Quebec and Maritime Provinces**

### WROUGHT NIPPLES

4" and under, 45%.

4½" and larger, 40%.

4" and under, running thread, 25%.

Standard couplings, 4" and under, 35%.

4½" and larger, 15%.

### OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 21 50 |
| Copper, heavy | 22 50 | 21 50 |
| Copper wire | 22 50 | 21 50 |
| No. 1 machine composition | 21 00 | 20 50 |
| New brass cuttings | 16 00 | 17 00 |
| No. 1 brass turnings | 14 00 | 15 75 |
| Light brass | 10 00 | 10 00 |
| Medium brass | 14 00 | 14 00 |
| Heavy brass | 15 00 | 16 00 |
| Heavy melting steel | 21 00 | 20 50 |
| Steel turnings | 12 60 | 8 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 23 00 | 18 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 20 50 |
| No. 1 machine cast iron | 27 00 | 25 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 17 00 | 9 00 |
| Car wheels, iron | 26 00 | 25 00 |
| Steel axles | 38 00 | 30 00 |
| Mach. shop turn'gs. | 9 00 | 8 50 |
| Cast borings | 12 00 | 8 50 |
| Stove plate | 17 00 | 19 00 |
| Scrap zinc | 5 50 | 6 50 |
| Heavy lead | 5 50 | 7 00 |
| Tea lead | 5 00 | 5 75 |
| Aluminum | 25 00 | 25 00 |

### BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, ⅜" and less. | 10 |
| Carriage bolts 7-16 and up. | net |
| Coach and lag screws | 25 |
| Stove bolts | 55 |
| Plate washers | List plus 20 |
| Elevator bolts | 5 |
| Machine bolts, 7-16 and over | net |
| Machine bolts, ⅜ and less | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | 10 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | add 25 |
| Nuts, square blank | add $1 50 |
| Nut, square, tapped | add 1 75 |
| Nuts, hex. blank | add 1 75 |
| Nuts, hex. tapped | add 2 00 |
| Copper rivets and burrs, list plus | 30 |
| Burrs only list plus | 50 |
| Iron rivets and burrs | 15 |
| Boiler rivets, base ¾-in. and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 37½ |
| Wood screws, O. & R., brass | 32½ |
| Woodscrews, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

### MILLED PRODUCTS

| | Per cent. |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil Head Cap Screws | net |
| Flat ⅞ But. Hd. Cap Screws plus | net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. and semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and semi-fin. nuts over 1½ in., up to 2 in. | plus 10 |
| Studs | net |
| Taper pins | 40 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | list plus 20 |
| Collar screws | list plus 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | 60 |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add $7 00 |

### BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $47 50 |
| Open-hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.
F.O.B. Pittsburgh.

### NAILS AND SPIKES

| | |
|---|---|
| Wire nails | $5 50 $5 45 |
| Cut nails | 5 50 5 65 |
| Miscellaneous wire nails | 60% |
| Spikes, ⅜ in. and larger | $7 50 |
| Spikes, ¼ and 5-16 in. | 8 00 |

### MISCELLANEOUS

| | |
|---|---|
| Solder, ½ and ½ | 0 39 |
| Solder, commercial | 0 33 |
| Babbitt metals | 18 to 70 |
| Soldering coppers, lb. | 0 53 |
| Lead wool, per lb. | 0 15 |
| Putty, 100-lb. kegs | 4 75 |
| White lead, pure, ground | 17 20 |
| Red dry lead, 100-lb. kegs, per cwt | 17 50 |
| Glue, English | 0 28 |
| Tarred slater's paper, roll | 0 95 |
| Gasoline, per gal. in bbls. | 0 [illegible] |
| Benzine, per gal. in bbls. | 0 [illegible] |
| Pure turpentine, single bbls., gal. | 0 [illegible] |
| Linseed oil, raw, single bbls. | 1 55 |
| Linseed oil, boiled, single bbl. | 1 [illegible] |
| Paints, red, per lb. | 2 50 |
| Sandpaper, B. & A. | list plus 20 |
| Emery cloth | list plus 20 |
| Coal tar, gal. | 0 03½ |
| Asphalt, gal. | 0 05 |
| Asphalt, commercial, gal. | 0 04½ |
| Resin "D" per lb. | 0 03 |
| Rosin "G." per lb. | 0 03½ |
| Borax crystal and granular | 0 15 |
| Wood alcohol, per gallon | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

### ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 41 |
| Plumbers' oakum, per lb. | 0 09 |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila Rope | 0 33 |
| New Zealand Hemp | 0 33 |
| Transmission rope, Manila | 0 45 |
| Cotton Rope, ¼-in. and up | 0 47 |

### POLISHED DRILL ROD

Discount off list, Montreal and Toronto net

### CARBON DRILLS AND REAMERS

| | Per Cent. |
|---|---|
| S.S. drills, wire sizes up to 52 | 30 |
| S.S. drills, wire sizes, No. 53 to 80 | net |
| Standard drills to 1½ in. | 30 |
| Standard drills, over 1½ in. | 30 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 20 |
| Bit stock | 25 |
| Ratchet drills | 15 |
| S.S. drills for wood | 30 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 40 |
| Sleeves | 40 |
| Taper pin reamers | net |
| Drills and countersinks | list plus 30 |
| Bridge reamers | 52½ |
| Centre reamers | 10 |
| Chucking reamers | net |
| Hand reamers | 10 |

### COLD ROLLED SHAFTING

| | |
|---|---|
| At mill | list plus 40% |
| At warehouse | list plus 50% |

Discounts off new list. Warehouse price at Montreal and Toronto

### IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 25% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings: Class B black, 24½c lb.; Class C black, 15¾c lb.; galvanized, Class B, 34c lb.; Class C, 24½c lb. F.O.B. Toronto.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $9 50 | $ 8 25 |
| Sheets, black, No. 10 | 12 00 | 10 00 |
| Canada plates, dull, 52 sheets | 9 00 | 8 50 |
| Canada plates, all [illegible] | [illegible] | [illegible] |
| Apollo brand, 10¾ oz. galvanized | .... | .... |
| Queen's Head, B.W.G. | .... | .... |
| Fleur-de-Lis, 28 B.W.G. | .... | .... |
| Gorbal's Best, No. 28. | .... | .... |
| Colborne Crown, No. [illegible] | [illegible] | [illegible] |
| Premier, [illegible] | [illegible] | [illegible] |
| Viking, [illegible] | [illegible] | [illegible] |
| Zinc sheets | 20 00 | 20 00 |

### PROOF COIL CHAIN.

| B | |
|---|---|
| ¼ in. | $12 35 |
| 5-16 in. | 11 85 |
| ⅜ in. | 11 50 |
| 7-16 in. | 10 90 |
| ½ in. | 11 20 |
| 9-16 in. | 11 20 |
| ⅝ in. | 11 10 |
| ¾ in. | 11 00 |
| ⅞ in. | 10 90 |
| 1 inch | 10 65 |
| Extra for B.B. Chain | 1 20 |
| Extra for B.B.B. Chain | 1 80 |

[illegible] WELD COIL CHAIN [illegible]

| | |
|---|---|
| ¼ in. .. | [illegible] |
| 5/16 in. | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | 6 35 |

OILS AND GASES.

Per [illegible]

| | |
|---|---|
| Globe . | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
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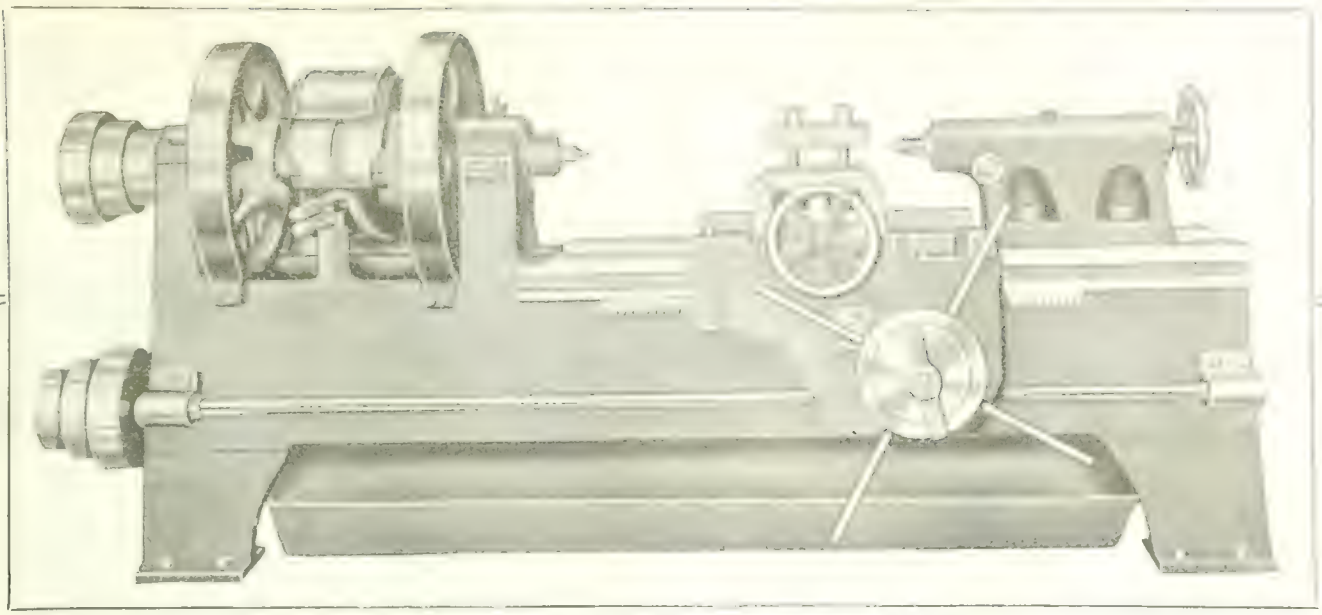
| [illegible]



## The "MONTREAL LATHE"

For Boring and Turning 6" Shells.

*EARLY DELIVERIES*

***Send us your enquiry—Now.***

## The A. R. Williams Machinery Co., Limited

**64-66 Front Street West, TORONTO**

# OTT UNIVERSAL GRINDER

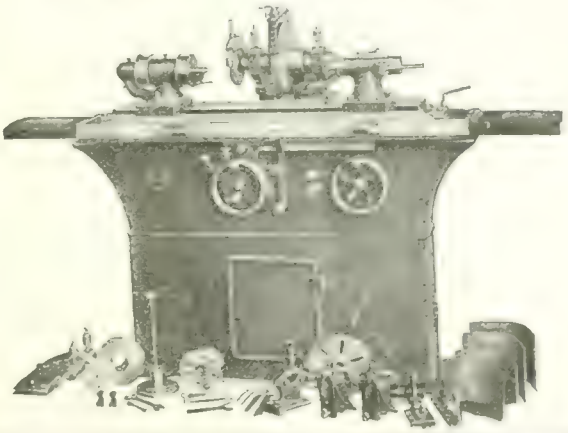
***Ideal for General Tool Work***

Use it for grinding straight and taper cylindrical parts, chuck and face plate work, etc. Fast, efficient, economical, sturdy. 9" x 26"—wheel 10" x 1".

## OTT GRINDER CO.

**INDIANAPOLIS**

Canadian Representatives
Geo. F. Foss Machinery & Supply Co., Montreal



# Special Purpose Tools

## For Shell Making

For nearly three years we have been making shells in our own factory. To turn these out economically we have designed many special purpose tools. We have found that these will do the work for which they were designed, as well as the more expensive general purpose tools, that they are easily operated by inexperienced workmen, and are not so apt to get out of order as the more complicated tools. We are now offering them for sale to other shell factories.

Boring Lathes
Base Boring Lathes
Waving Lathes
Band Turning Lathes
Hydraulic Band Presses
Shell Grinding Machines
Shell Cleaning Machines
Undercutting Machines
Finish Tapping Machines
Inside Profiling Machines
Nicking Machines
Centering Machines

We can supply any of the above complete, ready for use, at about half the cost of ordinary tools for the same purpose, or we can furnish you with a complete set of castings ready for you to machine and set up.

## MARSH & HENTHORN, Ltd.

**BELLEVILLE** **ONTARIO**

# INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

## ENGINEERING

**Redcliffe, Alta.**—The Alberta Rolling Mills are building an extension to their plant here.

**Hamilton, Ont.**—The Canada Steel Goods Co. will build a factory addition to cost $150,000.

**Tillsonburg Ont.**—The Maple Leaf Harvest Tool Co. contemplate building an extension to their factory.

**Vancouver, B.C.**—The Canadian Metal & Equipment Co. propose establishing a smelter at False Creek.

**Merritton, Ont.**—The Riordon Pulp & Paper Co. will instal power equipment at the mill here. Head office, Montreal.

**Nelson, B.C.**—The Waneta Power Co. is engaged in the development of a large water power on the Pend d'Oreille River, south of Nelson.

**Toronto, Ont.**—A building permit has been issued to Reid & Brown for the construction of a structural steel shop at 63 Eplanade ave. east, to cost $4,000.

**Welland, Ont.**—The Provincial Natural Gas Co. at the week-end struck a large gas well which will go a long way to relieve the gas shortage in Welland and other municipalities. This well is said to have a flow of two million. Gas was struck at a depth of 3,380 feet, so the well must be counted one of the deepest in this section.

**Gowganda, Ont.**—The South Bay Power Co. will install a 500 h.p. electric unit and proceed with the diversion of the East Montreal River. The company fully expects to carry out its original plan, that is, to install a 1,500 electric horse-power plant at Hangingstone Falls, Gowganda Lake, for the purpose of supplying electric power to the mines at Gowganda. First, to install a 500-horse-power unit, part of the electric energy from same to be used to drive a tunnel to divert the East branch of the Montreal River into Hangingstone Lake, which will give water enough to develop an additional 1,000 horse-power. The Reeves-Dobie Mining Co. is assisting in the financing of the company for the purpose of securing electric power to operate their mine.

**Sudbury, Ont.**—The proposal of the British-America Nickel Corporation to [illegible] power from a development plant on the French River has been definitely abandoned, owing to the prohibitive cost involved, according to a report current here. In consequence of this it is thought probable that the company will establish a refining plant [illegible] the war all kinds of material have ad-

that power could not be developed on the French River under $40 or $50 per horse-power. The Hydro Commission, therefore, advised against the French River proposal and advocated the establishment of a nickel refinery in the Ottawa Valley. In the meantime, the British-America Nickel Corporation will likely install a steam plant at the Murray Mine to supply some of the power needed.

## ELECTRICAL

**Windsor, Ont.**—It is likely that before long the Hydro Commission will purchase the Essex County Light and Power Co.'s plant and business. The plant is at present owned by the Detroit Edison Co. of which Alex Dow is president. This company supplies power to Windsor, Walkerville, Sandwich and Essex. Negotiations for the purchase have been proceeding for some months, but the deal has not been completed yet. The price will be likely around $200,000.

**Guelph, Ont.**—A movement is on foot in this city to develop the unused power on the Speed River in the neighborhood of the Ontario Military Hospital. Several farmers have become interested in the scheme, with the hope that they may be able to secure power for use on their farms. It is understood that R. H. Clemens, district representative, is taking up the matter with the Hydro-Electric Power Commission, and an engineer will make an inspection soon.

## GENERAL

**Halifax, N.S.**—Hillis & Sons, are considering rebuilding their factory.

**Oakville, Ont.**—The plant of the Ontario Brick Co. has been sold by the liquidators, Ward, Price Ltd. The purchaser was F. W. Palfield, of Montreal, who represents Eastern interests, and the price paid was $250,000.

## TENDERS

**Brantford, Ont.**—Tenders will be received until Thursday, Feb. 7th, 1918, for one 40 h.p. vertical induction motor, switchboard, and accessories, with installation at the Sewage Pumping Station, Brantford, Ont. Specifications may be obtained on application to the city engineer, T. Harry Jones.

**Ottawa, Ont.**—Tenders will be received until Feb. 5, 1918, for the elevators and hoist equipment required in the re-construction of the Parliament Buildings. All tenders to be based on the execution, erection and completion, together with the furnishing of all material, tools, appliances, labor, etc., as required and described by the plans and specifications for elevators and hoist equipment. The work of this contract shall be proceeded with immediately upon the signing of the same and continued as directed, in such a manner as to insure the completion thereof by Dec. 1, 1918. Plans and specifications, and any other information required can be obtained at the office of the General Contractor, P. Lyall & Sons Construction Co., Ottawa.

**Ottawa, Ont.**—Tenders will be received until Feb. 5, 1918, for rolled steel casements and bronze covered frames and sash for the Parliament Buildings. All tenders to be based on the execution, erection and completion; together with the furnishing of all material, tools, appliances, labor, etc., as required and described by the plans and specifications for (a) rolled steel casements; (b) bronze covered frames and sash. Separate tenders to be submitted for "a" and "b." The work included under this contract shall be commenced immediately on the signing of the same, or at such time as may be directed, and be carried out in such a manner as to insure the completion thereof by Sept. 30, 1918. Plans and specifications, and any other information required can be obtained at the office of the General Contractor, P. Lyall & Sons Construction Co., Ottawa.

## MUNICIPAL

**Mitchell, Ont.**—The Town Council are considering the advisability of installing a gasoline engine and pump.

**Newboro, Ont.**—A by-law has been passed giving the contract to J. P. Tett & Bros., for supplying electric light to the village. Power will come from Bedford Mills.

**Penticton, B.C.**—The City Council contemplate an expenditure of $20,000 for the construction of certain works in connection with the domestic water system and $35,000 for works in connection with the irrigation system.

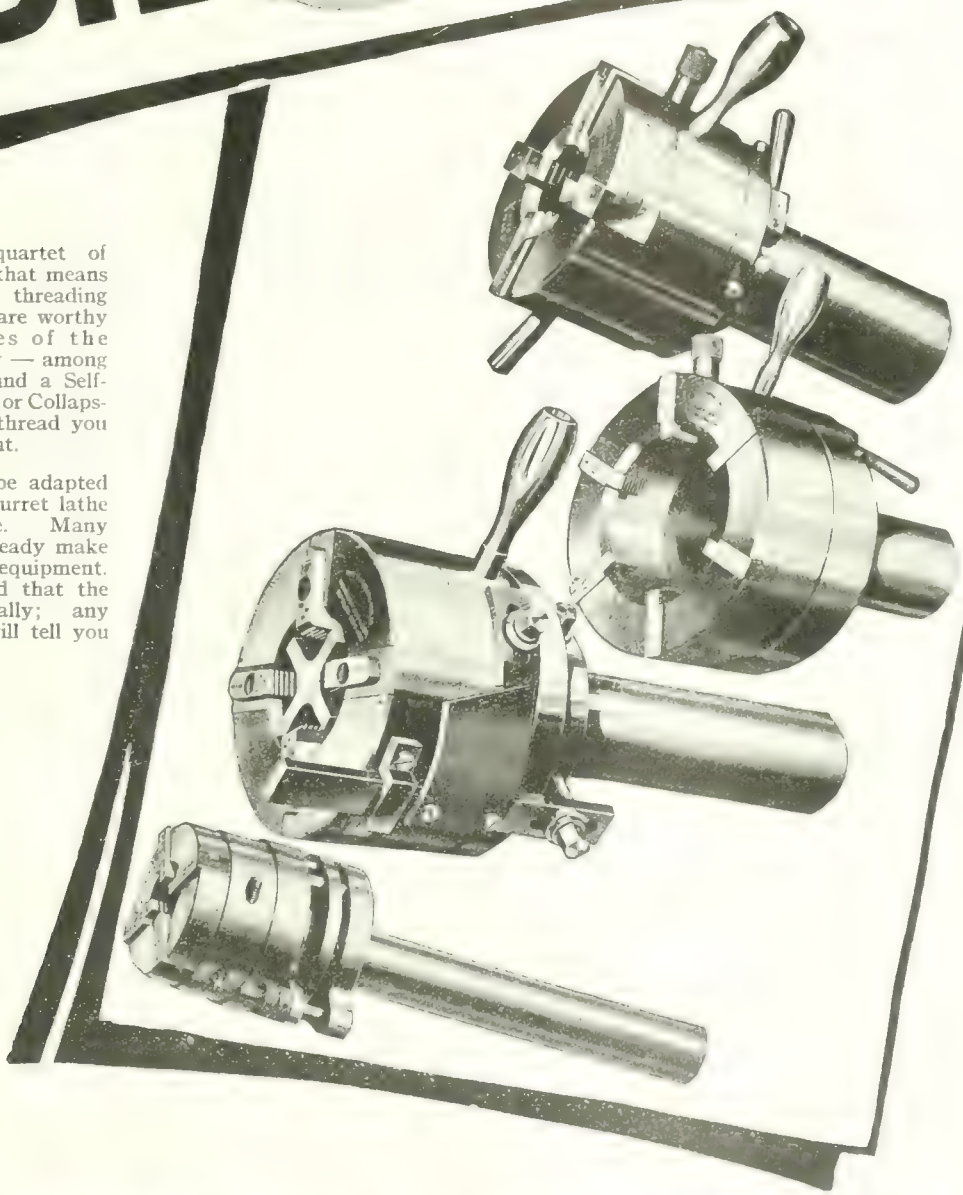
**Vancouver, B.C.**—The following by-laws have been defeated by the ratepayers. A grant of $120,000 to the Y.M.C.A. in order to assist in completion of building; $26,500 for constructing and equipping a high school; $53,500 for heating and ventilating and general school purposes and $66,000 for constructing and equipping additions to school buildings.

## PERSONAL

**James H. Munro**, founder of the Munro Wireworks, Winnipeg, died on Jan. 17, following an attack of apoplexy.

**Henry J. Fuller**, president of the Canadian Fairbanks-Morse Co., Montreal and Toronto, has been elected a director of the Liberty National Bank of New York City.

# GEOMETRIC DIE-HEADS



HERE'S a quartet of die heads that means death to threading trouble. They are worthy representatives of the Geometric family — among which can be found a Self-Opening Die Head or Collapsing Tap for any thread you could possibly want.

These tools can be adapted to any make of turret lathe or screw machine. Many manufacturers already make them standard equipment. We are convinced that the rest will, eventually; any Geometric user will tell you **why**.

## THE GEOMETRIC TOOL COMPANY

**NEW HAVEN** **CONNECTICUT**

**Canadian Agents: Williams & Wilson, Limited, Montreal; The A. R. Williams Machinery Co., Limited, Toronto, Winnipeg and St. John, N.B.**

Edward G. Mack, managing director of the Cosmos Hosiery Co. of Cowansville, Ltd., Toronto, has been elected to the executive council of the Toronto Board of Trade for the ensuing year.

Alderman W. S. Weldon of Montreal, has been appointed Collector of Customs of the Port of Montreal. He was at one time president of the Montreal Amateur Athletic Association.

Capt. James Lanaway, a former resident of Woodstock, Ont., died in Seattle on Jan. 27, aged 58. For many years prior to going west seven years ago he was a captain on the Great Lakes.

Flight Lieut. Ralph Gordon Hall, of the Royal Flying Corps, was accidentally killed while flying at Birmingham, England, on Jan. 22. His father is Thomas Hall, president of the Hall Engineering Works, Montreal.

W. F. Tye, of Montreal, president of the Sterling Coal Co., Toronto, and former chief engineer of the C.P.R., has been named a member of the Commission of conservation to succeed the late Sir Sanford Fleming.

Lloyd Harris, president of the Russell Motor Co., is being mentioned as likely to be appointed Canadian representative at Washington. Mr. Harris is already in the American capital as the agent of the Imperial Munitions Board.

**Sir John Wolfe, Barry,** widely known engineer, officer of numerous engineering and allied societies, member of the army railway council and consulting engineer to many railway and public works corporations, died in London on Jan. 22. He was born in 1836.

Lieut. S. S. Smith, formerly sales and credit manager for the Lake Winnipeg Shipping Co., Winnipeg, Man., who was reported missing early in June, is now officially presumed to have been killed in action. Lieut. Smith went overseas with a Winnipeg battalion in Oct., 1915.

F. C. Winterburn, chief engineer of the steamer Quadra, died at St. Paul's Hospital, Vancouver, B.C., on Jan. 12. He was 57 years of age and had done duty in England as inspector of munitions for over two years, having heard the call of his country in 1915 while working at the Yarrow yard at Esquimalt. He returned to British Columbia six months ago and shipped as chief of the Quadra on the ore trade between Britannia Beach and Tacoma.

Lieut. Harold H. Vroom has invented a gyroscope control for the Vroom hydroplane which has been accepted by the British Admiralty. Lieut. Harold H. Vroom is a son of Ald. E. G. Vroom, of [illegible], Montreal, and a native of St. Stephen, N.B. He was educated at [illegible], being graduated in 1910 with the degree of Bachelor of Science. In May 1916, he enlisted as [illegible] in the motor patrol service [illegible] in the work of [illegible] of 1917.

Albert George Hill, late manager of Babcock & Wilcox, Ltd., Toronto office, Imperial Munitions Board, with headquarters in Toronto. Mr. Hill will have charge of production of marine engines and boilers in the Toronto district. Mr. Hill was with Babcock & Wilcox, Ltd., in charge of the Toronto office for five years, having previously been with the Drummond, McCall & Co., Toronto office, in the engineering department. He was two years with this concern as sales engineer in Toronto district and Western Canada. Prior to coming to Canada Mr. Hill was for some years with Alley & MacLellan, Ltd., of Glasgow, in the marine and high-speed engine department, and previously with Deacon & Foster, consulting engineers, of Birmingham, England.

**Henry Hague Vaughan,** formerly of the C.P.R. and now vice-president and general manager of the Dominion Bridge Co., has been elected president of the Canadian Society of Civil Engineers now known as the Engineering Institute of Canada. Mr. Vaughan was born in England in 1868 and came to the United States in 1891. He became mechanical engineer of the P. & R. R. and later superintendent of motive power in the L.S. & M.S.R. Mr. Vaughan came to Canada in 1904 as superintendent of motive power of C.P.R. lines, east and in 1905 became assistant to the vice-president of the C.P.R. During this time he had charge of the Angus Shops, and the car and locomotive equipment service of the C.P.R. In 1916, Mr. Vaughan left the C.P.R. to become president of the Montreal Ammunition Co., and in 1916 he organized the Dominion Copper Products Co., of which he became president and general manager. These companies were later absorbed by the Dominion Bridge Co., whose staff Mr. Vaughan joined in 1916 as vice-president and general manager.

## TRADE GOSSIP

**Lindsay, Ont.**—The Town Council may decide to take over the Fitzsimmons auto body factory.

**The International Malleable Iron Co.,** of Guelph, Ont., has increased its capital stock from $250,000 to $500,000.

**The Elliott Co.,** manufacturers of power accessories, have disposed of their office building in Pittsburg, Pa., and have taken a spacious suite of offices in the Frick Building in that city.

**The Liberty Manufacturing Co.,** manufacturers of boiler tube cleaners, have removed their offices from Susquehanna street to the Frick Building, Pittsburg, Pa.

**Erratum.**—In the review of the Motor Marine and Aircraft Redbook in the Dec. 6 issue of CANADIAN MACHINERY, an error was made in the price of this publication which should have been 5/6 ($2.10) and not 5/6 ($1.40) as stated.

**U.S. Army Will Use Metric System.**—Adoption of the metric system of measurement for artillery and machine guns and maps for the American overseas forces was announced recently by the War Department at Washington.

**Airplane Engine a Success.**—The first of one thousand aeroplane engines being built in Toronto was satisfactorily tested recently. The engines are being constructed at the plant operated by the Imperial Munitions Board.

**Fort William, Ont.**—The Canadian Car and Foundry Co. plant is about completed. Early next month the work of making cars will be commenced, when 1,100 men will be employed, increasing to 1,500 and 1,700 as the capacity of output is reached.

**Canada and U.S. Pool Steel Supplies.** Arrangements are in progress between the Canadian and United States Governments for pooling supplies of steel for shipbuilding purposes in connection with the Canadian policy of shipbuilding under Government operation or control of shipyards.

**Toronto Board of Trade Council.**—The following were elected members of the Council at a meeting of the Toronto Board of Trade in Jan. 24. J. D. Allan, Hugh Blain, J. L. Campbell, Col. W. F. Cockshutt, M.P.; B. B. Cronyn, R. Eaton, Charles McD. Hay, Edward Hay, Arthur Hewitt, A. O. Hogg, John G. Kent, Edward G. Mack, J. F. Michie, A. R. Reid and H. G. Stanton.

**Ottawa, Ont.**—The City Council has made application to the Ontario Municipal Railway Board for a hearing in connection with a by-law to raise by way of debentures $250,000 for the purpose of establishing a municipal fuel depot. The Board instructed the applicant city to first pass the by-law as proposed, when a date for the desired hearing will be fixed.

**Cannot Build Ships for Neutrals.**—It has been decided, with a view to meeting special British requirements, that no further orders must be taken in Canada for new vessels other than of Canadian or British register; at present a number of new ships are being completed in Canada on Norwegian order. As soon as the ships under construction are completed other vessels will be laid down under the Government programme.

**Shawinigan Falls, Que.**—The Canadian Aloxite Co. are building a factory here for making aloxite and carborundum. The buildings cover a wide area and are of steel construction. The aloxite mixing building is 60 x 162 ft.; the carborundum building, 60 x 113 feet; the aloxite building, 59 x 162 feet, and the main building, comprising offices, machine shop, boiler room, etc., 64 x 160 feet. The Church, Ross Co., of Montreal, are the contractors.

**Oxygen to Run Power Engine.**—Production of motive power and light from the oxygen of the air at practically no cost except that of the original installation of the plant has been accomplished by Patrick K. Gallagher, of Nelson, B.C. For some years he has been working on his invention, and it has now reached the stage where he is developing an internal combustion engine, in

which oxygen will take the place of gasoline, gas or oil.

**International Engineering Works Control Changes.**—A majority of the stock of the International Engineering Works, Amherst, N.S., has passed into the hands of a syndicate composed of several leading Canadian business men and manufacturers. The company will be reorganized and placed on a more satisfactory financial basis. A circular recently issued states that the company sustained a loss with its munitions contracts during first nine months of 1917.

**Copper Price Extended.**—On Jan. 23 President Wilson approved the recommendation of the War Industries Board that the maximum price for copper fixed upon its recommendation by the President and announced September 21, 1917, be continued in effect upon the same conditions until June 1, 1918. The maximum price under this action will be 23½ cents per pound f.o.b. New York, subject to revision after June 1, 1918, upon these conditions.

**Special License Needed for Hardware Exports.**—The Deputy Minister of Trade and Commerce, Ottawa, has received the following cablegram from the Canadian High Commissioner in London:—"The Department of Import Restrictions advises the revocation of general licenses in respect to hardware, taking effect on February 1st. From that date the special licenses will be issued on a rational basis. Goods covered by general licenses will be admitted on proof of despatch to consignees on or before January 31st."

**No Rate Increase Till After March 1.**—The increased freight and passenger railway rates raised by the Dominion Railway Board in its judgment of December 26, 1917, will not become effective until some time in March. The increases, with the exception of the rates on wheat, deferred by a special judgment of the board until June 1, were to have become effective on February 1. The postponement of the date until some time in March is the result of the protests made to the Cabinet Council by the Western Provincial Governments and public bodies with whom were associated the organized farmers and some of the business interests of Ontario.

**Saskatoon, Sask.**—The contract has been let for the installation of the refrigeration machinery for the public co-operative cold storage system in Saskatoon being operated by the Saskatchewan Co-operative Creameries to the Canadian Ice Machine Co., of Toronto and Winnipeg. The total cost of the building and machinery will be about $125,000; of this amount the machinery alone will cost $60,000. The building has a total cold storage space of 206,000 cub feet. The machinery will comprise two 35-ton York compressors and condensers, electric motors, etc., equal to the cooling power of 70 tons of melted ice every 24 hours.

**U. S. Concerns Would Start Steel Plants in Canada.**—It is reported in Ottawa that the Dominion Government has received tentative offers from large American companies desiring to engage in the

Oil Tempered Steel Springs

—for every purpose and the best for each use.

Special styles of all kinds to order.

THE CLEVELAND WIRE SPRING COMPANY

Cleveland, Ohio U.S.A.

WIRE SPRINGS OF ALL KINDS

Machine Springs, Valve Springs, Automobile Cushion Springs etc., of a quality that defies competition. Tell us your requirements. Send sample or specification for price.

JAMES STEELE, LIMITED

GUELPH, ONTARIO

JOHN STIRK & SONS, Limited

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Agents—The A. R. Williams Mcy. Co., Ltd. Toronto, Winnipeg, Vancouver, St. John, N.B.

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Special Machinery

MADE TO ORDER

Mill Machinery, Engine Work

Grey Iron and Brass Castings

TRY US FOR GENERAL REPAIRS

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(Vulcan Iron Works) OTTAWA, ONT.

METAL STAMPINGS

We are manufacturers of stamped parts for other manufacturers.

We do any kind of sheet metal stamping that you require. Our improved presses and plating plant enable us to produce the finest quality of work in a surprisingly short time.

We can finish steel stamping in Nickel, Brass or Copper.

Send us a sample order.

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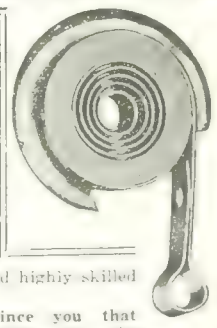

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manufacture of steel for Canadian ships. These companies, however, required encouragement in the way of bonuses and concessions before taking up the manufacture of steel products on a large scale in Canada. The Government, it is understood, has not yet decided to bonus corporations desiring to engage in the work. Companies may, it is stated, submit a proposition and prices to the Government which will consider them and accept or reject them as it sees fit.

**Government Railways Will Have More Cars.** The Canadian Government railways are in need of seven million dollars' worth of extra rolling stock in addition to four million dollars' worth of equipment already contracted for. Officials of the railways are now discussing with the government methods for obtaining them. Of the seven millions, three millions are to be used for the purchase of passenger cars, and the remainder for box cars and a number of locomotives. The new equipment will not only be used on the government lines but will also be utilized to assist other lines which are at present hard up for equipments.

**Financiers Preparing for Peace.**—A great deal of careful thought is being given in the Street to the probable trend of events for a period of say six to nine months after the declaration of peace, and the general tendency is to look for very drastic readjustment in industrial and labor conditions. Many industries which depend on the war for their impetus must fade away, and it is a question of what developments will arise to fill the vacancy. Canada is in a hopeful position, having many of the raw materials which will be needed in the work of restoration, and it is one of our problems to rise to the occasion in that connection.

**Must Restrict Consumption of Gas in Ontario.**—The task of relieving the fuel crisis in Western Ontario caused by the inadequate supply of natural gas has been put up to T. A. Magrath, Dominion Fuel Controller. The Ontario Railway and Municipal Board, which conducted as extensive investigation a week ago into the situation in Sarnia, Windsor, Chatham and several of the border towns, has arrived at the conclusion that the situation can only be met by restricting the consumption of gas in radical fashion—by giving domestic consumers first call upon the supply. But the board, while convinced that domestic users should be supplied first, has found that it has not the power to interfere with contractual rights.

**Spruce Output for Airplanes to be Rushed.**—As far as governmental action is concerned, the Province of British Columbia has now gone the limit in the matter of speeding up to large proportions the supply of spruce necessary to the manufacture of airplanes for the Allied cause. An order-in-council passed by the provincial executive effectively links up the activities of the Imperial Munitions Board in this connection with an active and immediate co-operative policy advocated by the Brewster Government. The order grants powers to the government to arrange with the Imperial Munitions Board for the immediate logging of airplane spruce upon all vacant areas of crown land and calls upon such holders to proceed with the necessary operations forthwith.

**Niagara Falls, Ont.**—Ice is causing considerable trouble in the power companies' plants here which has created a shortage of power for the Hydro-Electric Commission. The Hydro secures its power from the Ontario Power Co., the Canadian Niagara Co. and the Electrical Development Co. All these companies have had trouble with ice. One day recently there was a shortage of from five to ten per cent on the power from the Ontario Power Co. As the total capacity of the machines of this company is 160,000 horse-power this meant a shortage of from 8,000 to 16,000 horse-power. The amount of power that was available fluctuated throughout the day and at intervals of ten minutes there was only 50,000 horse-power available.

**Canada Foundries & Forgings Have Good Year.**—At a meeting of directors of the Canada Foundries & Forgings Co., a concern having plants at Brockville and Welland, preliminary figures for the business of the year 1917 were submitted, and contained the evidence that the business of 1917 had considerably exceeded in volume that of 1916, while the profits for the year were fully equal to those of 1916. This was considered very satisfactory in view of the experience of many Canadian companies during the past year. The report respecting the Delaney plant at Buffalo fully justified the expectation of the directors and the plans they had in taking over the plant. The company has sufficient business booked to keep it busily occupied for the remainder of the year. The usual dividends were declared.

**May Construct Large Ships Only.**—It was stated at the Marine Department Ottawa on Monday that the Government is not contemplating the construction of vessels of 2,800 tons. It is hoped to start building ships before June 1, and the tonnage will likely be 5,000 and 8,200. Although arrangements for steel plates and other parts necessary in the construction of the ships have not yet been definitely settled, it is believed that these will be supplied through the British Purchasing Commission. It is understood that the Marine Department officials who visited Washington recently made an arrangement with the Commission to this effect. The ships will be owned by the Government, but their method of operation, the Marine Department states, has not yet been decided on.

**Could Produce Much More Coal.**—That the 10,000 miners of Nova Scotia could produce from 1,500 to 2,000 tons of coal more per day if "mechanical haulage" or more horses were used at the mines

to remove the "mine boxes," was the statement of S. Barrett, President of the Amalgamated Mine Workers of Nova Scotia, who arrived in Ottawa on Monday to attend the joint conference of Canada's Labor delegates with heads of the Government. Mr. Barrett explained that he had come to Ottawa at the invitation of the Government to talk over increased coal production. He stated that it was his intention to bring to the knowledge of the Government the mode of mining coal, and he would suggest that more up-to-date methods be employed than having the men push out the mine trucks.

**War Tyee Launched at Victoria.**—The wooden steamer War Tyee was successfully launched at the Cameron-Genoa Mills Shipbuilders, Ltd., Victoria, B.C., yards on Jan. 24. This vessel is the third of the boats building on the coast for the Imperial Munitions Board. She was christened by Mrs. Butchart, wife of R. P. Butchart, representative of the Imperial Munitions Board. The War Tyee is the same size as the War Songhee and War Nootka, being a standard type chosen by the board. The War Tyee is 250 feet long, 43 feet 6 inches beam, and 25 feet deep, with a deadweight capacity of 2,800 tons on a 21 feet draught. The machinery will be installed at the Ogden Point assembling plant. She will be equipped with triple expansion engines of 950 horse-power. The official trials of the War Tyee will probably be run about the middle of March.

**New Commissioners on Imperial Trade.**—A despatch from London, England, states that the changes recently announced among the trade commissioners result from the Dominion Royal Commission, one of the recommendations of that body being an increase in the number of representatives, and Canada being allotted four senior members. Newfoundland will also be covered under the new scheme and other appointments are expected shortly. Hamilton Wickes, who will remain at London Headquarters, spent five years in Montreal as senior commissioner. One important feature of the new arrangment is to keep on the London staff several commissioners with practical experience with trade conditions in the Empire. Provision is made for a division of the functions of the board into two main departments with several sub-departments, but the agitation for an Imperial Minister of Commerce is without prospect of success.

**Canadian General Electric Co.**—The fiscal year of the Canadian General Electric Co. was brought to a close with the end of December. Col. Frederic Nicholls, the president, states that the volume of business transacted during the 12 months in question compares favorably with the previous year. "While under present unsettled conditions it is difficul to look very far ahead," he adds, "the outlook is encouraging. The principal improvement effected by the company in 1917 was the fitting up of its Bridgeburg works at the Niagara River as a shipyard, which is now in operation for the purpose of constructing four


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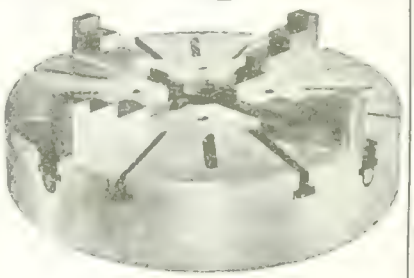
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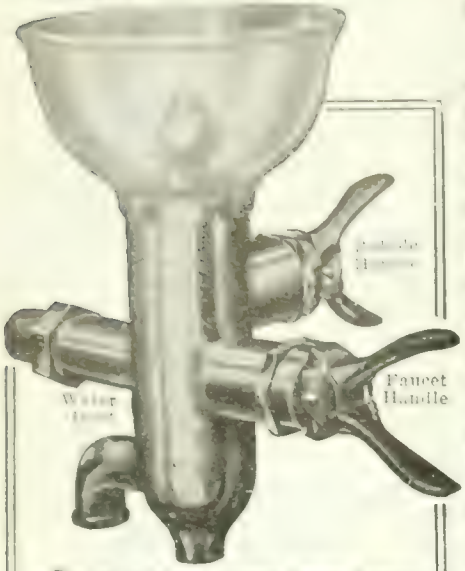


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Steel Plant for Vancouver.—The Hon. ... Minister of Mines for B... Columbia, states that Vancouver ... the importance of a ... metallurgical centre and ... try. It is reported that the B.C. Provincial Government has been engaged in ... with eastern capitalists and ... local smelter owners. The negotiations have not reached a point where the government has agreed to join with the Pacific Steel Co. of Thorne, the Acton Iron and Steel Co. of Port Moody, in which companies the Tudhope interests of Orillia, Ont., and R. F. Turnbull, a well-known electrical metallurgist of Welland, Ont., are identified, together with other interested parties, in inviting an eminent outside metallurgist to visit Vancouver and make a final report on the proposal to establish a steel plant here. It is understood if the final report proves satisfactory the government will extend the company its aid and influence."

**Norwegians Would Build at the Coast.**—Developments in shipbuilding at the Coast may be looked for if negotiations now on with the Dominion Government come to anything. A delegation representing Norwegian interests has been conferring with the B. C. Manufacturers' Association and has expressed its willingness to go into shipbuilding at Vancouver providing the Dominion Government will give the necessary permission. One of the principals is a relative of Norway's finance minister and there is no doubt as to the capital. The trouble is that permission is refused to build vessels for neutral countries, but urgent pleas have been made to the government to raise this embargo on the ground that there are no further orders in sight after the fleet of twenty-seven wooden steamers for the Munitions Board is completed. If the necessary license is given the Norwegians will go ahead and establish a yard for the construction of steamers, and telegrams are now passing between Vancouver and Ottawa on this point.

## MARINE

**Equimalt, B.C.**—The British Columbia Salvage Co's. steamer Salvor has been docked at Yarrow's yard for a general overhaul.

**Vancouver, B.C.**—The Union Co.'s steamer Coquitlam has been hauled out at the B.C. Marine Co's. plant for annual inspection and overhaul.

Victoria, B.C.—The ... has left her moorings at the Foundation Co's. wharves at Point Hope and has gone to Ogden Point to have the boilers and engines, etc., installed.

**Vancouver, B.C.**—The executors of the ... Hendry estate have sold a site on ... Creek to John Coughlan & Sons, which will give the shipbuilders an additional 400 feet of frontage which they urgently need for the expansion of their business.

Victoria, B.C.—The auxiliary schooner Jean Steadman, eleventh of the fleet built for the Canada West Coast Navigation Co., is fitting out at Victoria and will run her trials some time this week. She is to load lumber for Australia at the Fraser River Mills and will do her trials while bound up from Victoria to the river. Captain Manning will be the master.

**Pictou, N.S.**—The Gaspesien has been towed into Pictou harbor and will remain here for the rest of the winter. The Gaspesien when bound from Montreal to New York was caught in the ... in No thumbe... and ... helpless for two weeks. Later she drifted down between Belle River and Point Prim being eventually released by the ice breaker Prince Edward Island.

## INCORPORATIONS

**Gas Processes Ltd.,** has been incorporated at Ottawa with a capital of $50,000 by W. A. J. Case, J. B. Taylor and G. E. Atwood, all of Toronto, to carry on the business of electrical, mechanical and gas engineers at Toronto.

## BOOK REVIEWS

**Heaton's Annual, 1918,** published by Heaton's Agency, Toronto, price $1.25. The fourteenth edition of this valuable reference work is just out, and as in the case of previous issues, contains a great deal of useful information for business men and also for the public generally. All the matter in last year's edition has been retained, including the Customs Tariff, Boards of Trade Register, Summary of Resources of all the provinces, and other interesting information. Of the new features we notice particularly the complete list of titled and decorated Canadians which the war has swelled to several pages, and under the heading of "Commerce" an interesting compilation of the pre-war imports from enemy countries into Canada, which will be a useful guide to firms considering the establishment of a new industry in the Dominion. At the end of the book a new section under the heading of "Colonization" gives some very interesting and valuable information, which has never before been collected, giving for each province land available for farming, fruit farming, cattle and sheep ranching, etc., crown land regulations, financial assistance of farmers by Provincial and Dominion Governments, special provisions for returned soldiers, etc. The widespread reputation of Heaton's Annual in Canada, Great Britain and the United States is due to the judgment which has been used in the selection of its contents by the editor. It is not a luxury, but a necessity, and no well-equipped office can afford to be without it. From cover to cover in its 450 pages there is nothing that the critic would eliminate.

# CANADIAN MACHINERY

## AND MANUFACTURING NEWS

*A weekly newspaper devoted to the machinery and manufacturing interests.*

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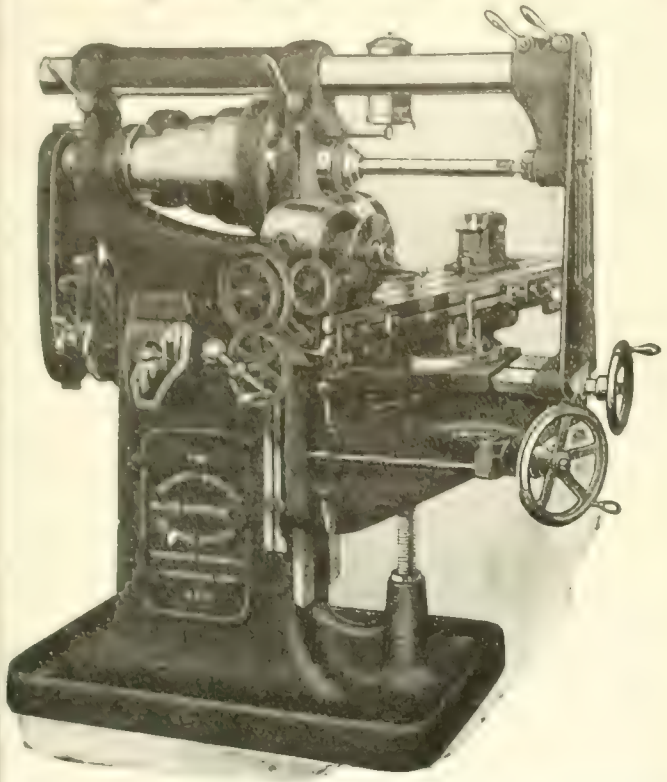

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# Canada's Place in the Markets of the World

By R. J. Younge*

*In the course of the following address [illegible] Canadian Manufacturers' Association, Maritime Provinces Branch, the speaker put three important questions to his audience, and the manner in which the answers were expounded possess [illegible] reading interest for all who have Canada [illegible] respective [illegible]*

THERE has been one predominant note throughout this convention. All the addresses have laid stress on the one fact—that no matter what other duties we have, the first and paramount duty of every Canadian is to do what he can to win the war. Nothing that I will say would detract from this principle that is being laid down so forcibly all over the Dominion. But I would like to say that, while we bend every ounce of energy we have towards winning the war, we should not neglect the next most important thing—the conditions after the war.

This is the special duty of Canada's business men who are not in the trenches. Everyone in Canada has some duty to perform which is connected in some important way with the great war, but let me impress upon you the fact that, if for some reason or other we are not in the trenches, it becomes our particular duty to support those who are and to prepare for the conditions which will follow when the men who are fighting return home. In pointing out this and in putting these future conditions plainly before you, I am not asking of you anything that the business men in Great Britain are not asked to do, I am not asking you to take up anything that the business men of France are not asked to do, I am not asking you to take up anything that the business men in the United States are not asked to do; and I leave it to yourselves whether the business men of Germany are not at this very moment thinking and planning for after-the-war trade. In short, the business men at home in all the belligerent countries are preparing for the future.

### When Munition Orders Cease

Let me ask you three important questions—first of all in connection with the change that must come when our munition orders are finished. We have to-day in Canada one thousand factories making shells and various kinds of requirements for the war. Employed in those factories there are half a million workmen. I ask you gentlemen, and you are all business men, what is going to happen to these factories when these munition orders are cut off, as they will be some day—soon, we hope; perhaps over night.

The second question is, how are we going to take care of our returned soldiers? We will have perhaps three or four hundred thousand soldiers coming back from the front, and all the manhood there is in us tells us that our first duty as Canadians is to see that employment is offered to these men. If we do not plan some scheme now, if we allow these intervening months to pass while they are away carrying the burden in the trenches, without preparing and organizing to insure them not only welcome when they come back, but a good job which will bring them proper remuneration, we shall have failed to do our duty.

But even supposing that we have orders to fill these factories, even supposing that we have plenty of work for all our soldiers who will come home—then let me ask you how are we as a nation going to meet our national obligations after the war, unless we build up a balance of trade by greater production and wider markets? We do not realize what our national debt is going to be when the war is over. The seven and one-half million of people in Canada can only avoid staggering under that debt if, as a nation, we are able to sell more than we buy—that is the only solution for meeting our national obligation.

### The Other Side of the Picture

All that I have said to you may appear more or less pessimistic. I do not intend that it should be so, but when we think seriously of these problems which are confronting us, we must face cold, hard facts. There is another side, however, to this picture. If these conditions which we must face as business men do appear to be almost insurmountable, there is a brighter side in the magnificent prospect which we have to establish ourselves as a much greater factor in the world's markets than we have been in the past. Speaking with a few hundred manufacturers as I have in the past two years, I have been told by many that we cannot compete with the world, that our export experience before the war has taught us that money can be lost in export trade as well as made, and that when compared with the much lower-priced labor in Great Britain and much more highly specialized industries in the United States, Canada is operating under enormous disadvantages. Now, gentlemen, if I can leave with you only one idea, let it be on this very point. The President of the National Association of Manufacturers, speaking more than a year ago, said that in the enormous changes that were taking place in the world's trade, the manufacturer in the United States would reap his full harvest from those changes only if he learned now to understand that

### "Old Things Have Passed Away

and all things have become new." If that is true for the highly specialized and highly capitalized manufacturer of the United States, then I say that it is even more true for the small and sometimes struggling manufacturer in the Dominion of Canada. Gentlemen, the sooner that we learn that the conditions which prevailed before the war are not the conditions that will prevail after the war—are not the conditions that will dominate the future—just so soon will we commence to appreciate our wonderful new opportunities.

When I say old things have passed away and all things have become new, I am not telling you any fancy fiction. You all know that the old channels of trade have been buried in the past, old scales of wages have passed away, the old surplus of labor has gone, old shipping conditions have passed away, old easy-going systems of taxation are gone—for your lifetime and mine, at least—old antiquated methods, party distinctions and political ideas have passed away, and all is new—new channels of trade, new sources of supply, new markets, new scales of wages, new shipping conditions new standards of efficiency, new political ideas, making the narrow, sordid aims of party subservient to the welfare of the nation.

These changes are much more significant than they appear to us now. The Britain of to-day is not the same old Britain of before the war. The France of to-day is a new France. The Russia that calls for deliverance and is to-day bursting the chains that have bound her for centuries is a new Russia. The Germany that, with bowed head and broken heart, will sign the greatest peace treaty which was ever signed, will be a new Germany—and who will say that Canada, with the losses that she has sustained, the sacrifices she has made, and the everlasting glory which has been won for her by her sons in battle, who will say that she will not emerge from this terrible trial a new and greater Canada?

### International Preferences

There are those who believe that after the war we will have international preferential tariffs which would be of the greatest assistance to manufacturers of this country. They predict that after the war we will have first of all an inner circle for the members of the family of the Empire, a British preference operating throughout all British Dominions; a second circle just outside of that for allied countries; a third circle outside of that for neutral countries, and a fourth and almost prohibitive circle for the productions of enemy countries. For the reconstruction of our trade and our fin-

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ances, what a splendid assistance this would be! and I fully believe that preferences of some kind will come, if they do, we must be ready to reap the full advantage of them.

But supposing we get no tariff preference, are we to sit down and say, just because we are not going to get a preference, we are not going to organize our natural resources and our industrial strength, to show the world what we are and what we have? After all, and I have spent a great deal of time studying this very question, I believe that what we need most is a new confidence in ourselves, and a willingness and determination of the Canadian business men to say that they want world business and that they are going to get it.

It has been surprising to see the part that Canada has played industrially in the war—in fact, it has been one of the great surprises in the war. Many of us do not realize that every plant that has been making shells in this country has undergone an experience in the widespread knowledge of new processes, in accuracy, in precision in the study and use of metals, and, above all else, actual efficiency from the management down to the meanest workman. It is a proud thing for us to know, gentlemen, that the efficiency engineers who have visited our country and inspected the munition plants of Great Britain, have said that the Canadian plants are fully the equal of the plants across the sea, not only in the actual results, but in the efficiency with which these plants are managed. Our industrial progress since the beginning of the war has been so marked that it would have been impossible for the universities and technical schools of Canada to impart, in the course of many years, such a wealth of knowledge and experience as has been crowded into as many months.

### National Action

But all this progress will be in vain unless we can gather it up and nationalize it. Here we must take a lesson from the industrial success of Germany. Germany learned to do things nationally. Every source of production throughout the empire co-operated and took its place in the great plan which was to place her at the head of the world. Her farmers and her manufacturers, her banks, her railways, her steamship lines, and, behind them all, her government, working together to the one great end, which, had it not been inspired by Prussion militarism, would have made Germany a model for national and commercial progress. Canada must learn to act nationally, and her business men must show the way.

The share of the world's trade which will come to us depends altogether upon how we organize to get it. What is Canada doing to prepare herself for world trade? What are our manufacturers, and our banks and our Government doing to get ready for Canada's century? How much attention are you giving to this big question in your own business? Let me say to you now that unless we use these intervening months till the war is over organizing and consolidating our position, the coming of peace will find us absolutely unprepared.

We must organize at home and abroad.

We must demand national technical education.

We must increase the efficiency and perhaps the capacity of our plants. We must tell the world that we can produce, and we must seek out reliable agencies and channels of trade in every friendly foreign market to sell Canadian goods.

I am not one of those who believe that after the war we will see a great and universal trade depression. I believe that if you will analyze the manufacturing strength of the allied countries you will see to what extent after the war the allied countries must lean on Great Britain. Take staple commodities of life; with the exception of the United States, she is the only one of the allies capable of producing the manufactured products demanded by the buying nations of the world. It seems to me that after the war, when the world's stocks must be built up again—they are practically depleted now in most lines; when reconstruction must commence in Belgium, France, Serbia, Poland and Roumania—when that time comes Great Britain will only be able to fill a fraction of her orders. Demands will be made upon her by every allied country, and her own country is thirsty for goods of many varieties; but where must the surplus goods—the orders that Great Britain cannot fill—come from? There is only one outlet for those orders, and that is the North American Continent—the surplus orders must be filled in the United States and Canada, and just in proportion as we can organize now to get them ready, just in that proportion will Canada reap her share.

### War Orders vs. Export Orders

War orders are very different from export orders. War orders have been thrust upon us, and we have been commanded to use every ounce of energy that we have to increase our production and give the armies at the front all they need. But you will not have export orders thrust upon you; they will not fall from the skies—you will dig for them, and so I say again the whole key to the situation lies in organization, and, if we do not organize, we will surely fail.

In the United States over a year ago this whole question was up for discussion; they wanted an association to lay down broad lines for export business out of the United States and to provide a practical channel for carrying out an export programme. A number of the leading bankers and business men of the Eastern States came together and organized the American International Corporations, with a subscribed capital of fifty million dollars, of which one-half was paid up. Can you imagine what a tower of strength to the United States export trade this Association is? When they required ships to take their goods to South America, and were handicapped by the high rates of shipping, the Association bought four ships and paid four millions of dollars for them. The first annual statement shows a profit of nearly twenty per cent. on paid up capital in the first year of operation.

What are the manufacturers of Canada doing in a similar direction? Two years ago an appeal was made to them to subscribe one hundred thousand dollars to establish a National Export Association. Two years have passed and only about sixty thousand dollars have been subscribed. The business of the Association is now growing so fast that we require new members and additional capital. What we need most is increased effort and support from our manufacturers themselves, and unless that effort and support is forthcoming before the war is over, the manufacturers of Canada cannot hope to reap from the new trade conditions what they are really entitled to, and what it is possible for them to get.

### An Appeal for United Action

Gentlemen, the outline I have given to you of the world situation at the present time, and what it is possible for us to do, is not complete without the appeal that I wish to make to you for this young Association. We have had so many things to encourage us in that Association that it would be a pleasure if I could tell you of the opportunities that are not only opportunities to-day, but the foundations we are laying now in Australia, New Zealand, South Africa and England; and we hope later on to plant seeds for Canadian products in France, Belgium, Italy, and last, and perhaps greatest of all, in Russia. We can only do this through united action, so that it comes back after all to the question whether the Canadian manufacturer has got faith in himself, and whether he is willing to join his fellow manufacturers in this great national movement.

I thank you most sincerely for the patience with which you have listened to me. I trust you will not dismiss this subject until you have definitely decided that the opportunities are too great to be disregarded, the duty too clear and too insistent to be thrown aside, and finally that your hearty co-operation will be given in solving this problem which we must admit is of the greatest importance to Canada next to the winning of the war.

## FUELS OF CANADA

B. F. HAANEL, chief of the division of fuels and testing of the Dominion Department of Mines read a paper on "The Fuels of Canada" before the Canadian Society of Engineers, at Montreal on Jan. 22. Mr. Haanel prefaced his remarks by saying that Canadians were realizing that Canada was dependent on the American coal supply and was at the mercy of foreign strikes or industrial disorganization. Canada's supply of fuel might, therefore, be cut off at any moment. He continued:

"But there is even a more important factor which we must consider, namely, the necessity which may occur for the United States to keep her fuel within her own country. Such a situation may not arise for some time, but the indications are that we may have to meet such an emergency in the near future."

"Canada, to-day, is facing a fuel situation of great gravity, a situation which was not created by any special conditions in this country, but by those obtaining in the neighboring country. The United States is suffering from a shortage of fuels as a result of the withdrawal of skilled labor from the coal mines to other occupations, and, perhaps more directly, owing to the abnormal demand on the transportation facilities of that country for the carrying of material directly connected with the conduct of the war.

"We are not wholly dependent on the United States for our fuel supply, but we are dependent to the extent of 55 per cent. of our total coal requirements and 98½ per cent of our crude and refined oil products. Large and important sections of Canada, moreover, are almost wholly dependent on imported coal for house-heating purposes. This is a matter for grave reflections, since in a country such as ours, where artificial heat must be supplied during eight months of the year for the sole purpose of maintaining life, a continuous and dependable supply of fuel is absolutely essential.

"The present unsatisfactory—indeed alarming—situation can be improved only by a determined and energetic exploitation and utilization of our own vast fuel resources.

### Canada's Needs

"The total fuel requirements of this country during the year 1916 amounted to nearly 30,000,000 tons of coal; 299,426,121 imperial gallons of crude and refined oil products, and firewood valued approximately at $60,000,000.

"Compared with her annual requirements, Canada's production of fuels for the same period amounted to 14,483,395 tons of bituminous coal, of which 2,135,359 tons were exported; 6,934,288 imperial gallons of crude oil and wood fuel to the value of $60,000,000. To meet our own needs, therefore, it was necessary to import 17,580,603 tons of coal, and 292,426,131 imperial gallons of crude and refined oil products.

"Of this quantity of oil, approximately 50,000,000 gallons were used on the railroads; 30,000,000 gallons for steamships, and the remainder 210,000,000 gallons, was used for lighting and heating, in the form of kerosene and, to a large extent, in the form of gasoline, for power purposes."

### Canadian Fuel

The principal fuel resources of Canada, Mr. Haanel said, were bituminous and anthracite coal, lignites and peat. The coals were in the extreme east and west, the lignites were in Alberta and Saskatchewan, and within the limits of these deposits were 12,000 square miles of peat bogs.

Bituminous coal as such was of use only in industries, but an excellent substitute for anthracite, for domestic use could be produced from bituminous coal by a process of carbonization at low temperature and briquetting, which was in actual operation to-day. Lignite and peat required preliminary treatment before becoming available for general fuel purposes. If this treatment was given them the fuel situation would be greatly improved.

Mr. Haanel was of opinion that, at comparatively small outlay of money it would be possible to establish a commercial plant to demonstrate that the lignites could be converted into a fuel entirely satisfactory for domestic and industrial purposes.

As for peat resources, the speaker said that an economic process for the manufacture of raw peat into an excellent fuel for domestic and to some extent industrial purposes was in use to-day, and had been employed for many years in European countries, notably Russia.

"Not until the utilization of a natural substance is forced by absolute necessity," he said, "will the most sincere and earnest efforts be put forth to successfully and economically convert it into a usable product. It appears to me that the time is at hand when necessity will decide that we Canadians utilize our peat resources, and in the most efficient manner. . . . We not only have the process for manufacturing peat fuel, but also sufficient detailed information concerning peat bogs of immediate importance to make a good start in the formation of a peat industry. . . . Seven bogs, conveniently situated with respect to Toronto, could supply that city with 26,500,000 tons of fuel, and seven bogs, within easy reach of Montreal, could supply 23,500,000 tons.

### Must Exploit

"The fuel situation in Canada, as I view it, is not a gloomy or a discouraging one, for we are endowed with fuel deposits on a magnificent scale. All that is necessary now is that proper exploitation and economic use be assured."

## ST. JOHN AS A WORLD PORT

THE strategic value of the port of St. John as a factor in the winning of the war and in the national progress and development which is to follow the close of the struggle is a matter that should receive the careful attention of all who have any interest in the port, locally or nationally.

It did not need the war to emphasize the importance of St. John as a national port, or its value as a port of interchange for ocean and inland traffic. This was demonstrated long before the war broke out, the total volume of port trade having increased from $14,000,000 in 1900 to slightly over $30,000,000 in 1914.

### Record Annual Trade

Since the opening of the war the trade of the port has leaped to over $206,000,000 in one year, a record of progress surpassed by only one other port in Canada.

This was largely due to the fact that the Imperial authorities were quick to recognize its strategic value.

Though the record of Imperial shipments on war account through the port has not been given to the public in detail, the official records show that from December, 1915, to September, 1917, 1,232,687 tons of Imperial supplies were shipped through this port and 687,147 tons through its sister port of Halifax. For the corresponding period 1914-16 the totals were 538,937 tons for St. John, and 356,198 tons for Halifax, the increases at the two ports being 693,750 tons for St. John and 330,949 tons for Halifax. These figures are exclusive of the commercial exports of the ports mentioned.

A presentation of these figures must impress upon the public the vast potentialities of St. John as a factor in the war struggle and the great importance of maintaining it in the highest degree of efficiency.

### Value of Location

Men and munitions and food supplies are very necessary factors in the prosecution of war, but in the world struggle of to-day strategic ports through which troops and supplies may be forwarded with the least possible delay and with the minimum of danger are quite as important an essential.

Hitherto St. John has been chiefly used as a port of shipment for men and supplies from Canada, but with a growing scarcity of available tonnage and the necessity of saving every moment of time on the ocean voyage the nearness of this port to Great Britain and France suggests the possibility of it being used for the embarkation of U.S. supplies, provided the equipment of connecting railways would permit of this arrangement.

A glance at the table of ocean distances emphasizes the strategic position of St. John as an ocean port.

### Ocean Distances

| | To Liverpool miles | To Havre miles |
|---|---|---|
| St. John | 2,692 | 2,813 |
| Portland, Me. | 2,776 | 2,871 |
| Boston | 2,854 | 2,949 |
| New York | 3,043 | 3,131 |
| Philadelphia | 3,172 | 3,267 |
| Baltimore | 3,328 | 3,423 |
| Charleston | 3,518 | 3,631 |

This means that with shorter ocean voyages more men and more supplies could be shipped overseas through St. John than through any of the Atlantic ports of the United States, thus reducing the number of ships that would be required, limiting the ocean perils to a minimum, and hastening the winning of the war.

In this view the "Board of Trade Journal" is supported by such an excellent authority as Premier Lloyd George, of Great Britain, who declared in a recent address: "We must use our shipping to ply between ports between which the voyage will not occupy a long time."

# American Engine Builders Restore Damaged Ships

Special Correspondence *

*Sinister meaning is indeed a mild term to use in describing the malicious damage done by their crews to German ships in American harbors when it was seen that war was becoming inevitable. All the resources of the world were utilized on a wholesale scale, and the skill, ingenuity and efficiency exhibited by U. S. engineers are a matter for congratulation and mutual satisfaction amongst the Allied nations at this time.*

All the German and 11 [illegible] ships by their crews, prior to their seizure by the United States Government when war was declared, have been recovered and these ships are to lay [illegible] tonnage to the transport cargo fleets in war service for the United States.

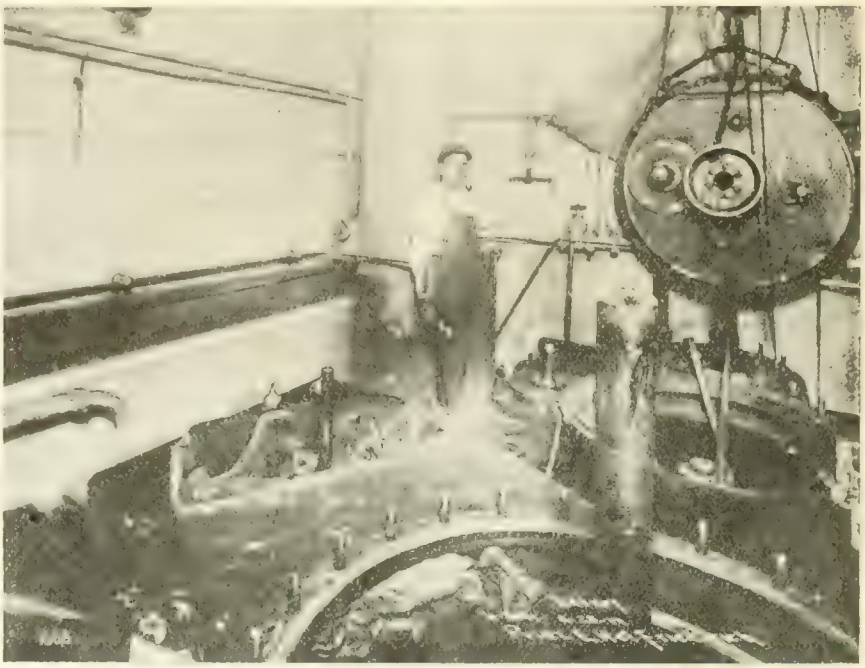
[illegible] central authority gave an order for destruction on these ships, effective on or about February 1, 1917, simultaneous with the date set for unrestricted submarine warfare and that the purpose was to inflict such vital damage to the machinery of all German ships in our ports that none could be operated for from 18 months to 2 years.

### German Purpose Signally Defeated

This purpose has been defeated in signal fashion. In less than eight months all the ships were in service.

The destructive campaign of the German crews cunningly comprehended a [illegible] parts they believed would necessitate the shipping of new machinery to substitute for that which was ruthlessly battered down or painstakingly damaged by drilling or dismantlement. There is documentary proof that the enemy believed the damage irreparable.

To obtain new machinery would have entailed a prolonged process of design, manufacture, and installation. Urged by the necessity of conserving time the engineers of the Navy Department succeeded, by unique means, in patching and welding the broken parts and replacing all of the standard parts which the Germans detached from their engines and destroyed or threw overboard.



BROKEN VALVE CHEST AND SCORED PISTON ROD OF THE OSTWEGO, FORMERLY THE PRINZ EITEL FRIEDRICH.

Copyright by Committee on Public Information

* [illegible] Committee on Public Information, Washington, D.C.

[illegible] THE KAISER WILHELM DER GROSSE WAS CRACKED [illegible]

### Scheme of Ruin Shrewdly Devised

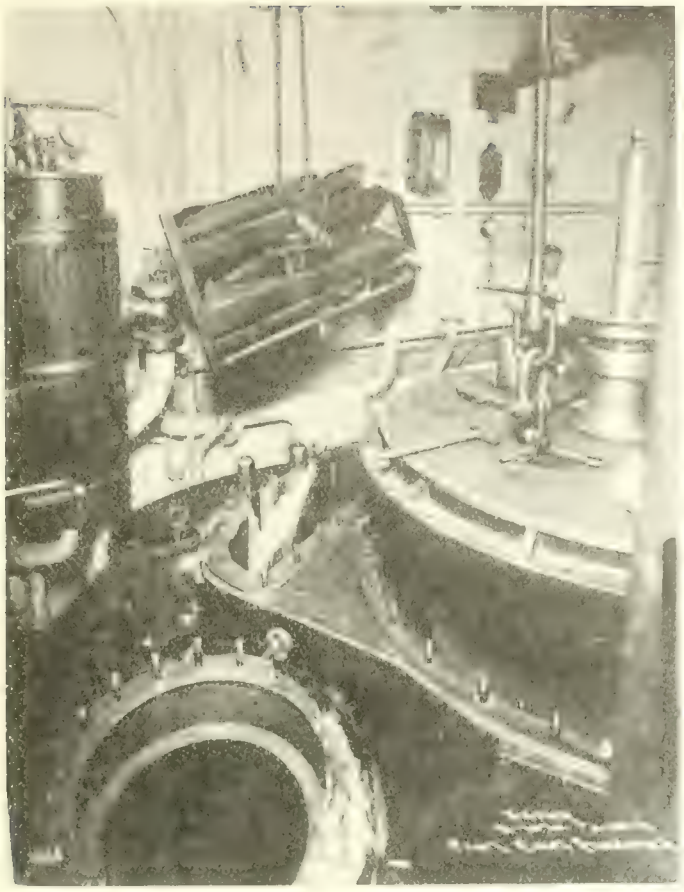
The mechanical evidence is that the campaign of destruction was operated on these ships for more than two months and that the Germans were convinced that they were making a thorough job of it. Their scheme of ruin was shrewdly devised, deliberately executed, and it ranged from the plugging of steam pipes to the utter demolition of boilers by dry firing.

When the United States Shipping Board experts first surveyed the ruin the belief was expressed that much new machinery would have to be designed, manufactured, and installed, making 18 months a fair minimum estimate of the time required. However, at the Navy Department, where the need of troop and cargo ships was an urgent issue, officers of the Bureau of Steam Engineering, having faith that the major portion of the repairs could be accomplished by patching and welding, declared it was possible to clear the ships for service by Christmas, and the last of the fleet actually took her final sea test and was ordered into service as a Thanksgiving gift to the nation.

### Special Workmen on the Job

To accomplish this end the Navy Department secured the services of all available machinery welders and patchers, many of them having been voluntarily offered by the railroads.

Although explosives were not used in the process of destruction, the engineers of the Navy Department were always conscious of the danger of hidden charges of high explosives which might become operative and disastrous when the machinery was put to a test. Instances of artful pipe plugging, of concealing steel nuts and bolts in delicate cylinders, of depositing ground glass in oil pipes and bearings, of cunningly changing indicators, of filling fire extinguishers with gasoline and similar means of spoliation, were common enough to induce the engineers to make a rule calling for thorough overhauling. On each ship there was no boiler that was not threaded through every pipe for evidence of plugging, no mechanism of any sort that was not completely dismantled, inspected, and reassembled before it was finally passed as safe.



BROKEN VALVE BROKEN VALVE CHEST AND BROKEN FLANGE ON THE OSTWEGO, FORMERLY THE PRINZ EITEL FRIEDRICH OF HAMBURG-AMERICAN LINE
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**Record of Damage Found on One Ship**

A memorandum written in German was picked up on one of the ships which gave a complete record of the destruction on that ship. Investigation revealed that the list, which had evidently been left through an oversight, was correct in every detail. The following is a translation of excerpts from this memorandum:

"Starboard and port high pressure cylinder with valve chest: Upper exhaust outlet flange broken off (can not be repaired)."

"Starboard and port second intermediate pressure valve chest: Steam inlet flange broken off (can not be repaired)."

"First intermediate pressure starboard: Exhaust pipe of exhaust line to second intermediate pressure flange broken off (can not be repaired)."

"Starboard and port low pressure exhaust pipe damaged (can not be repaired)."

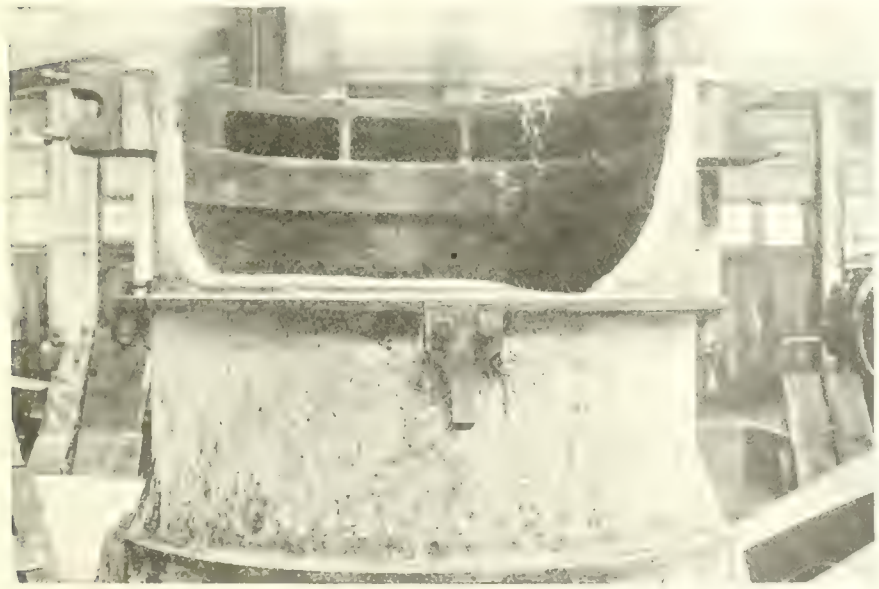
The parenthetical optimism of the German who was so confident of the thoroughness of his mutilation is now the source of much glee among naval engineers, inasmuch as every one of the supposedly irreparable parts was in fact speedily repaired and those engines are to-day as powerful and serviceable as when they left the hands of their makers.

The method of patching and welding broken marine engines had never before been practised, although the art has been known in the railroad industry for 15 years. Three methods of patching were used; electric welding, oxy-acetylene welding, and ordinary mechanical patching, the latter often later being welded. Following the repairs tests of the machinery were first made at the docks, where the ships were lashed firmly to the piers while the propellers were driven at low speed; and later each ship was taken to sea for vigorous trial tests. The patches and welds were reported as having given complete satisfaction.

When the Leviathan, formerly the Vaterland and the largest ship afloat was put into commission by the United States Government and sent to sea for a trial run, her commander, a young American naval officer, was ordered to "exert every pound of pressure that she possesses, for if there is any fault we want to know it now." The Leviathan stood the test. She was one of the ships least mutilated, due to the fact that she was in bad repair and it was believed that she would not be fit to put to sea for many months. The navy engineers found it necessary to overhaul and partially redesign and reconstruct many important parts of the engines.

**Ships Now in United States Navy**

The larger German ships which have been repaired and are to-day in commission as a part of the United States Navy,



TYPICAL BREAK IN CYLINDER. THE PHOTOGRAPH SHOWS IT AFTER IT HAD BEEN PREPARED FOR WELDING
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A CAST IRON PATCH INSERTED IN BROKEN CYLINDER BY OXY-ACETYLENE
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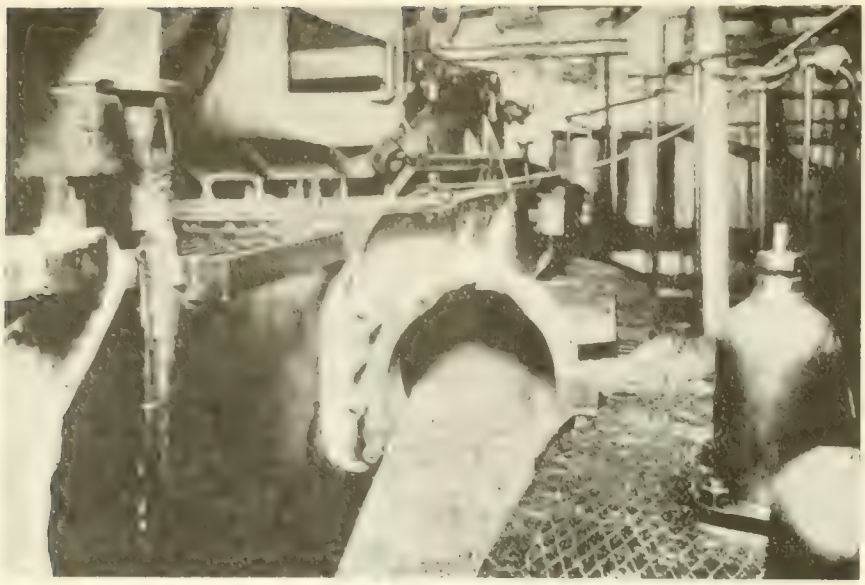

[illegible] FOR DESTRUCTION OF A STEAM PIPE ON THE U.S.S. MADAWASKA FORMERLY THE S.S. KOENIG WILHELM II.
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with their former German and their new American names are as follows:

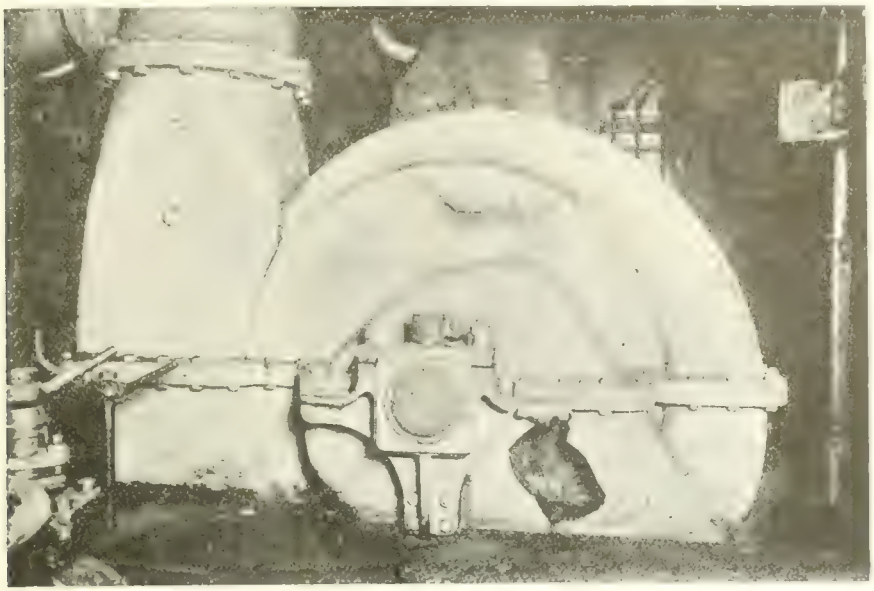
| German Name | American Name |
|---|---|
| [illegible] | U.S.S. [illegible]ham |
| [illegible] | U.S.S. America. |
| [illegible] | U.S.S. [illegible] |
| [illegible] | U.S.S. Mercury |
| [illegible] | U.S.S. [illegible]port |
| [illegible] | U.S.S. [illegible]n |
| [illegible] | U.S.S. Astoria. |
| [illegible] | U.S.S. Huron. |
| [illegible] | U.S.S. Schurz. |
| [illegible] | U.S.S. [illegible] Washington. |
| [illegible] | U.S.S. Aeolus. |
| [illegible] | U.S.S. [illegible] George W. Goethals. |
| [illegible] | U.S.S. [illegible]tan |
| [illegible] | U.S.S. Hermes. |
| [illegible] | U.S.S. [illegible] Beach |
| [illegible] | U.S.S. Camden. |
| [illegible] II | U.S.S. Agamemnon. |
| Koenig Wilhelm II. | U.S.S. [illegible]waska. |
| Kronprinz Wilhelm | U.S.S. von Steuben. |
| Kronprinzessin Cecille. | U.S.S. Mount Vernon. |
| [illegible] | U.S.S. Houston. |
| [illegible] | U.S.S. [illegible]rt. |
| [illegible] | U.S.S. Antigone. |
| [illegible] | U.S.S. Pensacola. |
| [illegible] | U.S.S. [illegible] News |
| [illegible] | U.S.S. [illegible]. |
| [illegible] | U.S.S. President Grant. |
| Praesident Lincoln | U.S.S. President Lincoln |
| [illegible] | U.S.S. Pocahontas. |
| [illegible] | U.S.S. Dekalb |
| [illegible] | U.S.S. Susquehanna. |
| [illegible] | U.S.S. Beaufort. |
| [illegible] | U.S.S. Savannah. |
| Staatssekraetar Solf | U.S.S. Samoa. |
| [illegible] | U.S.S. Quincy. |

### Repaired by Shipping Board

The ships taken over and repaired by the Shipping Board, with their German and American names, are as follows:

| German Name | American Name |
|---|---|
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| Adelheid | (No name.) |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| Calabaria | (No name.) |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible]

many instances. Numerous fire extinguishers were found to be filled with kerosene and gasoline. Piles of shavings and refuse were strewn about where fires might be started, open cans of kerosene being found in several of these incendiary traps. There had evidently been a plan to burn the ships under certain conditions and it is believed that the German crews were seized and interned somewhat in advance of their expectations.



TYPICAL VANDALISM ON THE GERMAN SHIPS. WITH A BATTERING RAM OR A SLEDGE, THE VANDALS SMASHED THIS CIRCULATING PUMP CASING WHICH WAS DULY REPAIRED BY THE ELECTRIC WELDING PROCESS

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### Case of Vaterland Distinctive

The case of the Vaterland was quite different from that of any other ship. Engineers of the Navy Department who examined the big liner declared that inferior engineering had been practised in her construction. She has four turbine engines ahead and four astern on four shafts. All of the head engines were found in good condition and all of the astern engines were found damaged.

The major portion of the damage was credited more to faulty operation than to malicious intent. Cracks were found in the casing of the starboard high-pressure backing turbine of such size as to make it certain that the engine had not been used on the vessel's last run. Certain documentary evidence found on the ship corroborated this belief. It also indicated that the Vaterland on her last trip had made less than 20 knots.

There was just enough evidence of mutilation to warrant full investigation and the vast mass of machinery, electric apparatus, and piping in the Vaterland was patiently and doggedly examined before she was sent to sea. Original defects in her engine equipment were corrected, she was overhauled and in many respects refitted, and on the whole she was declared a better ship when she entered the service of the United States than when she took her maiden voyage.

THE general practice in regard to the use of water for internal grinding is to grind soft steel and hardened work wet, and to grind cast iron, bronze, etc., dry.

## OFFICIAL NARRATIVE OF GERMAN U-BOAT SINKING BY U.S. DESTROYERS

THE event related below took place in November last and resulted in the destruction of a German submarine and the capture of the crew by American destroyers. According to an official [illegible] ment recently made by Secretary Daniels, the capture was made by the U.S.S. Fanning, assisted by the U.S.S. Nicholson. The Fanning was commanded by Lieut. A. S. Carpender, Lieut. G. H. Fort being the executive officer.

About 4.10 p.m., while escorting a convoy, the lookout of the Fanning, Coxswain David D. Loomis, sighted a small periscope about a foot above water some distance off the port bow. The periscope was visible for only a few seconds. The destroyer immediately headed for the spot and three minutes after the periscope had been sighted dropped a depth charge. The Nicholson also speeded to the position of the submarine, which appeared to be headed towards a merchant vessel in the convoy and dropped another depth charge. At that moment the conning tower of the U-boat came to the surface between the Nicholson and the convoy. The Nicholson fired three shots from her stern gun. The bow of the submarine came up rapidly. She was down by the stern, but righted herself and seemed to increase her speed. As the Nicholson cleared, the Fanning headed for the U-boat, firing from the bow gun. After the third shot the crew of the submarine all came on deck and held up their hands, the submarine surrendering at 4.28 p.m.

#### Submarine Goes Down

The Fanning approached the submarine to pick up the prisoners, both destroyers keeping their batteries trained on the boat. A line was got to the submarine, but in a few minutes she sank, the line was let go and the crew of the U-boat jumped into the water and swam to the Fanning.

Although the crew all wore life preservers, a number of them were exhausted when they reached the side of the destroyer. As the submarine sank, five or six men were caught by the radio aerial and carried below the surface before they disentangled themselves. Ten of the men were so weak that lines had to be passed under their arms to haul them aboard. One man was in such a condition that he could not even hold the line thrown him. Chief Pharmacist's Mate Elzer Harwell and Coxswain Francis G. Connor (N. N. V.), jumped overboard after this man and secured a line under his arms. When he was hauled aboard every effort was made to resuscitate him, but he died in a few minutes. The four officers of the submarine and the 35 members of the crew were all taken prisoners.

After being taken on board the prisoners were given hot coffee and sandwiches. Though kept under strict guard, they seemed contented and after a short time commenced to sing. To make them comfortable the crew of the destroyer gave them their warm coats and heavy clothing.

The German officers said the first depth charge had wrecked the machinery of the submarine and caused her to sink to a considerable depth.

The submarine bore no number nor distinguishing marks. She was identified by life belts and by statements of an officer and men of the crew. One of the life belts had "Kaiser" marked on one side and "Gott" on the other.

A BROKEN CYLINDER COVER AND CYLINDER ON S.S. MOOSE CASIN, OPERATED BY THE PRINZ JOACHIM

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## NOTES ON EXPORT PRACTICE

By "Commerce."

IN connection with the f.o.b., f.a.s. and c.i.f. clauses in quotations on goods intended for the export market considerable misunderstanding sometimes arises. We frequently see the term "F.o.b. factory," which means little or nothing to the foreign buyer except that the seller is not particularly anxious for the business or he would take the trouble to give his customer any accurate idea of what the goods will actually cost him when delivered. F.o.b. meaning "free on board," should only be used in connection with export business where the goods are actually delivered stowed in the hold of the vessel. F.a.s. signifies "free alongside," and is somewhat vague in meaning, as it might indicate that demurrage charges on the cars or lighters were up to the buyer. Strictly speaking, this term is the same as f.o.b. minus all dock and loading charges, cranage, primage, etc.

### By Way of Illustration

Let us take the case of a manufacturer of woodworking machinery in Toronto quoting against an inquiry from Buenos Aires. A regular line of steamers runs from both New York and Philadelphia, and one of these ports would provide the best route. There are several ways in which the quotation might be made:

**F.o.b. Toronto.**—This phrase implies, though it does not actually state, that the shipment will be loaded on cars routed for New York or Philadelphia. Every kind of charge, such as rail, freight, insurance, dock charges and all subsequent costs, are to be borne by the buyer. Now it is easy to see that the South American importer will have a most painful time figuring out just what this machinery will cost him by the time it is installed in his factory.

**F.a.s. New York.**—In this case the shipper undertakes to pay rail freight and lighterage right into the steamship dock. In the case of goods arriving in New York on the Jersey shore, they are lightered across to the steamship dock free of charge by the railway company; nevertheless it is often more convenient and quicker for the shipper to make his own arrangements with a private lighterage company to handle these goods across the North River. However, in either case the charges are all up to the seller of the machines until the cases are placed upon the pier.

**F.o.b. Steamer, New York.**—This is certainly the most satisfactory way to make quotations, as both parties know exactly how far each is liable. The shipper has to have the goods stowed in the hold, as shown by the bill of lading, which is recognized by the bank as a negotiable receipt for the shipment. In quoting on this basis the seller should add to his offer three important pieces of information:

(i.) Size and number of cases.
(ii.) Prevailing freight rate.
(iii.) Prevailing marine insurance rate.

On this basis the foreign buyer can tell exactly what the machinery is going to cost him laid down by simple addition.

### Increased Responsibility

**C.i.f. Buenos Aires.**—Quoting on this basis carries the responsibility of the shipper a little farther. Cost, insurance and freight to Buenos Aires means exactly what it says. However, there is sometimes a little misunderstanding in regard to the marine insurance. Shippers sometimes imagine that because they contract to insure the shipment up to the port of arrival that they are liable for its safe transit. Nothing, of course, is farther from the truth; the shippers' responsibility ceases as soon as the goods are stowed in the hold, exactly as in the case of an f.o.b. sale. In addition, he merely contracts to pay the ocean freight and insurance to destination. We are considering the case of a shipment to the Argentine and the laws of the republic hold that the insurance in this case must include war risk. Now in shipments to most other countries at the present time it is legitimate for the shipper to add the war risk premium to his invoices, but not in the case of the Argentine. Certain Customs authorities call for a definite certified statement of the freight charges on the invoice; this is necessary to enable them to estimate the "home market value" of the goods and to arrive at the ad valorem duty. It is always wise to include such a statement, whether specifically required or not.

**F.o.b. Buenos Aires.**—The buyer will sometimes request all quotations to be put in this form. It would not, however, be to the advantage of any shipper to quote f.o.b. destination, because the phrase is too elastic and might include many large and unforeseen charges. It would certainly be held to cover duty and cost of unloading, sundry Customs charges and cartage or teaming. The best alternative would be for the shipper to quote c.i.f. and leave all such local charges to the buyer.

### Export Licenses

At the present time all the great exporting countries have embargoes in force covering practically all metals and manufactures of metal. The embargo is designed primarily to keep such material out of enemy countries and further to control the output in the event of there being a shortage of the commodity. Where good reason exists and there is no shortage export licenses or permits are issued to approved persons at the discretion of the authorities. In Canada the Chief Commissioner of Customs at Ottawa issues a license to approved firms for the export to allied countries of embargoed metals and manufactures, provided that a declaration is produced from both the shipper and the buyer that the material will in no case be converted to enemy use. This license attached to the export documents is scrutinized by the Customs officer at the point of export and the inspector has authority to hold any shipments not properly described or covered by a license.

A similar arrangement is in force in the United States. In respect of iron or steel in various forms the embargo is more complete, as no licenses are being issued for the export of these goods unless it is shown that they are primarily intended for the manufacture, directly or indirectly, of war material for the allies. Other materials, such as non-ferrous metals, oil, gasoline, coal and coke, fertilizers and explosives, may be exported for ordinary industrial use subject to license, but, of course, in the event of any shortage becoming apparent the same restrictions would probably be applied as already cover iron and steel. Permits for the export of these goods to Canada are to be obtained on application to the Division of Export Licenses, 1435 K Street, Washington, D.C. Any attempt to evade this law renders the parties concerned to a fine of $10,000, or two years' imprisonment, so it will be seen that the Washington Government is taking a very strong stand against the possible shipment of goods for enemy use.

In Great Britain controllers have been appointed to deal with different raw materials, and each of them has authority to issue permits for the export of his particular commodity, provided (i.) that a surplus of such material exists in the country, and (ii.) that shipping space is available for its transport. The chief difficulty which arises is that a machine or other article contains materials coming into the province of two or more different controllers, in which case it is not easy to obtain the endorsation of all these different officials to the same permit.

## INCREASED USE OF "ISHERWOOD" SYSTEM OF SHIP CONSTRUCTION

ACCORDING to a recent statement issued by J. W. Isherwood, of London, Eng., an increase in the number of ships contracted for under his system of construction is recorded during the past year, despite the almost total abolition of building for private ownership.

No less than 180 vessels, aggregating in deadweight carrying capacity about 1,334,000 tons, have been placed since the end of 1916. The grand total now stands at 800 vessels, aggregating 6,000,000 tons deadweight carrying capacity, as against 6 vessels, aggregating 31,608 tons in 1908. Of the 800 ships referred to, there are 386 general cargo vessels, colliers and ore steamers, and passenger vessels aggregating 2,891,600 tons deadweight carrying capacity, 24 Great Lakes freighters for 279,600 tons, 310 oil-tank steamers for 2,800,000 tons, 77 barges for 26,800 tons, 2 dredgers for 760 gross register tons, and 1 trawler for 570 gross register tons. The use of the system is greatly on the increase in the United States and in Japan.

# Canadian Mnfrs. Face Their Greatest Opportunity

By James W. Spence *

*Whatever [illegible] the war, it is and has been the [illegible] conclusion that international trade will be looked to as one of the most potent factors in the reconstruction period of the world. At the present time ample preparations with complete organizations are a source of much activity in the leading nations and should be [illegible]*

TO-DAY an opportunity presents itself to our manufacturers in foreign fields. Each mail from our allied countries brings forth many inquiries for materials of the Canadian manufacturers; but are we taking advantage of the opportunity to place our goods in such fields? Many articles have been written telling the manufacturers how to approach foreign trade without first establishing the first principles.

To-day very few firms selling to our foreign buyers would think of starting that most important department without first engaging a highly experienced man capable of handling such a department, and who is well versed with the various details necessary to do the work properly. They would not use book knowledge. These means were very acceptable to some before the war, but to-day very few manufacturers are looking for new business, so they are, therefore, losing the splendid opportunity for future business. Heretofore, it has been necessary to spend thousands of dollars on salesmen sent to these countries to drum up trade. To-day the business is sent to our doors and the great majority of us turn it away.

The remedy is a simple one. If we to-day do not plan and arrange for the use of the numerous plants that will some day be idle it is our own fault. Let us attend to our war needs, but at the same time let us look into the future for Canada and Canadian manufacturers.

We have all had a small sample of what conditions will be as soon as war contracts cease. Only a few months back, when contracts were not so freely given out, many valued employees lost their positions. Imagine what the conditions of the country will be when the time comes to change! We owe it to everyone to be ready.

We stated that the remedy is simple. IT IS.

Why not place for foreign trade a percentage of our products, say, 10 per cent.?, and they will be gladly accepted.

Place yourself, for instance, in a foreign buyer's position. He requires certain materials, foodstuffs, etc.; he sends his inquiries broadcast to the various countries. Some supply, others do not. Isn't it logical that this buyer will remember later, when we are all looking for business, those who helped when help was needed? It will not make any difference whether you supply his total requirements or merely some. Place your goods before them. Our materials will be remembered. They will advertise themselves and will be called for later when we need business.

We must remember, however, that the excess profit must be forgotten. The time is coming when we shall not speak so readily of the millions of dollars, but with very little arranging of our present plants we can very easily start now to lay the foundation for a staple lasting business.

On the manufacturers of to-day rests the welfare of the country of to-morrow. Unless the manufacturers prepare to-day, on their shoulders rests the idleness of our returned men.

The shops of to-day, that will be closed to-morrow, will stay closed for quite some time. Perhaps some of the manufacturers are unable to determine just what line to turn to for future manufacturing. If they will but consult with our Government and learn the requirements from foreign fields, which are easily obtained, they would have no trouble in reaching a decision.

Perhaps now would be a good time for the Government to step in and assist financially those who require it. Let the manufacturers set aside 10 per cent. of their plants for foreign work and let the Government assist in every way possible, both in advice and financially, and allot shopping space.

The future will show the advisability of early preparation. Our materials will advertise themselves and future business for Canadian manufacturers will be assured. In any event it deserves our most earnest consideration.

*Let us not forget the supposed war profits, as a great many of the war profits are only a supposition anyway.*

*Let us get at the remedy and put the Canadian products before that most acceptable market.*

*Let us start by placing an obligation on our foreign buyers. Very few of us forget an old favour, and least of all those whom we helped in the present crisis.*

*Let us place some of the burden on the other fellow by placing ourselves where he will not forget us when all the world will be out in competition for business.*

*Let our products be known so we shall not have to spend so much introducing them.*

*Let us prepare to turn our plants, mills and factories into the uses as soon as the war ceases.*

*President, the Spence Company, Ltd., Montreal.

## IMPERIAL TRADE PREFERENCE

CANADIAN bank managers in London, England, express lively interest in pronouncements of leading British bankers in favor of measures to create inter-Imperial trade preference through the establishing of rates of exchange within the Empire.

If feasible it may prove a greater stimulant of Empire commerce even than tariff preferences which the British Government have now followed the example of Canada and other Dominions in making a permanent feature of British policy.

Frederick Goodenough, chairman of Barclay's Bank, said: "The extension of banking organizations and the maintenance of fixed rates of exchange within the British Empire will give the Dominions and Colonies a substantial preference which would serve to consolidate and promote trade within the Empire and induce economy in the use of gold and enable gold resources to be utilized elsewhere. Drafts on London at fixed rates would be obtainable at all points. Similarly London would sell in the same manner and the balance of trade within the Empire would be adjusted by closer administration of inter-Imperial finance."

Mr. Goodenough announced that in view of greatly enlarged trade after the war, Barclay's Bank had arranged with the Colonial Bank, of which Lord Beaverbrook is president, for working together on joint account in financing exports and imports from and to the West Indies, West Africa, and elsewhere.

Charles Milburn, president of the London Joint Stock Bank, strongly urges increased gold production within the Empire to rectify the disproportion of gold to war liabilities. Canada has her share of sixty million sterling of Empire gold out of the world's total output of 95 millions.

Mr. Milburn said he foresees the development of a firmly united Empire which will carry and ultimately pay off the war debt, heavy though it is, but sound banking must have an adequate gold basis.

## ATLANTIC CONFERENCE FORMED

ACCORDING to an official announcement [illegible] steamship lines interested in the North Atlantic trade have concluded an alliance for the purpose of governing the [illegible] ing to an official announcement. The [illegible] but from which the German and Austrian lines are now excluded. The main offices of the organization will be in Paris.

The formation of the new "Conference" may be taken as a definite and far-reaching step towards an after-war shipping policy in which the Entente Allies do not propose to allow Germany to dictate. The old pre-war Atlantic Conference had its offices at Jena, in the heart of Germany, and it held most of its meetings in Berlin and Cologne. The new conference will consist, for the present, only of British, American and French lines. German and Austrian lines are excluded, and no neutral lines have yet been admitted.

The underlying idea of the organizaton is protective. A representative of the conference, in a talk with the newspapermen here, said that "the primary object is to consolidate, in a commercial sense, the interest of the allies, who have stood shoulder to shoulder in the war. We must have everything ready when peace is declared to endeavor to conserve business to the alles and to keep control of the Atlantic trade. We know what we have had to suffer in the past through the insidious German penetration, and how the German lines worked always to the prejudice of other nationalities in spite of their agreements."

The new organization will co-operate with various sectional conferences which are already in existence, such as the Trans-Atlantic Passenger Conference in New York, and the Mediterranean-Atlantic Conference, which includes mainly Italian and British lines.

The Atlantic Conference, as at present constituted, includes the following lines: Cunard, White Star, Allan, Canadian Pacific, Anchor, Anchor-Donaldson and Dominion (British); American Line (American); Compagnie Generale Trans-Atlantique (French).

## RESEARCHES ON TIN AND TUNGSTEN

THE *Board of Trade Journal*, London, England, says that one of the most attractive fields for investigation being opened by the exigencies of the war is that which pertains to the winning of tin and tungsten. Recently some successful experiments have been made with a view to increasing the recovery of tin. No systematic researches, however, have been undertaken beyond those designed to improve the appliances now in use; and, having regard to this fact, the Privy Council Committee for Scientific and Industrial Research has expressed the hope that a research association might be established in order that the series of investigations already undertaken might be continued with fresh vigor on a larger scale.

One of the difficulties in the way hitherto has been the want of adequate funds for sustained investigation and experimental trials. But the Ministry of Munitions, represented by the department for the development of mineral resources, is now venturing on a strong effort to make progress possible, and is suggesting that those interested in the tin and tungsten mines of Cornwall and Devon should co-operate in the establishment of a research association, and contribute to a central fund devoted to a study of the many-sided aspects of the problem. In this way adequate means might be provided annually for two or three years; and with such a fund, supplemented if necessary by a grant from the Committee of the Privy Council, experimental researches upon scientific principles could be conducted under the continuous supervision of first-class professional men, and upon a basis of cost which individual operators do not feel themselves able to bear.

This proposal is one which should appeal to mining companies and royalty owners from a strictly business standpoint. Under present methods over 35 per cent. of tin, and a higher percentage of wolfram, in the ore is lost. An improvement of even 10 per cent. in the recovery would have a very important bearing on the fortunes of the mines now being worked, and would, moreover, offer a considerable incentive for the resuscitation of many properties that have been closed down.

## INCREASED TRAFFIC AND FEWER SLIDES ON PANAMA CANAL

TRAFFIC through the Panama Canal last year increased largely over the previous years, according to the annual report of Col. Chester Harding, governor of the canal. A total of 1,876 vessels of all classes passed through the canal from July 1, 1916, to June 30, 1917, inclusive.

Of these, 905 passed from the Atlantic to the Pacific, and 971 from the Pacific to the Atlantic. In the fiscal year 1915, 1,088 vessels passed through the canal, and in 1916, 787. The total number of vessels transiting the canal since it opened for commercial traffic in August, 1914, is 3,751. The total net tonnage, canal measurements, for the several years is as follows: 1915, 3,849,035; 1916, 2,479,762; and 1917, 6,009,358. The cargo tonnage transported was, for 1915, 4,969,792; 1916, 3,140,046; and 1917, 7,229,255.

### Loss From Present Traffic Rules

The traffic for the year yielded a revenue of $5,631,781.66 from tolls. The rules for levying tolls have thus far remained unchanged.

It will be remembered, says the report, that under present law and regulation tolls are based on canal tonnage, at the rate of $1.20 per net ton, except when this product exceeds the registered net tonnage, United States rules, at a rate of $1.25 per ton, in which case the lesser amount is collected. The confusion, lack of uniformity, and loss in revenue to the canal resulting from the present arrangement have been fully discussed in previous reports, and remedial legislation is now pending in Congress.

In this connection, attention is invited to the fact that the revenues from tolls for the past fiscal year would have been $6,668,247.32 if canal rules alone had governed, which is $1,036,465.66 more than the amount actually collected.

### Dredging Work of the Year

The year's dredging chargeable to construction, which includes all the excavation in the canal prism at locations where the full widths and depths have not been once obtained is as follows: Gaillard Cut, 183,904 cubic yards; between Gamboa and Pedro Miguel Lock, 246,998 cubic yards; and Pacific entrance, 221,138 cubic yards. At the end of the year there remained 1,409,140 cubic yards of original excavation to be done within the limits of the canal prism.

Cucaracha slide has given no further trouble since the large movement that blocked the canal in August, 1916, as described in the report of last year. To reduce the chances of interruptions to traffic due to future similar movements if they occur, the material in the slide was removed for a distance of 100 feet outside the canal prism.

It is believed that in the future the great slides of the canal will be of historic interest only.

## SEVENTY OCCUPATIONS TAUGHT IN MONTREAL

AT the present time in Montreal there are 175 re-educational courses given to returned soldiers comprising instruction in seventy different occupations. The policy of the Military Hospitals Commission, to combine instruction under competent teachers selected from returned officers, N.C.O's and men, with the practical instruction under practical conditions has been found to work most satisfactorily indeed, the marked interest displayed by the men and their ambition to succeed is a constant inspiration to the teaching staff. The great willingness of manufacturers to co-operate with the vocational department in giving over their plant facilities for instructional purposes indicates clearly the wonderful appreciation of the services rendered by returned men at the front, and the importance of the great economic problem which confronts the nation.

THE tags attached to grinding wheels should be preserved, so as to enable duplicates of good wheels to be easily secured, as without that information it becomes necessary to guess and try different grades and grits to again secure the most satisfactory wheel.

# Constructing Fabricated Ships on Manufacturing Lines*

By R. H. M. Robinson **

*A timely discussion and explanation of [illegible] construction not previously attempted in any country and a historical resume of the development of the fabricated ship with the author's personal instructive [illegible]. The practical difficulties and the manner in which they were overcome promise interesting developments in the future.*

RECENTLY the term "fabricated ships" has become one of public interest. A fabricated ship may be defined, briefly, as a ship on which the work of punching and shaping the plates and shapes and, to some extent, assembling the riveting, is done in a fabricating shop, ordinarily employed for bridge or tank work, as distinguished from the usual practice of doing it in a shipyard punch shop. So far as the writer knows, the fabricated ship is a product of American progressiveness. The writer claims no credit for the idea or for its development, and hardly knows why he should prepare a paper on the subject unless it be that he has the honor to be connected with two companies now constructing ships on this system, one of which may reasonably claim to be the first to do so. The principal credit for carrying out the fabricating idea is due to Mr. C. P. M Jack, now consulting engineer, and to Mr. Max Willemstyn, engineering manager of the Chester Shipbuilding Company and of the Merchant Shipbuilding Corporation, and it would be improper to neglect to state that the ideas of Messrs. Jack and Willemstyn could probably not have been carried out except for the the interest and assistance given them by Mr. Jas. A. Farrell, president of the United States Steel Corporation, and by the officials of the American Bridge Company.

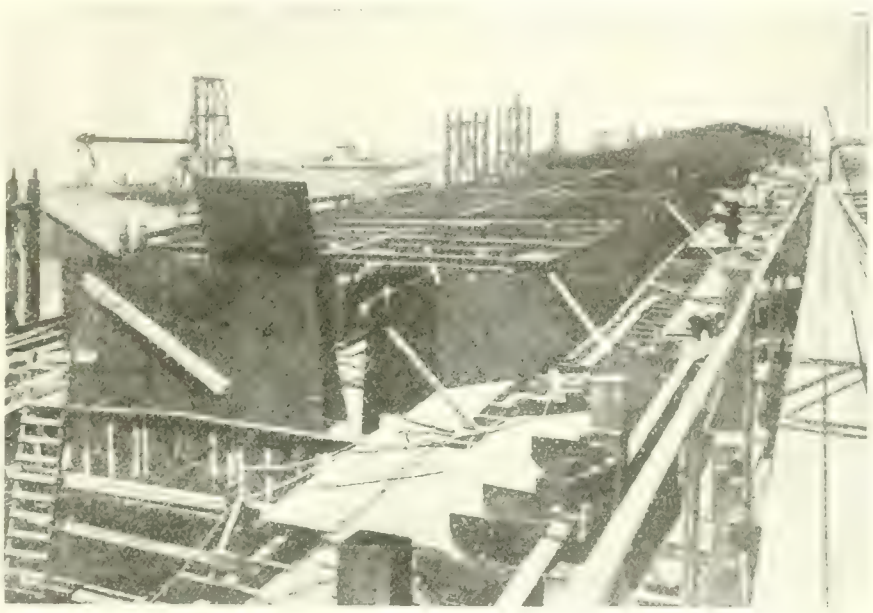


FIG. 1. VIEW OF A FABRICATED SHIP IN COURSE OF CONSTRUCTION.

### Scope of System

The construction of fabricated ships makes it possible to have the steelwork done by those who are specialists in the line of fabricating steel with all of the special tools and labor-saving devices at their disposal. It relieves the mind of the shipyard operator from the multitude of detail that goes with such work, reducing his problems to those of engineering, erection, riveting and assembling by the workmen, and to installation of other units of outfit and equipment.

The type of ship which the Chester Shipbuilding Company has built, and which it and the Merchant Shipbuilding Corporation are now building, provides for the use in all places of conventional ship shapes and ship plates, subject to the rules, inspection and survey of the registration society, both as to quality and material, dimensions, riveting and other matters. These vessels are cargo carriers of about 8,800 tons to 9,000 tons deadweight capacity with poop, topgallant forecastle and bridge, the latter being about 124 ft. long. The decks, with the exception of the poop and topgallant forecastle, are without sheer at the centre line. Complete double bottom for carrying of fuel oil or water ballast is fitted. The machinery is located amidships and consists of high and low-pressure turbines driving a single screw through reduction gears.

In the emergency which has recently arisen there have been proposed ships constructed from bridge shapes and universal mill plates with regard to which the writer has no personal detailed knowledge. It would appear to him that there might arise certain difficulties in using this character of material in the construction of ships, but he would prefer to leave to those who are personally cognizant of the matter any questions in regard to this.

### Tanker Developments

During the late winter of 1912 there was a sudden demand for oil tankers, while freight charters were low and cargo ships plentiful, and almost anything which could be made into an oil tanker was used. Mr. Jack then conceived the idea of using a system of vertical cylindrical tanks which were to be built and tested ashore, then installed bodily in the steamer. Two cantilever-type colliers, the Borgestad and Fritzoe, were acquired under long-term charter. Contracts with Pittsburg tank builders and New York pipe fitters and shipwrights were entered into. The tank builders started to erect the steel (amounting to about 900 tons) long before the arrival of the steamer, and by June the loading of the tested tanks in the Borgestad was begun, and the actual loading was finished in 10 days. It is needless to say that almost unsurmountable difficulties had to be overcome—in the first place, on account of the use of cylindrical tanks for ships; secondly, because of the manufacture of these tanks by tank-builders, the riveting by house-smiths and several other "objectionable" features which were not done according to old-time custom. Mr. Jack, during this time, spent several months in Norway to adjust matters with the classification society and had to withdraw the second ship from their class and change to Lloyds. The first ship sailed in September, 1913, without class, which was only again assigned after a trial of three months.

During 1913 the Escalona, then building at a British yard, was changed into a

*A paper presented before the Society of Naval Architects and Marine Engineers, at New York, November, 1917.

**Member of Council.

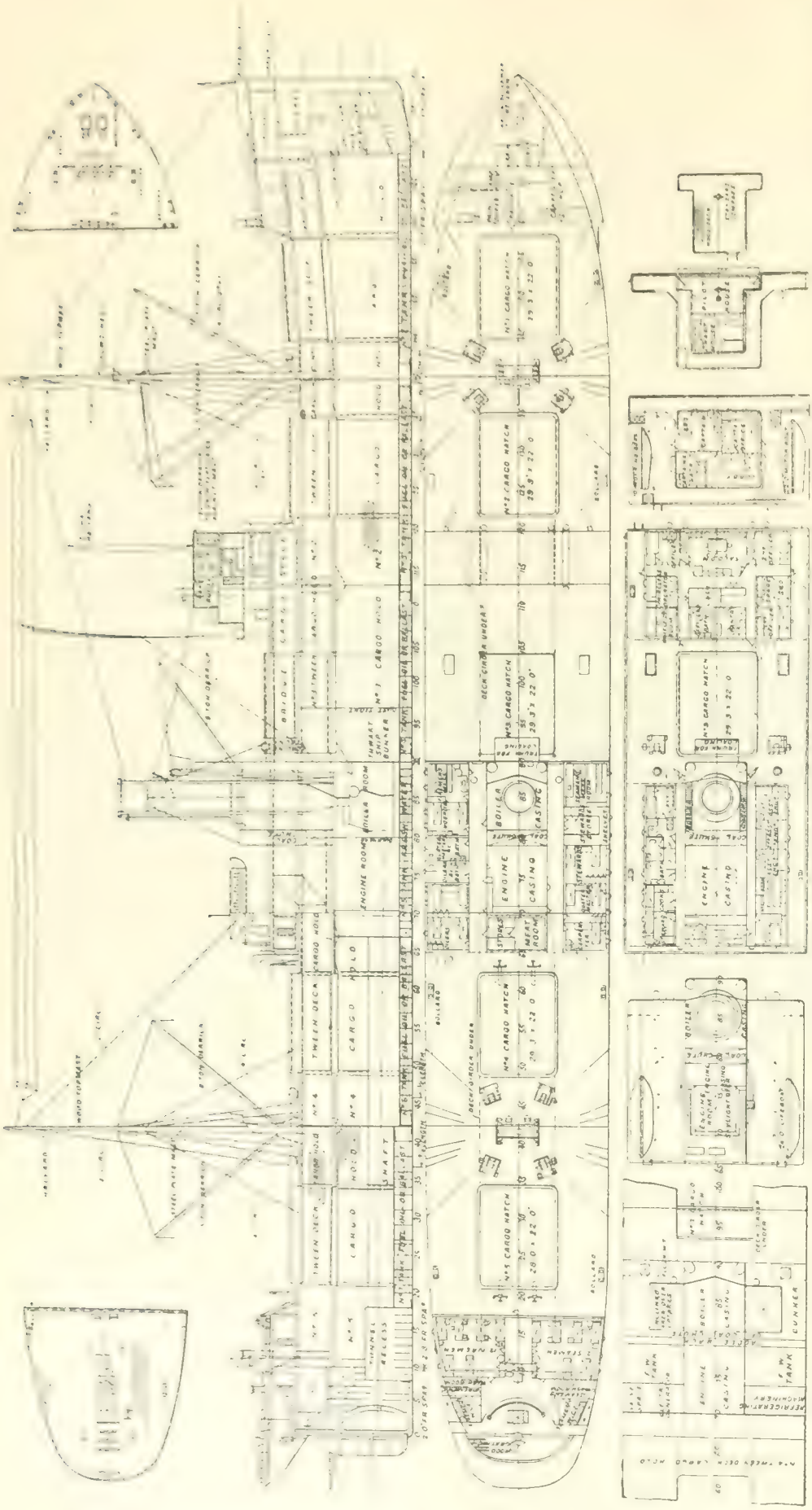



FIG. 2.—LONGITUDINAL SECTION AND DECK PLANS OF FABRICATED SHIP.

cylindrical tanker, but, due again to difficulties of classification, horizontal tanks were installed. These tanks were also manufactured and tested complete outside the shipyard. In the fall of that year three ships were started in Great Britain on the general design of the tankers now building at Chester, but the shipyard would extend the fabricating portion only to the cylindrical tanks.

In 1914 the Chris Knudsen and the Mills were converted on this side. The former was on the type of the Borgestad. A new departure was made with the Mills. The tanks in this ship were connected to tanktop and deck, a trunk built on deck and connections made from tank to tank and to the ship's side, thus forming cylindrical tanks and spaces between tanks and shell, with oiltight centre line bulkhead between tanks. Practically all the material was ready for assembly when shipped from Pittsburg. All holes were punched and countersunk, and stiffeners riveted to trunk sides, centre line, &c., wherever possible before shipping. The only pieces which were left blank were the outstanding leg of bounding angles connecting to the old ship's structure, and one edge of the transverse bulkheads. On account of the peculiar dome roof construction of tanks, which dome formed into rectangular trunk, only about 60 per cent. of the material was multiple-punched and the balance single-punched. The ships converted at New York were all erected with regular tank builders' outfits, consisting of a gantry or stiffleg derrick, air compressor outfit, blacksmith's forge and one or two ships' fitters. All piping, ventilating, &c., was fabricated beforehand, except the closing pieces.

### Initial Efforts

The above experience is given in some detail as it was gradually leading toward the fabricated ship, but in taking up the fabricated ship as a whole another difficulty arose on account of the size of the job involved in fabricating complete ships, involving thousands of tons of steel instead of hundreds. The tank manufacturers previously engaged could not entertain the proposition, and others were quoting prices which made the undertaking impossible commercially. The American Bridge Company, however, after several months of search and discussion, decided to fabricate two ships, but would only undertake to do the absolutely parallel midship body. About 60 per cent. of the total steel weight of the first two ships was thus manufactured. This was increased to 70 per cent. on the following ships, and to-day the bridge shops contracted for 85 per cent. of the hull steel and will fabricate also part of the curved portion of the ship. Of course a 100 per cent. fabricated ship is possible, but with the present bridge-shop equipment this is not obtainable. They will first have to increase their furnace facilities to take care of the bending of frames and the

beveling of angles, which may be done in the near future if the standard ship is here to stay.

### Duplication Necessary

The manufactured ship is a commercial possibility only if duplicate ships are built and, therefore, this policy was adhered to as far as possible from the beginning in contracting for the ships at Chester, there being but four different classes. These classes are as follows:—

1. Tank ship of about 9,000 tons deadweight capacity, fitted with cylindrical tanks on Jack's system. The vessel is built with topgallant forecastle, poop and short bridge. The main deck at centre line and top of expansion trunk are without sheer. Cylindrical tanks extend from tank top to under side of main deck, and a continuous trunk extending between poop and topgallant forecastle takes care of expansion and provides a working deck between the bridge, poop and forecastle decks. Machinery is located aft and consists of a high and low-pressure turbine driving a single screw through reduction gears.

2. Two-decked freighter to about 8,800 tons to 9,000 tons deadweight capacity, having poop, topgallant forecastle and bridge, the latter being about 124 ft. in length. This vessel is built with sheer. Complete double bottom for the carrying of fuel oil or water ballast is fitted. Machinery is located amidships and consists of high and low-pressure turbines driving a single screw through reduction gears.

3. Shelter-deck freighter of about 9,300 tons deadweight capacity, having poop, topgallant forecastle and bridge. Complete double bottom for the carrying of fuel oil and water ballast is fitted. Machinery is located amidships and consists of high and low-pressure turbines driving a single screw through reduction gears.

4. Two-decked freighter of about 8,800 tons to 9,000 tons deadweight capacity, having poop, topgallant forecastle and bridge. The decks, with the exception of the poop and forecastle decks, are without sheer at the centre line. Complete double bottom for the carrying of fuel oil or water ballast is fitted. Machinery is located amidships and consists of high and low-pressure turbines, driving a single screw through reduction gears.

### Riveting Details

Except as to details, which may be modified to provide ease of fabrication, the fabricated ship does not differ essentially in structure from any ship of a similar class. One of the prime questions involved is that of multiple punching. The greatest difficulty with the arrangement for multiple punching lies in the fact that the minimum distance from centre to centre of punch dies in a multiple punch is regularly 2 in., which distances can occasionally be reduced to 1⅞ in. The term "multiple punch" implies that the spacing of rivets is to be laid out so that the spacings of rivets in different successive rows are in multiples of each other or in multiples of 2 in. Take, for example, a butt spacing of four diameters of ⅞-in. rivets, equal to 3½ in. The frame riveting in this case could be six diameters, or 5¼ ins., which is no multiple of 3½ in., and neither is 3½ in. a multiple of 2 in. A compromise is made in this case by making an average butt spacing of 3½ in., which can be done by spacing in groups of three, viz., 3¼ in., 4 in., 3¼ in. The punches for the butt and frame spacing would be spaced in the machine as follows: 3¼ in., 2 in., 2 in., 3¼ in. The first, second, fourth and fifth punches would be used for the butt spacing. The first, third and fifth for the frame spacing, allowing for a 5¼ in. spacing. Where the butt spacing is 3½ diameters and the frame spacing 7 diameters, such as on smaller size ships, there is not much trouble, but the multiple punch is hardest to apply on the 9,000-ton, clear-hold, single deck ships, with their 5½ and 6 diameters frame riveting. Again, on the larger ships, with 4-in. butt spacing it is easier to be according to rule, and it should be here noted that Lloyd's Register of Shipping has been very progessive and broadminded in allowing the use of the average spacing instead of the strict and absolute adherence to stated rules.

The first thing to do on a ship designed for multiple punch is to arrange the midship section in such a way that all longitudinal rows of holes fall in line with the principles just explained; second, to arrange the plate width so that the greatest number of equal width plates are obtained; third, to see that if possible each plate is symmetrical about the long centre line of the plate, so as to avoid any possible countersinking errors. No templates are required for setting the multiple punch, which is entirely done from the typical rivet spacing drawing.

### Human Element

In staggered riveting, the minimum longitudinal spacing between the rivets of one row and those of the other is 1 in., but 1⅛ in. is preferable. This space is required for the stops and pawls, which stop the table during the downward stroke of the punch-head. It is, of course, possible to reduce the minimum space to small fractions, but then the human element of error is introduced, as a man has to insert a liner between stop and pawl, equal in thickness to the change in spacing wanted. Otherwise the machine is electrically controlled, except the throwing in of the clutch for punching.

A "pole," being a batten about 3 in. wide by ½ in. thick, and of such length as required, is used as template for the longitudinal spacing. Steel stops are inserted in the holes of the batten corresponding with rivet spacing, or, on the newest machines, steel stops are set up in a steel rack to suit the pole. Different color of light is shown where butts, edge-seams, frames &c., occur and the man on the levers is acting solely according to these colors

The multiple punches have, as a rule, only three or four set-ups, that is to say, one set-up for butts, one for edge-laps, one for frames, one for, say, intercostal angles in conjunction with the edge-laps. In this case the watertight bulkheads could not be punched if the holes would not entirely coincide with one of the four set-ups? It is possible to omit a few holes in some of the set-ups, but this is done only by hand. The man on the punch can release any number of punches temporarily by disconnecting the gag-operating gear for these punch dies.

The Chester Shipbuilding Co., Ltd., has, wherever possible, carried out the idea of duplication and standardisation, but very often has had to abandon it in detail. The hull, engines, boilers, and in fact all large items for a group of ships have been duplicated. The dimensions for all but two ships contracted for by the Chester Shipbuilding Co. are: length, 401 ft.; moulded breadth, 54 ft.; moulded [illegible] sheer, but in the latest type sheer is dispensed with and a raking forcastle and poop substituted, giving the effect of sheer but simplifying the work of manufacture. The results of the fabrication in the Bridge Co's mills as outlined above is beyond criticism. Work is fair rivet holes require no reaming, and the resulting fit of joints and water tightness is excellent. Constructing a ship becomes to a great extent a problem of routing, handling and erection of material and riveting.

The Chester Shipbuilding Co. and the Merchant Shipbuilding Corporation are now building some 68 ships on the manufacturing principles outlined above. It is expected to embody even more than has been possible in the past the manufacturing idea, [illegible] of labor shortage, to do a maximum of skilled shipyard labor of the conventional kind.

## BRITISH COLUMBIA SHIPBUILDING

EVERY shipyard in British Columbia engaged in constructing wooden steamers for the Imperial Munitions Board is well ahead of its schedule, according to E. C. Walsh, who is the official responsible for the lumber going into the vessels, and whose department is one of the most important under the Munitions Board. The building of these twenty-seven steamers has meant a great deal for the lumbering industry of the province, for about 1,400,000 feet of timber is needed for each ship, and ten million feet has yet to be delivered. Not only are old-established logging camps engaged on getting out ship timber, but four new camps have been started for this purpose. Merrill & King, on Thurlow Island, get out 100,000 feet a day, and a similar quantity is logged on Thurlow Island at the P. D. Anderson camp. The Hansen camp at Granite Bay is get-

[illegible] feet, and so does the Jackson Bay camp, which is a Munitions Board plant operated by the Colonial Fruit Co. The result of the dispatcher has resulted in lumbermen getting out the long lengths necessary for the programme, and the production of ship knees is also a big feature. These knees are very essential in order to give the requisite strength to the vessels, and the fleet now under construction will be a big advertisement for British Columbia timber.

### Lumber Inspected

The lumber is very carefully inspected and it must come up to a grading set by Mr. Walsh, who was with the Hastings mill for twenty-five years. The Inspectors' Bureau Association also checks up the quality and issues a certificate if it comes up to grade, and there is a representative at every mill cutting timber for the ships. The shipyards are also held responsible for what they receive, so there is small chance of faulty lumber [illegible] the vessels.

At the Western Canada Shipyards, of which W. W. Clark is superintendent, there are four ways. Number One hull is completed and should be launched at any time, but she was finished so far ahead of the scheduled time, that the shafting and other engine room gear has not arrived. Otherwise she could be sent into the water. When it is considered that the ground for the yard was broken as recently as June 5, it will be seen that rapid work has been done. Work on the second vessel will be about 20 per cent. faster than on the first ship as the workmen get more efficient and more men are trained. The ceiling has been started on the third vessel, and the fourth is in frame, while the saws are whining on the lumber for the fifth.

False Creek is beginning to look like a miniature Clyde, for right across from the Western Canada yard is the big Coughlan plant, where steel steamers are under construction and the hull of one is looming large, for she will be launched this month.

### Launching Dates

The launching dates set for the six ships at the Western Canada yard are: Feb. 1, March 15, April 21, May 15, June 7, and June 13. The dates at Lyall's yard, North Vancouver, are: Jan. 20, Feb. 10, March 2, March 23 and April 11. The Cameron-Genoa, Victoria, launching dates are: Feb. 1, March 1, April 1 and May 1. The Foundation yard, Victoria, dates are: Jan. 20, Feb. 20, March 20 and May 20. The dates for the New Westminster Construction and Engineering Co. are: Feb. 1, March 1, May 15 and June 15, and for the Pacific Construction Co., Coquitlam, March 1 and May 1.

All the yards engaged in the work have been fortunate in that no labor troubles have interfered with the progress, and Mr. Walsh states that the greatest harmony has prevailed, all hands apparently realizing the need for turning out the tonnage as rapidly as possible. This feeling is prevalent from the logger who drops the trees to the men who build the ship, and the six yards are working in a spirit of friendly rivalry.

The steamers under construction are 250 feet long, 43½ feet beam, and a moulded depth of 25 feet. They will carry 2,800 tons deadweight on a draught of 21 feet, and most of the lumber used in construction is Douglas fir.

### Are Strong Vessels

A visit to the Western Canada yard shows that the specifications of the Imperial Munitions Board are high. From the vessel in frame to the completed No. 1 hull every timber seems to be of beautiful lumber of immense strength, and the vessels are very solidly built. There is no evidence of any weakness, and the magnificent timbers are a great testimony to British Columbia's great lumbering asset. The ships are to be built to Lloyd's A1 classification and the British Board of Trade's requirements for cargo steamers.

The frames, of course, vary in size. Some are as big as 21 x 23 inches, and the smallest is 12 x 14 inches. The rudder-post is 37 feet long and 20 x 20 inches, and is in one piece, as is the propeller post, which is 30 x 36 inches and 37 feet long. The beams are 14 x 12 and 14 x 13, and the stem is in one piece, 45 feet long and 18 x 26 inches.

## UNFOLDING ROMANCE OF THE AIRPLANE

By Frank H. Russell*

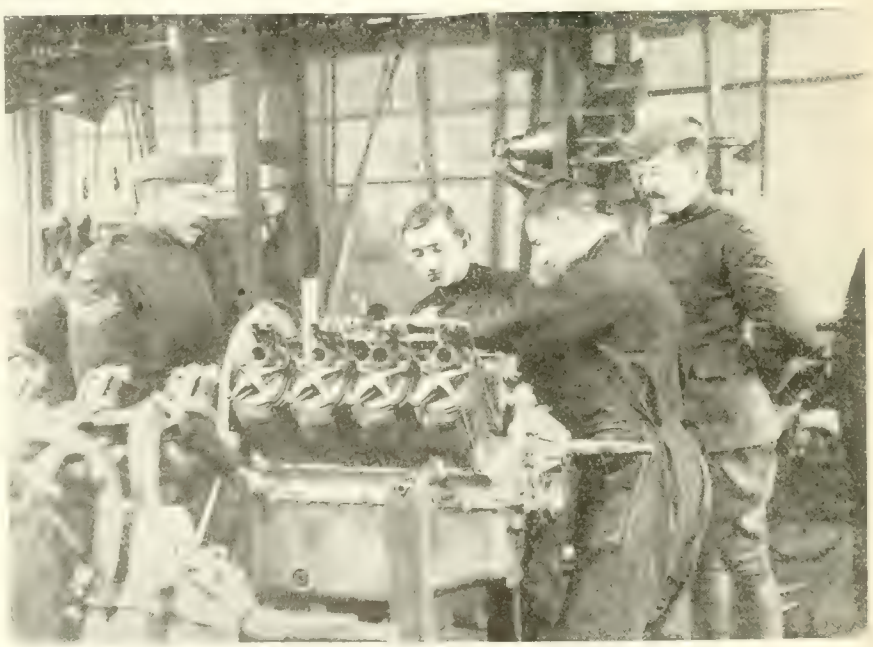
THE romance of oil and of steel, of the railroads and of the motor car, has been written, though the stories are of such recent origin that the pioneers in these enterprises are still among us, masters now of the forces that they created. But their stories, fresh as they are, yet are old, and to-day a new tale of success is in the making. It is the romance of the air and of the infant industry, already grown to manhood's figure, which has revolutionized warfare and is waiting only the coming of peace equally to make its impress on the normal life of the world.

It is less than a score of years ago that the first heavier-than-air machine successfully carried a passenger into the air. It is less than fifteen years ago that the art of controlling such a craft was imparted by the inventor to another, yet to-day air-craft have been standardized, and factories turn them out with the case that motor car builders produce their product. Throughout the world aviation schools are in operation, and thousands of students are acquiring the art of flying just as their fathers studied and mastered the control of the motor car.

Any figures which aspire to consider the whole of the civilized world must be approximate at best, and possibly far from accurate, but it is safe to say that to-day upward of a billion dollars is invested in an industry which within the memory of the present generation was capitalized solely by the private fortunes of the brothers Wright.

That capital will be doubled, trebled, perhaps, before world peace succeeds the present struggle, and it is no impossible conception to picture the airplane industry at the end of the war as the greatest industry ever created by man; an industry employing more capital, consuming the energies of more men, and rendering the greatest proportionate service to mankind ever attained by any other form

*President Manufacturers' Aircraft Association.



INSTRUCTING BRITISH RECRUIT MECHANICS IN THE WORKING OF A 70 HORSE-POWER RENAULT MOTOR

Passed by Official Press Bureau

of human endeavor. For war is not the only field in which the airplane may prove its worth. It is in the ways of peace that its greatest potentialities will be realized, although it seems to have needed the present world conflict to win recognition for even the least of its merits.

### Pioneers' Resources Low

It is no secret within the industry, and it must have been widely suspected without, that the men who had the vision to foresee the future of the aircraft when the Wright brothers gave it to the world and who had devoted themselves to the task of developing a demonstrated principle into practical manufacture, had come close to the end of their resources when the world conflict gave aviation the impetus which to-day has launched it as an industry past the experimental stage and well into the production period.

As an industry the existing manufacturing plants and facilities practically did not exist up to three years ago, or at the outset of the world war. From the time of Darius Green and his flying machine, Professor Langley, and the brothers Wright, there had always been men with the vision and the determination to develop the aircraft into a practical utility. But they had been tremendously in the minority among their fellow-men. The pioneers in the industry developed their ideas against the dominating negative thought of practically the whole world. They were regarded as interesting visionaries, and it is needless to say that among them were no geniuses of finance; the art of flying was not one to attract bankers. Here and there in the United States shops had been erected that were little more than shacks, and in them enthusiasts tried with small skill and less money to develop the ideas they had conceived.

Progress was necessarily slow, and the attitude of the public was well illustrated in the newspapers, which showed a tendency to print a paragraph about a successful flight and a column about a mortal accident. There were accidents, of course. In the sixteen years up to 1916 the loss of life, time and money in the effort to make the airplane a commercial proposition was appalling.

But as is always the case with a new venture, if it be of an exciting, thrilling type, there was no lack of men willing to fly. Any man who could put together a machine could find some daredevil to try to fly it. Finding money was not so easy; men who had entered the game enthusiastically at the outset soon sunk their own fortunes in their experiments and then sought for financial backing among heir friends. What they received was generally small in amount and grudgingly given. The public had not their ability to visualize the future and the Government seemed even more blind to the possibilities of aviation.

### War Its Salvation

It was a sport, at best, was the chief argument against investment. It has no utilitarian purpose, and no market for the aircraft could ever be established beyond the ranks of wealthy young sportsmen who were willing to pay well for the notoriety and the sensations of an aviator. That was the average attitude of the man with money, and to offset it the pioneer builders could advance only predictions that a commercial future was in store for the airplane as a means of transportation for persons, freight and mail; that the aircraft made possible journeys beyond the scope of ships and trains, and that it practically eliminated distances by the speed of its progress.

Such arguments, it need scarcely be said, were seldom effective and the development of the aircraft languished for lack of financial support. But here and there engineers were turning their attention to the possibilities offered by the new art and here and there practical builders were experimenting in small ways with airplane motors, striving to adapt existing automobile motors to the needs of an airplane. They met with a measure of success and, as early as 1907, practical machines that actually flew were turned out by more than one maker in this country. But up to 1914, when the airplane industry may be said actually to have come into existence, conditions were little changed. There was little demand for aircraft and no monetary incentive to build them.

AMERICAN AEROPLANE ENGINE ON TESTING BENCH READY FOR TRIAL. THE OPERATOR IS PROTECTED AGAINST INJURY FROM THE PROPELLER BY HEAVY WIRE SCREEN

Passed by Committee on Public Information

Then came the war, and with it an ever-increasing demand for airplanes and pilots, until to-day the United States has appropriated some $720,000,000 for the construction and equipment of aerial fleets for the army and the navy and is committed to a program that contemplates the construction of 22,500 airplanes this year, with a doubled output for 1918, the training of hundreds of thousands of aviators and the creation of a new branch of war service that shall assail Germany from the skies and wing a way to victory that has been denied to the older branches of the service, the army and the navy.

### Great Britain's Output

To-day some $40,000,000 is invested here in the airplane industry. Approximately 15,000 men are employed in it, and the combined output of the country is about 200 planes a week. Factories devoted exclusively to the construction of airplanes and their parts cover a floor space of more than 4,000,000 square feet, and some twenty-five manufacturers are now making report to the Automotive Committee of the Council of National Defense on their capacity, their capital-

capacity.

These figures give some notion of the [illegible] experiences of Great Britain in the aviation field indicate that these are but the preliminary steps in the march of progress which the United States is yet to make.

Great Britain, for instance, has $375,000,000 invested in her airplane industry and [illegible] facture 41,000 planes a year. The total appropriation by the British Government for airplane work this year was $600,000,000. The proportion of capital invested here to that invested in Great Britain is about 1 to 9¼, yet the present capacity of the United States is approximately one-quarter that of Great Britain, and it is planned to double this output by the operation of night shifts of labor.

It has been found that there are about 4,000 hours of work in a finished airplane, so it is generally estimated that it takes eighty men, working a fifty-hour week, to produce one airplane. It is not likely that this relation will be altered much, for the same proportion has been found to hold true in England, but output can be increased, not only by the employment of additional shifts, but also by the utilization of the facilities of allied industries.

Ordinarily a construction program such as the United States has authorized would require at least a year of preparation in any industry, but time is life and blood now and the gap between the experimental stage of before the war and the present quantity production of airplanes is already partly bridged and [illegible] be completely spanned within six months.

The automobile industry is at hand with its tremendous organized facilities for quantity production, and on these plants the airplane makers will depend in some measure for the construction of motors. The bodymaking departments of these automobile plants may be used for the fabrication of fuselage and wing frames under the direction of airplane experts, and thus all the present sources of supply will be maintained and strengthened.

There is another important factor in the situation, however. This is the matter of cross licensing, which has been largely misunderstood by the public, but which is to play a most important part in the successful fulfillment of the Government's plans. By it the differences which have existed among makers almost since the Wrights obtained their first patents have been amicably settled, and any manufacturer worthy of the boon may now avail himself of all the patents relating to the aircraft industry.

*The Analist.*

VIEW IN BRITISH REPAIR SHOP WHERE ENGINES ARE OVERHAULED AND PUT IN SHAPE AGAIN

Passed by Official Press Bureau

## U.S. AIRPLANE MOTORS

IT is reported from Washington that experts under the aircraft production board are already at work upon an engine that is expected to surpass the Liberty motor in power, while retaining all the qualities for quantity production.

While the original Liberty motor included no mechanical innovations, or experiments, the designers have been given full latitude in the new machine and it probably will mark distinct progress in the art of airplane engine designing. For that reason details of construction are highly confidential.

American experts have worked on the theory that a good big airplane is better than a good little aeroplane. They believe super-dreadnoughts of the air will be the masters of the air and consequently the new engines are being developed to run planes of increased size and fighting power. Months ago General Pershing urged that American designers anticipate craft armed with six machine guns each, three heavy and three light. At that time no serious attempt was being made in Europe to get more than four guns aboard any plane.

The Navy Department also is at work on designs for advanced types of seaplanes. For the present the capacity of the new plant at the Philadelphia yard, where nearly 1,000 men are employed, is needed to turn out the accepted type of flying boat, but some of its facilities soon will be diverted to development of enlarged and improved flying boats.

## CHROMIUM-STEEL FOR MAGNETS

OWING to the commandeering of tungsten for military purposes, German electricians found themselves without tungsten for their magnet steels early in the war, and experiments on the use of chromium in the place of tungsten, which had already been projected before the war, were accelerated. The research has been conducted in the Reichsanstalt on behalf of the Verband Deutscher Elektrotechniker. The preliminary report, published by the Reichsanstalt in 1917 did not give particulars, which were, however, to be communicated to members of the Verband on inquiry. Krupp's works supplied 37 specimens of steel containing varying percentages of chromium and of carbon; they had been turned into rods and hardened in various ways in the works, and were then aged, after the method of Strouhal and Barus, by repeated heating, cooling and mechanical stress, while being tested at intervals in the Reichsanstalt. The unfinished investigation concerns also the temperature co-efficient of magnetisation and the durability of the steels. It results that on an average chromium steels, which have undergone suitable heat treatment, do not rank below tungsten steels; the very best magnetic chromium steels, however, are not equal to tungsten steels. Technically, chromium steels would thus appear to be quite satisfactory, while for special researches their further improvement is desirable.

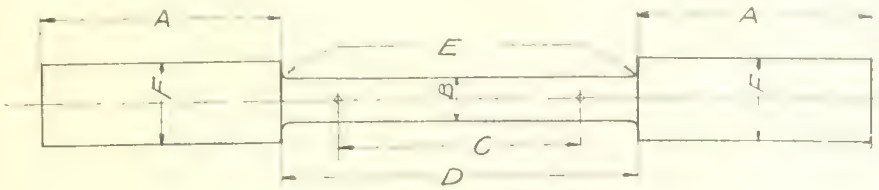
IN the old days when light grinding spindles and relatively light machines only were available, it was desirable to leave as little stock for grinding as possible to reduce the time required. With the modern internal grinding machine, however, this is not true and it is now considered wiser to leave a liberal amount of stock, as this reduces somewhat the accuracy required in chucking the pieces.

# Shell Inspection: What a Shell Inspector Should Know--I.

By Chief Examiner

*The prolongation of the war with the increasing importance attached to quantity and quality of ammunition make it more than ever essential that inspection, to fulfill its purpose, must be applied intelligently, however unremittingly. A little knowledge is sometimes dangerous if misapplied, and the author of this article endeavors to make clear the object of inspection, rational methods of carrying it out in practice, and incidentally the disastrous results attending ignorance or carelessness in performing the duties attached thereto.*

WHETHER he be shop inspector or government man, anyone who is responsible for the inspection of shells—high explosive or shrapnel—should understand the entire manufacture of them, from the pouring of the ingot to the shipping of the finished article. The subject is intensely interesting to those who realize the responsibilities attached to the work, but




HIGH EXPOSIVE SHELL TEST BAR

those who handle it from a purely mercenary motive will probably find less interest in it than they do in their ordinary duties.

### The Material

The first thing to think about is the question, "what is steel?" The answer is simple and may be given in two words: iron and carbon. In other words iron with all its impurities removed. Some of these impurities are added later to give the steel the necessary elasticity required for shell making, but they can only be added in certain quantities.

Manganese makes the steel crumble or break up; phosphorus and sulphur are undesirable in steel for shell making, as they render it very brittle. Phosphorus is especially dangerous, and a large amount of it makes the steel unworkable. An excess of sulphur prevents proper forging when in billet form. The percentage of these substances allowed by the Imperial governmen are: carbon, maximum .55 per cent; silicon, maximum, .35 per cent.; manganese, maximum, 1.0 per cent., minimum, .4 per cent; phosphorus and sulphur, maximum, .05 per cent.

Now comes the interesting process of manufacturing the steel. This question has of course been discussed and explained in detail often enough, and this account is only given as a rudimentary explanation, merely for the use of those interested in shell inspection.

Iron first comes from the ground in the form of ore. This ore must then be refined—that is, all its impurities must be taken away. There are several processes by which this is done, and the first step in each process is the blast furnace. The iron ore is charged into a tall stack and with it a quantity of coke and lime which act as fuel and flux respectively. The fire is started and the whole mass, aided by a strong blast of air, becomes hotter and hotter till the iron is simply fused out of the ore and becomes white hot liquid. This liquid is then run off into channels made for the purpose on the floor of the cast house and is then known as pig iron.

### From Pig to Steel

Now pig or cast iron is hard, but it is not tough, or elastic, and is therefore not suitable for making shells. It is too brittle owing to the fact that its impurities have not yet been removed. It is not malleable or workable. The proper quantities of carbon, silicon, and manganese have to be obtained to make it workable, but the iron must first be refined in order to remove certain excess impurities as well as to permit such additions of others as are necessary to meet specifications.

This purifying is carried out in Canada chiefly in what is known as the basic open hearth furnace. The pig iron is again brought to a white heat in a special type of furnace by means of hot air and gas, so that the remaining impurities are reduced to the desired limits through absorption into a slag formed of molten limestone. While still molten, the final proportioning quantities of carbon and manganese are added. This fiery liquid is then poured into a big ladle from which it is drawn off or teemed into moulds. It is drawn off from the bottom so that all the slag and dirt may be left in the ladle and not get into the moulds.

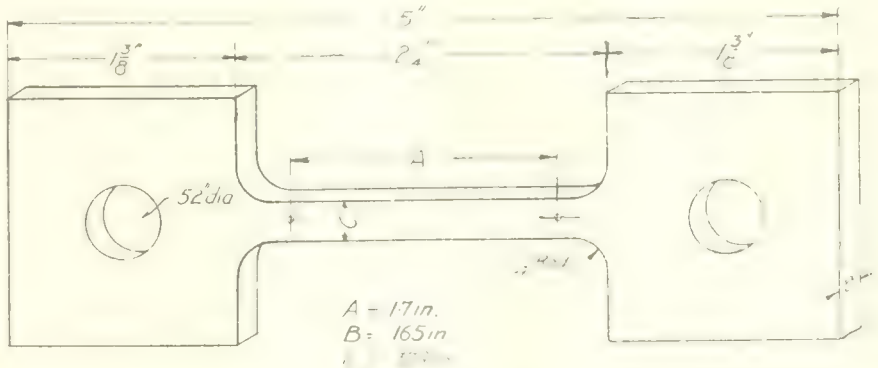
Another process is the Bessemer, so called on account of the name of the inventor. In this case the iron passes direct from the blast furnace into a converter. A blast of cold air is blown through the bottom, and this, instead of, as would be supposed by the uninitiated—lowering the temperature—actually raises it, and the impurities are oxidized, passing off as combustible gases, and when the flame dies down it is known that they are all gone.

A third process is the electric furnace. The "juice" passes through the pig and scrap, which are put in together, in this case and brings the mass to a very high temperature, when a similar action takes place.

### Ingots and Their Defects

When the molten mass is poured into the moulds, it is known as an ingot, and defects begin to occur from that moment. Now we have to ask ourselves "what physical change takes place when the ingot cools?" The answer is simple—it contracts. This contraction first takes place from the outside towards the centre.

As the ingot slowly cools and contracts in this direction a cylinder of




SHRAPNEL SHELL TEST BAR

liquid metal. Then the contraction commences to take place from the centre towards the place where the first contraction ceased. This contraction outwards leaves small spaces in the centre [illegible] of the ingot, which are called piping. Of course the hot metal, in almost liquid form, at once fills up these spaces, but sometimes it does not entirely fill them up, consequently a small pipe is left when the ingot is cold. This is a serious flaw in the steel.

A portion of the ingot is broken off after being partly cut through, in order to discover this piping if possible. If piping shows, another cut is taken, and [illegible] still shows the ingot is scrapped.

After the ingot is poured it is rolled, while still hot, so that the diameter is lessened and the length increased. Sometimes, owing to dirt, a "crack" or "seam" develops, and when it does the ingot is useless because this type of crack will never amalgamate or join with the rest of the metal. Sometimes air gets in and causes bubbles or blow holes, giving the metal a spongy form called porosity—porousness. The ingot receives three rollings.

After the first rolling it is called the bloom, after the second, the bar, and after the third the sub-bar. The sub-bar is then cut into lengths and each length is called the billet. A billet is that quantity of steel required to make one shell. Generally no defects arise in the operations between ingot and billet, although they may and do develop in the rolling.

### Causes of Defects

There are six defects to be found either at the ingot stage or the forging which is the next operation. These faults are piping; cracks or seams, from contraction; cracks from slag or dirt; porosity, cones in the base, and eccentric forgings. The last one is of course found after the billet has been forged. Piping has been dealt with. Cracks from contraction are found when the contraction is not uniform as for instance when a current of cold air strikes the hote metal, or the forging rolls through very cold water. Cracks from slag or dirt explain themselves. Porosity has also been dealt with.

Cracks from contraction are also generally caused by the steel being burned. This weakens it when cooling and the pressure of any dirt or slag, or even air, causes the steel to develop them, and they sometimes show, when machined, as "rokes," "hair lines," and "ghost lines." The last two are also caused by the presence of sulphur, but the last is one of the mysteries in the manufacture of steel, and the exact cause has never yet been absolutely and definitely determined. This question will be mentioned again later. Ghost lines are so termed on account of their peculiarity of appearing and disappearing. If one is discovered after the shell has been machined it can often be filed out, but if the shell is left standing for 24 or 48 hours it will again show itself as bad as ever. The oxygen in the air seems to bring it out again, as also does the heat of the varnish-baking oven.

### Forging

When being forged the billet is heated slowly to approximately 2,100 degs. F. when it is forged. This is done by means of a punch, which descends at high pressure into the putty-like hot metal, and forces it up between the punch and the walls of a die of suitable size.

Cone defect.—If the billet is not heated equally right through there is a portion in the very centre which is colder than the rest of the metal. This colder portion, which may be very small like a pin head or as large, or even larger, than an ordinary marble is forced by the punch into the base end, and when the forging cools off, it is possible to knock the piece right out with a hammer. Very often this cone is not discovered till the base is machined, and even then it may not be discovered as it may not come to the machined surface of the steel. This is one of the most dangerous defects, and an inspector should make a practice, at the preliminary bench, of testing frequent batches of each heat by striking the hogged out base recess a sharp blow with an ordinary machinist's hammer, taking care, of course, not to mark up the recess with the edge of the hammer.

### Steel Requirements

Steel for shell making must be elastic. When the shell is fired from the gun it gets a blow of about 200 tons on the base. The rear half of the shell tends to overtake the front half, and there is a momentary bulging of the walls. The steel, if elastic, will immediately return to its original position. If it did not the shell would jamb in the gun and either burst the gun or fetch it back over on to its own men. The same result would happen if a shell were allowed to go through having cracks or seams. These would open under the pressure, i.e., chamber pressure, and would remain open. Ghost lines, hair lines and slag or sand holes are other dangerous defects which might cause the same thing and needless to remark must be carefully and continually watched for during the visual examination at both preliminary and final inspection.

The markings, of which there are four, will be found on every forging. They are: 1. The code letter; 2. The heat number; 3. The forge maker's initial, and 4 the government acceptance stamp.

The first is stamped on to show what firm made the steel. The second is the shell's name and denotes the heat or batch of ingots that were poured at one time, the third is to show what firm made the billet into the forging, and the fourth is put on by the government inspector after he has passed the forging as being correct and serviceable for machining. Before doing so he must gauge the thickness of walls, thickness of base, length over all, examine it visually, and tap it to find by the ring if there are any cracks.

### Specified Tests

The acceptance stamp is not put on until word is received that the tensile test piece has passed. To ensure that the steel has the proper elasticity required for the purpose of making shells, the Imperial government requires that there shall be three tests made of a portion of the steel itself from each heat number. These test pieces are sent to a laboratory chosen by the Steel Inspection Department.

The tests are: 1 chemical analysis; 2 compression; 3 tensile. The first is taken from the ingot, and the second and third from the forging. In the first case a portion of the centre or core of the ingot is drilled out and analysed. The hole is also examined visually to detect piping. In the second case a piece is cut from the forging and is turned to form a circular button half an inch thick by half an inch in diameter. This is put under a hydraulic press and compressed to one half its length. If it cracks, breaks or shows any other defect the whole heat number, i.e., every forging in that particular heat, is rejected. In the third case, a piece is cut from the wall of the forging near the base end and is turned to form the test bar.

This test bar is about 6 or 7 inches long and is circular. It is turned down in the centre and two punch marks are placed on this portion. The dimensions are as follows: A about 2 in., but it is not important to have this exact; B, .564 in. dia. for 6 in. forgings, and .461 in. for 4.5 in. forgings. C denotes the punch marks, and the distance between them must be exactly 2.4 in; D is about 3 in.; E denotes ⅛ in. radii, and at F the diameter should be about ¾ in. The two ends are placed in jaws made for the purpose, and are pulled outwards. The dimensions are all carefully checked both before and after the pulling, and the strain is from 41 to 50 tons. The bar must stand 41 tons' strain before yielding, and must not break under 50 tons, nor yield too much.

The above test is for high explosive shell. Shrapnel also has a tensile test and is taken during machining immediately after the shell is nosed in. A piece is cut from the wall, just above the driving band recess.

The distance A between the punch marks is .556 in.; B the thickness of test piece is .125 in.; C, the breadth of the narrow or centre portion is 1-16 in.; and the two end pieces are about 1½ in. square. Holes are drilled in the ends for the purpose of holding the test piece when pulled. In this case the yield point is 36 tons per square inch; the breaking point is 56 tons, and the elongation or stretch must not be less than 8 per cent. of the distance between the punch marks.

# The Preventable Waste of Coal in the United States*

By David Moffat Myers**

*While asserting that the saving or waste of one-fourth of the coal consumption of any industrial plant depends entirely on the efficiency of the management, the author emphasizes the fact that this fraction of the consumption relates exclusively to the boiler plants and does not include the large economies possible in connection with its distribution and use.*

As a means of far-reaching economy the Government of the United States should at this time apply intelligent and direct-acting efforts to the conservation of fuel at the industrial plants which are responsible for its greatest consumption.

The mining and distribution of the coal have been placed under the supervision of the War Coal Board in order more nearly to meet the crying needs in these directions, to use the railroad facilities more efficiently so that the present car shortage may be minimized and to apportion the coal in quantity and to uses deemed most expedient.

While this organized effort to bring about efficiency in the production and distribution of coal is being made, no parallel measures have been adopted to bring about a normal and practical efficiency in its use. The hundreds of large plants which are consuming fuel wastefully, in many cases more wastefully and carelessly than ever before, are directly and needlessly causing a large fraction of the existing car shortage.

### Preventable Waste of Fuel

The preventable waste of fuel in the boiler furnace of one steel mill which I investigated amounted to 40,000 tons per year, which at $5 a ton would cost $200,000. This was a comparatively modern plant. The efficiency of boilers and furnaces in a 14-day test was 55 per cent. The load factor was unusually favorable to high efficiency and could readily be raised to 70 per cent or over. This is only one example, and there are many more extreme cases. In one hand-fired plant the evaporation was raised from 6 to 9 lb. in a few days of instruction and continuously kept close to this higher mark with the help of coal and water measurements which were inaugurated. The saving was due exclusively to instruction and consequent better operation.

The saving or waste of one-fourth of the coal consumption of any industrial plant depends entirely upon the efficiency of its operating management. Let me emphasize that this fraction of the consumption relates exclusively to the boiler plants, that is, the production of steam, and does not include the large economies possible in connection with its distribution and use.

For well-known reasons the boiler plant offers the more lucrative field for producing economies, and these with a minimum of alteration in physical equipment.

Under present conditions a plant which carelessly operates at an efficiency of 40 to 50 per cent. receives from the Government the same consideration in the delivery of coal as the one whose efficiency is 70 to 75 per cent. This obviously is unfair and wasteful.

The government hands over, say, 200,000 tons of coal a year to a plant owner, but asks for no accounting as regards its consumption, nor any questions as to the amount of steam it is made to produce.

There is no doubt that very important economies in the use of food have already been effected by educational campaigns. These economies are largely the result of educating the ultimate consumer. The requisite propaganda does not attempt to teach the intricacies of food chemistry or the complex action of the gastric juices.

TABLE I TOTAL COAL PRODUCTION BITUMINOUS, LIGNITE AND ANTHRACITE, YEAR 1915.

| | Net tons | |
|---|---|---|
| 1. Bituminous and lignite | 443,462,509 | 85.2 |
| 2. Anthracite | 76,906,431 | 14.8 |
| 3. Total | 520,368,940 | 100 |

The object of this paper is to open a discussion which, it is hoped, will ultimately lead to the formulation of definite fuel conservation recommendations, to forward these recommendations to the proper governmental authorities as an official communication of this society, and to offer to the Government the services of the society for the organization, furthering and, as far as possible, the execution of the plan which may as a consequence be adopted.

There are, I think, two plans of operation worthy of consideration. The one might be termed the autocraatic method. This would involve use of authority to compel coal consumers to execute such measures of economy as the proper authorities might prescribe for any given case, limits to be set as to expense to the user. Such limits might be in terms of a percentage of his present yearly coal bill. Alterations should be directed chiefly, as previously implied, to purely operating improvements. Many objections would probably be made by consumers against this plan, but once in effect the majority would no doubt realize its pecuniary advantage to themselves. But its tendency may be too strongly opposed to democratic principles.

The other plan would be largely an educational one, in which patriotism and efficiency would furnish the motive forces required. The teaching must be accomplished with the utmost simplicity and directness. Above all it must be in such form as to be readily comprehended and applied.

The requisite information must reach the owners and managers of industries, and there must be simple instruction sheets for the engineers and firemen. The vital importance of daily accurate records of coal and water must be taught and information given regarding practical appliances for automatic measurements of both.

Blank forms might be sent in advance to plant owners in order to be advised by them, first, whether they would be willing to co-operate with a governmental organization offering to assist them in reducing their coal consumption, and second, to obtain such data as to size, type, equipment, operation and fuel consumption of the plants as would enable a classification that would permit a government board of experts to send such instructions as would include the information needed for any one class of plants.

This work would be very greatly aided by a staff of experts ready to visit plants when so requested by owners, and make investigations and recommendations and keep in touch with the progress of economies. Included in such a staff must be men intimately familiar with practical operating economies, whose duties would be the delivering of lectures or talks which should be planned so as to reach directly not only managers and owners of the industries, but also the chief engineers and firemen of the boiler plants.

The United States Bureau of Mines has for a number of years engaged in obtaining and disseminating scientific information regarding the mining and consumpton of coal, and the results of the work have been of great value to technical engineers who are able to use and apply it.

Six hundred million tons of coal was mined in the United States last year. It is predicted that 700,000,000 tons will be mined this year, and next year's production will likely be still greater. Of this quantity approximately 67 per cent, or 469,000,000 tons, will be burned for steam-making purposes on land, assuming the same percentage consumption for steam production as existed in the year 1915.

The saving or wasting of one-quarter of these coal [illegible] over 117 million

*Presented at the annual meeting, December 1917, of the American Society of Mechanical Engineers, New York.

**Consulting Engineer, New York City.

tons, depends on the efficiency with which we operate our boiler furnaces. If we actually saved by proper methods only 50,000,000 tons per year, this economy would result in freeing for other important service the use of 1,000,000 fifty-ton freight cars per year. The significance of such an economy may be realized when it is stated that the number of cars thus released for other service would be equivalent to 15 per cent more than the combined yearly coal-carrying capacity of the Baltimore and Ohio and Southern Railway systems; approximately equal to that of the Pennsylvania R.R. system on lines east of Pittsburgh, or 1 2-3 times the number of coal cars hauled by the Norfolk & Western. The direct saving to our industries would be $250,000,000 worth of coal per year, if figured at $5 per ton.

This saving would be 50,000,000

469,000,000

10.65 per cent of the coal now burned for steam production. It is impossible to state the present average efficiency of boilers and furnaces, but I have personally spent sixteen years of concentrated study in the investigation and improvement of steam and fuel conditions in factory power plants, and I have never visited a plant of this class where a saving in coal of at least 10 to 12 per cent could not easily be made. The poorer the conditions found the easier it is to make an attractive saving in fuel.

TABLE II PERCENTAGE DISTRIBUTION OF BITUMINOUS COAL AND LIGNITE PRODUCED IN THE UNITED STATES AND IMPORTED IN 1915, BY USERS

| | % |
|---|---|
| 1 Railroad fuel | 28.0 |
| 2 Steamship bunker fuel, tidewater | 2.0 |
| 3. Steamship bunker fuel, Great Lakes | 0.3 |
| 4 Manufacture of beehive coke | 9.3 |
| 5. Manufacture of by-product coke | 4.3 |
| 6 Manufacture of coal gas | 1.0 |
| 7 Domestic and small steam trade | 16.0 |
| 8. Industrial steam trade | 33.0 |
| 9 Export fuel | 4.0 |
| 10. Steam and heat at mines | 2.0 |
| 11 Special uses | 0.1 |
| 12. Total bituminous and lignite | 100.0 |

NOTE.—Imports were only a little over one-tenth of one per cent. and are, therefore, neglected.

No information is available for complete classification of the distribution of the anthracite, but it is estimated in report on "Coal in 1915*" from which Tables I. and II. are made, that 50,000,000 net tons of anthracite were used in 1915 for "heating households, apartment houses, hotels, and office, school and other buildings." This leaves about 27,000,000 net tons or 35 per cent. for industrial uses, principally steam making. If we eliminate households we may assume that 25,000,000 tons of the 50,000,000 tons are used for making steam, so that of the total 77,000,000 tons of anthracite, we may say that 52,000,000 tons, or 67.5 per cent., are used for steam production.

*"Coal in 1915," by C. E. Sesher, published by the U. S. Geological Survey; Part A on production.

Table IV shows to what point the [illegible] must be raised to obtain the saving of 10.65 per cent. upon which [illegible] are based. The poorly run boilers would of course be most receptible to the greatest improvements. Hundreds of boiler plants operate at no greater than 58.07 per cent efficiency, and it is a comparatively simple matter to bring them up to an efficiency of 70 per cent or higher. The latter would result in a saving of over 17 per cent of the coal.

If we do not limit our action to coal used for steam generation, but extend it to include economy with which the steam itself is utilized and applied, the predicted saving could be doubled, so that we might save 2,000,0000 fifty-ton carloads of coal per year. There is, for instance, widespread ignorance to a surprising degree in regard to the value of exhaust steam in heating and process work. The coal-consuming public should be taught that a heating system which requires 100 boiler horsepower may insert a steam engine between boiler and heating main and obtain nearly 100 mechanical or electrical horsepower in addition to the required heating for about the same consumption of fuel.

Steam plants are under the immediate management of chief operating engineers. The examination requirements for licenses in this profession call for practically no knowledge of steam and fuel economics. These examinations deal chiefly with matters of safety, repair and maintenance of equipment and neglect almost entirely the subject of coal economy. This is a very serious defect in our present system and is directly responsible for a large preventable waste of fuel.

The mining and distribution of our coal supply, the regulation of prices and the adjustment of financial and labor problems have already been placed under official administrative attention. But no parallel measures have been adopted looking toward reduction of waste in connection with the utilization of this coal.

### Discussion of the Paper

Walter N. Polakov: The invitation to discuss the means and methods for reducing waste of coal is very welcome since all that has been said and done so far has failed to produce tangible results.

Last April I brought out the impending danger of a fuel famine and soon afterward the movement was on the way affecting at that stage only coal production, transportation and prices.

Being limited in its scope and nature, it did not embrace at that time the third group of my original recommendations concerning the use of fuel. My editorial in "Coal Age" of July 14 and articles in other magazines emphasized this paramount task "to start at once the movement for the efficient utilization of every available supply of fuel."

A couple of months later Mr. Garfield publicly admitted that the principal hope for a solution of the coal problem lies with the people themselves: "They must save every possible bit of fuel."

Saving may be carried out along two lines—either on the principle of German "Spar Kasse," inevitably limiting the industrial productivity and impairing the health of the people, or on the principle of more efficient utilization of fuel, producing more power and heat with less coal. Only this latter means of saving is to be considered.

The inauguration of efficient management of power plants cannot be accomplished overnight. It requires study in each plant of its peculiar conditions. It requires careful training of firemen and other employees. It necessitates an adequate stimulation of employees to continually maintain the highest degree of efficiency. To do it no capital investment is needed. It is not a matter of better furnaces, of mechanical stokers, or other cures preached by salesmen. It is a matter of knowledge and method.

There are already many plants that have reduced their coal consumption from 20 to 40 per cent for the same output by better organization of power-plant work. There is no need to here describe these principles and their results. "Task Setting for Firemen," a paper presented before this society in 1913, "Planning the Power Plant Work," a paper delivered before the Taylor Society, and numerous other contributions describe the nature of my work and fundamental principles more or less at length. Van H. Manning, Director of the Bureau of Mines, recently took the view advocated by me for years. Said he: "The immediate problem is a difficult one. We cannot scrap all out-of-date power plants. We must start by doing the best with what we have. We must begin saving coal at once. The problem is a peronal one. It deals with the human elements. We must reach the man with the shovel."

Mr. Myers presents for discussion two plans. The first one is unfortunately worded so as to create prejudice against it. It reads " . . . . the use of authority to compel coal consumers to execute such measures of economy as the proper authority might prescribe in any given case." It sounds Prussian. But is it? Does it mean imperialistic, arbitrary authority or an authority of an expert based on scientific knowledge of facts, similar to the authority of a doctor prescribing treatment?

TABLE III.—COAL USED ON LAND FOR STEAM PRODUCTION IN PERCENTAGE OF TOTAL PRODUCTION

| Bituminous | % |
|---|---|
| 1. Railroads, item 1, Table II | 28.0 |
| 2. Domestic and steam trade, assume only one quarter of item 7, Table II. | 4.0 |
| 3. Industrial steam trade, item 8, Table II. | 33.0 |
| 4. Steam and heat at mines, item 10, Table II. | 2.0 |
| 5. Total bituminous | 67.0 |
| Anthracite | |
| 6. To steam making | 67.5 |

Hence it may be assumed that 67 per cent. of all the coal produced is used for making steam on land.

To save 10.7 per cent. of the coal consumption necessitates the raising of any combined efficiency of boiler and furnace from that shown under Old Efficiency in Table IV. to the corresponding value under New Efficiency in the same table.

The strength of England, France and even the Central Powers is due to the co-operation in industries. Those who fail to render the service to the common cause are denied the privilege to mismanage their plants. True enough, this co-operation is regulated by the state

and at times compulsory as is conscription or commandeering of productive facilities or commodities. The voluntary co-operation for which we long will come only after the war as a result of new social readjustments. But we cannot wait. The problem is of to-day. To-morrow may be too late.

In other words we must create conditions stimulating voluntary co-operation even under individualistic regime.

The plan therefore means the abolition of privilege to waste fuel in inefficiently conducted plants, by giving priority in coal deliveries to those who prove that they use it efficiently.

At present a wasteful plant gets an excessive amount of coal, while the highly economical one stands an equal risk of being shut down for the lack of coal. If the efficiency is protected by priority, it will work also as a stimulus for the wasteful ones to find means to improve their methods and then ask for a new rating.

Such encouragement of efficient plants, rendering good service to the country and stimulating the inefficient to seek their salvation through the means beneficial to the country can be accomplished along the following lines:

Rating by experts (nominated by the national engineering societies and supported by public opinion and Government) of plants in the indispensable industries who are entitled, because of coal-saving methods in use, to the priority in coal supply.

Receiving of applications by the special service bureau of American Society of Mechanical Engineers, from the low-rated plants for assigning the expert help.

Serving the needs of such inefficient plants by offering services of recognized experts in power-plant management for direction of the work.

Organizing a staff of steam, electrical and combustion engineers, whose members will be assigned to carry out the work in the plants of the applicants under the direction and supervision of experts.

Charging for such services an adequate compensation to cover the expenses involved (salaries, traveling and office) but no profit.

Mr. Myers' second plan, "an educational one, in which patriotism and efficiency would furnish the motive forces required," is in my opinion doomed to failure for the following reasons:

Teaching efficiency by a correspondence-school method will accomplish little good, is incompatible with the professional dignity of this society and lacks the personal touch.

Endless variety of equipment, grades of fuel available, personality of men, nature of load, climatic conditions, etc., make the preparation of "simple instruction sheets for engineers and firemen" impossible and if made they are so general as to be useless. Failure of the Massachusetts fuel board in such an attempt is a joke among power-plant men in this section.

No instructions of real value could be given unless examination of the plant was made. Selling patent medicines curing all diseases ranks with fake only too often not to make one careful.

Keeping records, logs, etc., necessitates instrument equipment and measuring devices; all of this is good only when the data are used and interpreted by a trained man and this is done continually. Too many plants have no instruments at all; most of those that have keep them as ornaments owing to the lack of proper organization.

If the regular employees failed to secure high efficiency it is not because of the lack of "circularized education," but chiefly on account of lack of time to carry on investigations and tests, all the time being absorbed by routine duties; absence of instruments, facilities or encouragement; lack of experience in this highly specialized line of research work.

The education must begin with owners and managers, not with the firemen.

The very principle of "teaching" and "instructions" given to manufacturers and plant owners by the society is undemocratic and un-American. They do not want or need "to get something for nothing." Producing for the country but not without profit they can prefer to pay for what they get if the benefit is commensurate with the expenses.

"Educational" talks and circulars usually degenerate rapidly into debating societies, wasting time needed for deeds.

Any half-measures with good intentions falling short of accomplishing valuable results are dangerous as they chloroform the public conscience, creating a belief that something real is being done while there is little behind the words that make all content.

To sum up, the problem is to be solved by groups and individuals availing themselves through this society of services of those who know how more power can be gotten out of a pound of coal. There is no necessity to compel plant owners to improve their methods since in such a step lies their self-preservation. But there is an urgent necessity from the national viewpoint to conserve the fuel by preventing its waste by ignorance or indifference. The valuation of plant methods to establish ratings for priority in coal deliveries is therefore recommended.

Albert A. Cary: Mr. Myers endeavors to focus our minds upon this panacea in the statement that "the saving or wasting of one-fourth of the coal consumption of our industries depends entirely upon the efficiency of its operating management," and this seems to be the text upon which the balance of his paper is founded.

To secure the desired conservation of fuels in such plants, Mr. Myers advises the services of the expert in operating management. Provided he understands his business, such an expert can undoubtedly secure desirable fuel savings; but results depend largely upon the co-operation he receives from the plant owners and their employees, as well as their willingness to equip plants with the needed apparatus and to use them continuously after the expert concludes his work.

[illegible] PER CENT. SAVING IN COAL

| Old Efficiency Per Cent. | New Efficiency Per Cent. | Old Efficiency Per Cent. | New Efficiency Per Cent. |
|---|---|---|---|
| 44.67 | [illegible] | 62.54 | 70 |
| [illegible] | [illegible] | 67. | 75 |
| [illegible] | 60 | 71.47 | 80 |
| [illegible] | 65 | | |

Saving of [illegible] same output of [illegible] New Efficiency [illegible] Old Efficiency

New Efficiency
and increase of steam production for same coal
New Efficiency — Old Efficiency

| Old Efficiency | | | |
|---|---|---|---|
| 44.67 | 50 | 62.54 | 70 |

To illustrate, I will refer to the plant of one of my clients, the Tennessee Copper Co. By redesigning the furnaces in this plant and adapting them to the fuel used and by substituting machine-fired grates, they have since succeeded in obtaining the same amount of steam with but 64 per cent of the Jellico coal formerly used. This plant, when completed, was turned back to same management that it had before with no further instructions. There were installed facilities for continuously determining the weight of the coal, ash and water used as well as the analysis of the furnace gases.

In another large industrial plant a similar saving in coal was effected. This plant has an aggregate capacity of over 7,000 nominal boiler horsepower, divided into 22 units. It was formerly operated with hand-fired shaking grates for which machine-fired grates were substituted with properly designed furnaces. The plant is now being operated continuously at 150 per cent. rating and is using no more fuel than it formerly did when being operated at two-thirds of its present output. The boiler-room force required to operate this altered plant is less than half of the number of men formerly required. No change has been made in the management of this plant.

Proper furnace design and construction, flue and draft-producing equipment adapted to the use of the particular kind or quality of fuel used is the keynote of the question of fuel conservation.

Furnish the mason with complete instructions for "laying up" the brickwork and properly bonding the interior and exterior walls of the furnace so that the large difference in temperature between the two sides will not, by unequal expansion and contraction, rapidly destroy these furnace inclosures and so waste fuel by infiltration of air.

The selection of material used and its method of erection should never be left to the mason, as it is safe to say that fully 90 per cent of the masons erecting furnace settings are hopelessly un-

coal fed to produce a proper setting. After equipping the plant with proper furnace settings which are adapted to produce the highest possible efficiency with the particular fuel available, the expert in operating management can come into the plant to instruct the men.

To meet the present emergency, I propose that the War Coal Board bring all the firemen in this country under its control by requiring them to take out United States licenses. The various state, county or municipal governments can assist them in this work. The applicants for these licenses must show some qualifications that would entitle them to hold such privileges, but it is doubtful whether it would be possible, at the beginning, to have all these applicants examined before qualified examination boards.

Future applicants should be required to pass an examination before such boards and qualify in a satisfactory manner before receiving their licenses. Any operator of a coal-burning plant (domestic plants, of course, excepted) who operates his equipment without a licensed fireman should be liable first to fines and finally to more severe penalties.

Each license should be issued for the applicant to operate in a definite, described plant and nowhere else. Should the fireman leave this plant for any good reason, rather than for incompetence, he can take his license to the proper authorities and have it transferred to another plant where he has found re-employment.

Should the fireman be found to be incompetent, his license should be revoked and future applications be denied.

Inspectors appointed by the War Coal Board might visit from time to time the various coal-burning plants, and should they find any of them using fuel wastefully, a notice should be served upon the owner. If this is not followed by prompt action to reduce or stop the waste, the fireman's license should be revoked.

The foregoing is proposed as a war measure.

Professor L. P. Breckinridge told of the methods used in Connecticut to conserve coal, stating that meetings were held to which the public was invited, to be told how to burn coal economically in house and power-plant boilers. Norman Reinicker believed that fuel economy was much more a matter of design than education of firemen. E. N. Trump emphasized the value of bonuses to firemen to give incentive for economical use of coal.

## PERMISSIBLE TEMPERATURE OF COAL PILES

THE permissible temperature which a coal pile can be allowed to attain, according to the "Travelers Standard," is 150 degs. F., this having been adopted in a number of cases as a standard and no serious trouble experienced so far as is known.

It is conceivable, however, that there might be an appreciable diminution in the calorific value of the coal if it were subjected to prolonged heating at a temperature approaching 150°, even though actual ignition did not take place. It is therefore recommended that a maximum temperature of 130 degs. F. be allowed, which will probably be safe under almost all conditions.

Under certain conditions a considerable rise in temperature may take place within a short time. A rise of this kind may stop before it reaches the danger point, but, on the other hand, it may continue and result in spontaneous ignition; therefore, if such a rise is observed, steps should be taken immediately to check it. A recent case is illustrative of the conditions that may cause such a sudden rise in temperature. At a certain plant a steam pipe passed through a coal pile, but it was not expected that this pipe would cause any trouble because it was heavily insulated with a covering of 85 per cent. magnesia. Nevertheless, a rapid rise in the temperature of the coal pile was noted (the coal at this particular plant being under close observation for the purpose of detecting possible heating), and thereupon the steam was shut off before the danger point was reached.

## STEAM TURBINES v. DIESEL ENGINES

IT is sometimes remarked as a curious fact that the Diesel engine, whose fuel is oil, finds little favor in the oil regions of the United States. The explanation is, of course, that where fuel is cheap, the most economical type of power plant is one which entails the lowest first cost and the lowest maintenance charges rather than one which can show the highest thermal efficiency. This is one particular instance of the way in which the various factors which determine the choice of a prime mover vary according to the locality and to the conditions of each separate case. Another consideration, which may in extreme cases become decisive, is the load factor of the plant. Obviously, if a power plant is to work only intermittently, the extra capital charges on a highly efficient plant may easily outweigh the saving on the fuel due to the greater efficiency.

The cost of water is another factor in the equation. As between the Diesel engine and the steam turbine scarcity of water will sometimes turn the scale in favor of the Diesel, even when other weighty factors are against it, since about twelve times as much water is required for condensing purposes with steel turbines under general conditions as is needed for jacket cooling with a two-stroke Diesel engine, while four-stroke engines need only one-twentieth the water. In a paper read before the American Institute of Mining Engineers, Herbert Haas sums up concisely the economic considerations governing the choice between steam turbines and the Diesel engine in Western America. Where fuel is dear and the load factor is high, the Diesel engine has the pull; where contrary conditions exist the steam turbines come out the best except where the instant readiness of the Diesel engine gives it preference, and installation cost is of secondary importance. Here it is necessary to balance the cost of keeping boilers under steam continuously against the difference of interest charges of steam turbine and Diesel engine plants. For power plants erected at the source of the fuel either on the oilfields or at the coal mines prime movers will be selected costing least to instal, i.e., steam turbines, since fuel expenditure will weigh less than interest and redemption charges.

In many cases combination plants using Diesel engines for supplying power continuously against the constant main load, and steam turbines for furnishing periodically occurring peaks by the same use of high duty boilers with large water and steam spaces, capable of being forced when necessary, will prove most profitable. Up to capacities of 1,000 horse-power steam turbines can compete with Diesel engines only in special cases, such as supplying exhaust steam for heating purposes. For such small units, particularly for greatly varying loads, reciprocating steam engines are preferable. For larger plants than from 1,000 to 10,000 kw. capacity careful analysis must be made of the relative advantages of Diesel engines and turbines, a knowledge of the load factor, fuel prices, and water conditions being necessary. For power plants larger than 10,000 kw. using units from 6,000 kw. upward steam turbines have the preference, unless a combination of high load factor, high fuel cost and poor water conditions favor a Diesel plant.

## OILING MACHINERY

INSTEAD of going over machinery with an oil can in hand it is now possible to oil it automatically. Geo M. Rogers, of Chicago, has invented an oiling apparatus which is operated by electricity and which can be put to work at any time by setting the mechanism just as one would set an alarm clock.

The oiler has a cup with an oil-feed opening in the bottom. An oilfeed pipe is connected with the cup and a plunger rod is so arranged that it gives vertical movement in the cup. A valve fitted at the lower end of the plunger fits the opening when the plunger rod is lowered. A guide pin extends downward from the valve and a gasket adapted to bear on the bottom of the cup when the plunger is lowered is arranged under the valve. The valve and plunger are operated by electricity.

If it is desired, an electric light may be included in the circuit which operates the oiler so the attendant may be able to watch the operation.

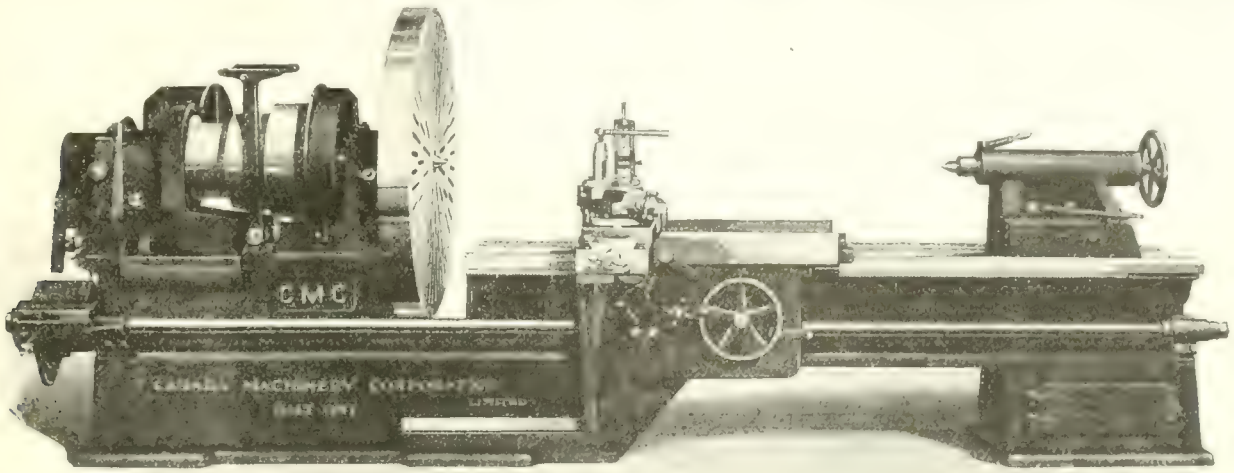
WITH universal grinding machines, which are relatively light and frail in construction, a wheel of narrow face is always used and is most satisfactory. On modern machines, of more massive construction, wheels of wider face may be used, and a greatly increased production thereby secured.

# PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

## 26 in. QUICK CHANGE GAP LATHE

AN improved gap and gap plate permitting the large face plate and thin work to swing without removal of the plate, a bed of unusual weight and strength, and a saddle having a bearing on the flat surface inside the front vee in addition to the two vee bearings are outstanding features of the gap lathe illustrated in the accompanying engraving and built by the Canada Machinery Corporation, Galt, Ont.



26 IN. QUICK CHANGE GAP LATHE WITH DOUBLE BACK-GEARED HEADSTOCK AND CONE BELT SHIFTER

The three-step-cone double-back-geared headstock is fitted with a large diameter spindle (front bearing 4⅜ in. by 8¾ in.) equipped with split phosphor bronze bearings having large oil wells. Special high carbon spindle steel is employed, and a 2⅛ in. hole is drilled throughout its length from the solid, while the bearings are ground to size. The extra wide steps on the cone enable large belts to be used, insuring ample power for the size of lathe.

Box section cross ribs brace the bed, which is provided with three vees of liberal proportions. The headstock and the tailstock each rest on one vee and one flat urface, while the saddle bears on two vees and also on the flat surface. The brackets attached to the bed are tongued and grooved in position.

The feed (5 to 160) and screw cutting changes (2 to 64) are obtained through quick change gear, the required positions of the lever being shown on an index plate. The thread on the lead screw is intended for screw cutting only and provision is made to prevent the engaging of either the automatic cross feed or longitudinal feed when the machine is set for screw cutting, or vice versa. The feed reverse lever is located on the apron, and the lead screw is reversed for right or left hand threads by reverse plate on the head.

The saddle is particularly substantial, has great strength in the bridge and has supporting strut resting on machined slide on bed for use when facing large diameter. A thread chasing dial for indicating thread engagement points avoids stopping the lathe when screw cutting, while the handles of the cross feed and compound rest screws are graduated in 5/1000's and 1/16's of an inch. The base of the compound tool rest is graduated in degrees.

The tailstock, of heavy design, is shaped so as to afford ample clearance for the compound rest when set at right angles. The spindle (3⅛ in. dia.) is graduated in fractions of an inch for boring, and set over adjustment is provided for taper turning.

Standard equipment includes countershaft with two friction pulleys and shifters, special cone belt shifter, follow rest, steady rest, one large and two small face plates and necessary wrenches. Special attachments such as taper attachment, turret on the bed or saddle, turret tool post, etc., can be supplied.

Motor drive is also provided for, either direct by variable speed motor or through an all geared head by constant speed motor on single pulley.

This lathe is furnished in both 26 in. and 32 in. sizes, having principal dimensions respectively as follow: swing over gap 46 in. and 52 in.; width of gap clear of face plate, 18 in.; swing over saddle 17½ in. and 21 in.; distance between centres, 10 ft. bed, 4 ft. 6 in. and 3 ft. 4 in.; width of belt, 5½ in. and 6 in.; weight of machine 10 ft. bed, 7,030 lbs. and 9,400 lbs.

## MULTIPLE SPINDLE CHUCKING MACHINE

THE machine shown in the accompanying engraving is a recent product of the New Britain Machine Co., New Britain, Conn., and although designed to handle much of the same variety of work as the regular single head automatic machine, exhibits two main points of difference, viz.: (a) The work is held and revolved by the spindles, the tools being fixed in the tool slide; (b) The use of cross slide tools is thus rendered possible, a feature lacking in the regular type in which the work is held stationary.

The spindles (six in number) are of liberal diameter, hammer-forged from chrome nickel steel, heat treated, hardened and ground, and run in bronze bearings of ample proportions, ground straight inside and taper outside, thus providing means for taking up wear without disturbing the alignment or original accuracy of the machine. Ball thrust collars are provided on all six spindles for taking care of the end thrust due to tool pressure, this arrangement resulting in a thirty per cent reduction in the power required to drive the spindles.

Five rates of spindle speed and twelve variations of feed are provided by means of change gears.

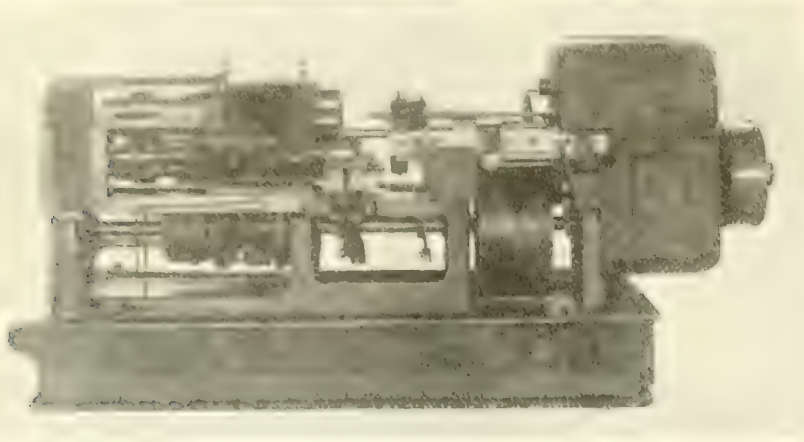
The spindle cylinder is heavy in design and is housed in a split housing with a loose cover permitting easy access to spindle-hearing adjusting nuts. The indexing mechanism, patterned after the Geneva motion, gradually accelerates the heavy spindle cylinder at the time of indexing, and as gradually checks its motion without shock, final accuracy in indexing being insured by means of an extra wide rectangular

ential (hurry-up motion) which indexes the spindle cylinder and operates the finished cutting, is regularly fitted to this machine. The spindle cylinder is always indexed at constant speed irrespective of production and spindle speed.

and at the feed cam is taken by a hardened steel roll fixed to the frame and bearing against the edge of the drum.

Standard tools, drills, reamers, etc., are used the direction of spindle, rotation being right handed.

A quiet, smooth-running machine results from the cutting of most of the gears by the generating process and



MULTIPLE SPINDLE CHUCKING MACHINE

Draw-in spring collars of special design are employed, operating satisfactorily where pieces do not show a variation exceeding 1-32 in. in diameter. If there should be a greater variation than this, parts should be sorted into lots and the spring chucks adjusted to each lot. The machine is regularly equipped with a hand wheel for operating the spring chucks for holding work, but when desired the machine may be equipped, special, with an air-chucking attachment provided with a cylinder of large size insuring successful operation on low air pressure. This device makes chucking a simpler, easier, and quicker operation, resulting in the acceleration of production where the operations are short.

For the better protection of the operator, the spindle is automatically disconnected from the drive during loading and unloading. A threading attachment may be installed in the fourth tool slide position and for work which is to be handled by means of a chucking lug and which requires no threading, the machine may be arranged to index in the opposite direction (clockwise), thus bringing the finished article to its final position opposite a cross slide which may be fitted with a cutting-off blade.

The tool slide is of extremely rigid construction and is so designed that the thrust of the work above and below the center line is evenly balanced, thus eliminating any cramping strain upon the tools. The tool slide cam, being laminated in a similar manner to a leaf spring, one cam, through its adjustment, is sufficient for all lengths of work within the capacity of the machine. The cam shaft is driven through a large internal gear on the inner circumference of the feed cam drum. The thrust of the tool slide from the absence of all chains and bevel gears.

Hand control levers on each side within easy reach of the operator enable the power feed to be instantly stopped or started. These, in connection with a hand feed crank for testing all feed movements and tool positions, are valuable features avoiding breakage in setting up, testing and adjusting tools.

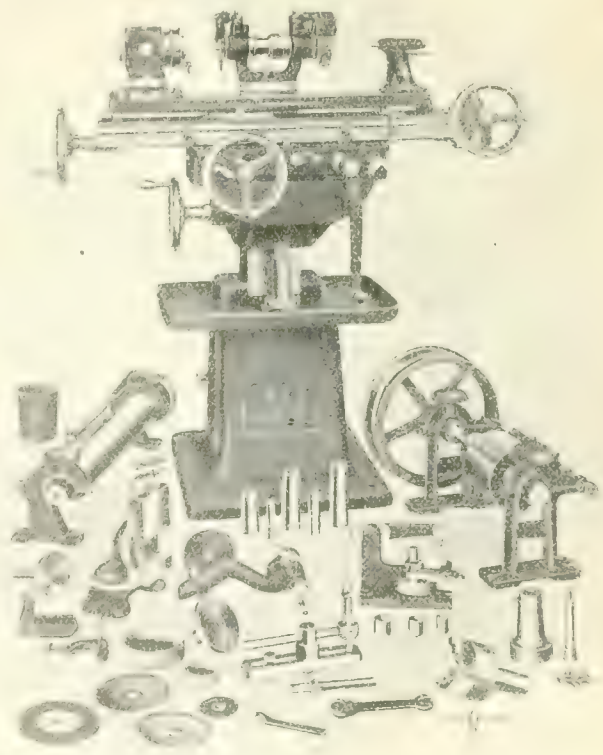
The elimination of much of the exterior piping for the oil distributing system is accomplished by conveying the oil through the underside of the toolslide into a chamber at the centre surrounding the driving shaft bushing, from which it is tapped off at intervals through short tubes to the individual tools. The oil pumps runs at constant speed.

The base, forming the chip pan, extends to the floor, thus dispensing with legs, and the broad foundation thus obtained, together with the stiff construction and ample weight of the machine, tends to prevent vibration, and insure smooth, accurate work. That portion of the bed directly beneath the work has a 45 degree slant toward the rear of the machine so that the chips are carried to the side as they are cut off. The chip pan is widest on the rear side, and slopes toward the rear end where there is an oil well and strainer, from which the oil is pumped and distributed to the work. This construction permits the draining off of the oil before the chips are removed and makes it possible to rake out the chip pan without stopping the machine or removing the splash apron.

Machines may be equipped with either belt or motor drive.

## CUTTER AND TOOL GRINDER

THE cutter and tool grinder, shown in the accompanying engraving, when furnished as a universal machine and equipped with attachments for gear cutter, cylindrical, internal and surface grinding, will grind all work that comes to the toolroom such as jig bushes, straight edges, snap gauges, slitting knives, reamers, rose bits, formed tools, etc. The design of the machine is such that unusual rigidity is obtained, while convenience of handling and accuracy of operation have been studied in the arranging of handwheels and levers. The machine is constructed with a heavy pyramidal base having large floor bear-



UNIVERSAL CUTTER AND TOOL GRINDER WITH COMPLETE OUTFIT OF ATTACHMENTS, ETC.

ing, to which the column is bolted. The column is of substantial box section and its front face is provided with dovetail slide to which the knee is gibbed, thus overcoming inaccuracy such as may arise where operating parts are swivelled around a column of small diameter.

The box form knee is closed in on top and bottom, affording maximum resistance to all torsional and bending strains, while a solid and accurate bearing during the life of the machine is assured by an adjustable tapered gib. The saddle slide on the top of knee has broad vees 16 inches apart giving unusual support against rocking of the saddle, while extensions of the saddle bearings protect the vees from dust in all positions.

One long straight bearing aligns the slide to the saddle, with full length dovetail taper gib. Both "degree" and "taper" per foot" graduations are provided, the taper adjustmemnt being operated by a fine thumbscrew in front of table.

Ample bearings support the table in the middle and both ends. When grinding at right angles to wheel it is unnecessary to swing table beyond end supports, as the wheel head swivels on column 180 degrees on either side. The spindle is hardened and ground and runs in dust-proof taper bronze bearings with adjustment for wear carried in a heavy head.

Fast and slow longitudinal feeds are obtained instantly by lever in front of saddle, the fast feed operates by long lever either from front or rear of machine through rack and pinion, and slow feed operates by large diameter hand wheels on both ends of table through screw and half nut. Ball bearings on the slow feed mechanism insure smoothness of operation and avoidance of chatter on work.

Cross feed is operated by large diameter hand wheels either front or rear of machine, and vertical feed by handwheel on side of knee. All [illegible] bearings and all feeds have micrometer dials.

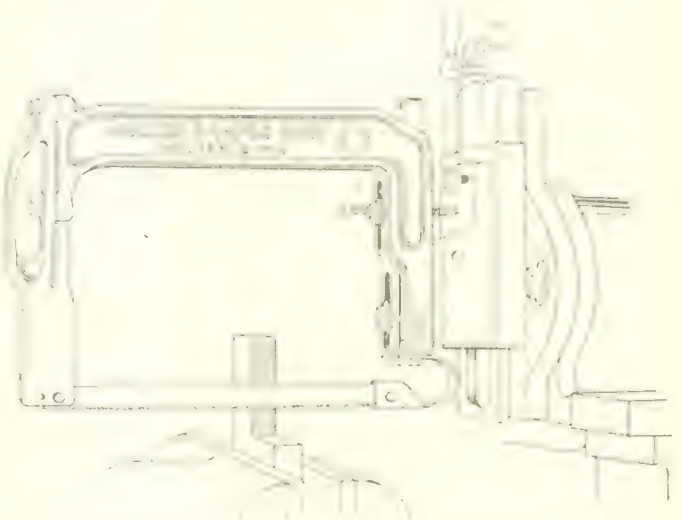
A special type of universal tooth rest is furnished having two blade suports, one flexible for use with straight fluted reamers and cutters, and one rigid for spiral fluted mills, hobs and similar work. Provision is made on the wheel head as well as on the work head for fastening the tooth rest either above or below the work to be ground, thereby giving the operator the option of grinding the tool with the grinding wheel revolving either against the cutting edge or away from it.

The illustration shows the drum countershaft for cylindrical grinding attachment, internal grinding attachment, and attachments for surface grinding and gear cutter grinding, also regular type of countershaft supplied.

This machine is the product of the Oakley Machine Tool Co., Cincinnati, O., and its range covers 17 in. longitudinal movement, 10½ in. vertical movement, 9 in. cross movement. Net weight of plain machine is 1,175 lbs. and of universal, 1,290 lbs.

## SHAPER SAW

THE accompanying illustration shows an attachment whereby the ordinary shaper may be converted into a power hack-saw, thus making it into a general utility tool of considerable adaptibility and usefulness. The combination of hacksaw and shaper possesses the advantages of: (a) powerful variable stroke; (b) variable speed range for different qualities of stock; (c) positive feed without dropping in changing wall thickness or at the end of the cut; and (d) the universal grip on articles afforded by the shaper vise and table.



SAW FRAME ATTACHMENT FOR USE ON SHAPING MACHINES.

The use of the entire blade and the securing of uniform wear throughout its length is ensured by the easy adjustment of the shaper ram as regard length of stroke and position in relation to the work on the shaper table or in the vise. This attachment may also be used where work of a large or bulky nature, which could not go in a milling machine, is to be sawn.

The saw frame is made in two parts, an adjustment shoe being provided for the purpose of tightening and aligning the saw blade. The frame is held in position by a screw entering a nut block inserted in the tool post block, or clapper of the shaper. The saw is held in position at the shaper end of the frame by a guide spring which by allowing a certain amount of oscillating movement prevents the blade from breaking.

A set screw with a five inch limit provides for the adjustment of the tripping motion of the saw and also provides a means of making the frame rigid with the shaper ram if desired. The frame has a 9 in. clearance to the cutting edge and can be fitted to shapers with a 16 in. to 24 in. stroke. The device is the product of J. A. Moller, New Rochelle, N.Y., who makes it in two sizes, No. 14 measuring 12 in. x 17 in. overall which takes 14 in. by 1 in. by 1/16 in. blades, and No. 18 measuring 12 in. x 21 in. overall which takes 18 in. by 1 in. by 1/16 in. blades.

## SCIENCE AND WAR HORRORS

THE necessity for arousing mankind, and especially that portion of it concerned with engineering progress and applications of science, to the danger attending the conscienceless development and utilization of the powers placed at our disposal by science was emphasized in the address of Dr. Ira N. Hollis on the occasion of his retirement from the presidentship of the American Society of Mechanical Engineers.

"Unless some conscience is aroused that science is not to be used against man, but for him, then it will never be safe for this world," said Dr. Hollis. "It is our task to assist in making the world safe against the forces that we have unloosened, so that the century may not close with a total failure of the civilization of Christian races. It is we who have developed the application of science, and it is we who are using it to destroy one another, forced into the struggle by the rulers of a nation that knows no right except might, and no mercy except that which is taught them by the sword.

"The twentieth century is still young, and we do not yet know what it will represent to the future historian. Will it be the debauch of science or will it mean a new birth to Christianity? It is the engineers' task to decide this. There are two tendencies; one towards greater comfort and luxury, and one towards greater service. The first can plunge us only deeper and deeper into war for the control of a commercial output. It can only bring us more firmly under a governing class devised either by birth or by commercial success. The second means the complete emancipation of the individual trained to think of service as the chief source of good government and happiness in life. The only theory that will hold men together is that of service."

IN grinding gas engine cylinders on the cylinder grinding machine, it is customary to run water through the jacket, or over the outside of the cylinder to maintain an even temperature. The purpose of this is to keep the cylinder from changing shape on account of heating up and to make it possible for inspectors to properly guage the cylinder an hour or a day after it has left the machine. Water is not used in the hole where grinding is being done as the machine works more satisfactorily grinding dry than wet.

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## FUTURE INTERNATIONAL TRADE

THE British Government is considering legislation designed to frustrate future German attempts to control the metals of the world; members of the Chamber of Commerce in Paris have banded themselves together to secure due recognition and utilization in France of French manufactured goods through the medium of a national trade-mark; the United States will soon be in possession of a mercantile marine which in post-war days will be a splendid counterfoil to German overseas trade activity, and Canada is following the lead of her big neighbor in a manner which not even Germany will be able to ignore.

The ultimate effect of all these developments on the international trade of the world can and must be anticipated as far as it lies in our power to do so. Germany realizes that, whatever governments may or may not do, the commercial powers of the various countries will not, during the life of the present populations, consider, let alone accept, overtures from Hun merchants. Her resentment at this certainty is evidenced by the commercial organ, Berlin Tageblatt, which says: "As far as Germany and her allies are concerned, we shall have to insist at the peace negotiations that discriminatory laws like these, which can only lead to endless reprisal legislation and must result in poisoning the whole economic atmosphere, are abolished by the treaty of peace."

The peace negotiations, however, are not yet, and when they do arrive the chances are that Germany will crave instead of insisting. If one cares to examine the list of peace conditions which Germany was prepared to offer France in the early months of the war, it will be found that complete control over France's fiscal policy for a term of twenty-five years was one of the long cards in the game. Why, therefore, should Germany object to the Allies controlling only their own policies—they will not need to care about Germany's?

Self-protection is the first law of nature; it was also Germany's national motto, plus subjugation or destruction of competitors.

Self-protection, minus the diabolical appendix, has been forced on the nations of the world, and that which has been learned in the heat of battle and ground into our flesh and blood will not only be remembered, but must be amplified, developed, yea worshipped, as the chief end of each nation, firstly to itself, that it may care for its defenders and recover from the struggle, and secondly to its companions in arms that their brotherhood in the struggle may be cemented in the days of peace to come, beyond all hope of future severance.

The attitudes of the various countries are peculiarly typical of their national temperament. Britain prepares a bill, not to create a monopoly, but to prevent future attempts in this direction by our present enemy. France, more virile and intensive, proposes the adoption of a national trade-mark, the use of which will be necessary by every French manufacturer, so that all products not bearing it will be recognized as either imported or manufactured by other than French makers in France. The exclusion, in addition to applying to goods not entirely made in France, is seemingly also directed against those made in France by other than French capital and labor.

The rapid development of this national sentiment is shown by the decision of L'Exportateur Francais, a leading trade paper which will not accept any advertisement nor open its columns in any form to any manufacturer who does not belong to the trade-mark society.

Former abuses of commercial hospitality by German interests are now exerting the inevitable recoil effect and in trying to dodge the eternal law of action and reaction they are already planning subterfuge and misrepresentation, through the conveniently neutral Sweden, but their evil genius has followed them there and the adoption of a national trade-mark similar to that of France is actively urged in that country.

In the address which R. J. Younge delivered recently before the Manufacturers' Association, the problems awaiting our industrial leaders are effectively enunciated. "How," he asks, "are we as a nation going to meet our national obligations after the war, unless we build up a balance of trade by greater production and wider markets? ....All this progress will be in vain unless we can gather it up and nationalize it."

## CANADA'S FUEL CONTROL ORDER

THE recent order of the Dominion Government suspending the operation of manufacturing plants for three days and the further restrictions placed upon theatres, clubs and other places of amusement brings home to the people of this province our dependency upon the United States for our fuel and also calls attention to the urgent need of conserving what fuel we have. It is needless to add that every manufacturer or other user of power, large or small, has a very clearly defined duty to perform in this regard.

Proper firing, clean boilers, well lagged steam lines and all other improvements effecting economies in various ways, not only are directly to the manufacturers' advantage but are of direct intrinsic value to the country at the present time.

According to first reports the Canadian order goes considerably farther than the American in some respects in that all munition plants must close for the three days.

# INDUSTRIAL NOTABILITIES

EDWARD GIBSON MACK, managing director, Crouse-Hinds Co., of Canada, Ltd., electrical manufacturer, Toronto, was born in Auburn, N.Y., March 19, 1887, son of Edward G. and Martha Reed (Coe) Mack, and attended high school at Syracuse, N.Y.

In 1900 he entered the employment of the Crouse-Hinds Co., Syracuse, as office boy, and worked through the various departments of the business until

EDWARD GIBSON MACK

1904, when he became traveling representative for the company for the eastern part of the United States and Canada; this he continued until 1910, and in 1911 came to Canada and organized the Crouse-Hinds Co., of Canada, Ltd., of which he was appointed managing director.

Mr. Mack was elected member of executive council (electrical section), Toronto Board of Trade, 1918, and is also member of Canadian Manufacturers' Association.

He married Marian Ward, daughter of John F. Ward, St. Paul, Minn., August 20, 1913, and has one son.

His clubs are National; Lakeview Golf; Parkdale; Canoe (Toronto); Citizens'; Amherst Athletic; Anglers' Fishing (Syracuse, N.Y.). His societies are: Electric Jovian Order and Electric Club (Toronto); A.F. & A.M. (Central City Lodge); Elks (Syracuse).

Fishing, hunting and motoring are his principal recreations. He is Presbyterian in religion.

Mr. Mack's residence address is 265 Glenlake Avenue, West Toronto, Ont.

# Three Day Close-Down Order for Ontario and Quebec

*Fuel Controller Issues Order After Consultation at Washington—Further Orders Expected if Necessary—Munition Plants Included—Iron and Steel Trade Still Affected by Weather—Spelter Prices Fixed in United States.*

The fuel regulations, while being in a measure drastic, will help considerably to relieve the fuel situation which has become acute. Only Central Canada is affected by the order as this is the section of the country which obtains practically all its fuel from the United States. The saving in coal during the three days February 9, 10 and 11 will be considerable and the railways will be able to concentrate on the movement of fuel. The continued severe weather is making railway operating extremely difficult and the movement of freight is slow. Deliveries of materials of all kinds are hindered by the congestion of freight in the yards and at the border, with the result that many industries are handicapped by the delay in receiving raw materials and in shipping the finished products. The coal situation as a result of these conditions continues acute while coke also continues in short supply. Foundries and furnaces are in need of coke and capacity operation is impossible under prevailing conditions. The steel plants likewise are suffering by reason of the coke shortage and the cold continues to curtail production. Conditions prevailing in the United States in this respect are much the same as in Canada. Production of iron and steel has fallen off while the demand is as insistent as ever. As a result of these conditions the available supply of steel and iron has diminished, leaving a comparatively small tonnage for consumers not working on war orders. The scrap metal market is dull and business quiet. Prices of copper and brass scrap are easier but heavy melting steel and cast iron scrap are firmer at a slight advance in prices. The price of grade "A" spelter has been fixed by the War Industries Board. Apart from this there has been no development of particular importance in the non-ferrous metal markets. Tin continues very scarce at nominal quotations, while the copper market is a routine affair. Prices of machine shop and mill supplies are keeping very firm and business is good. Some lines are in short supply on account of the raw material situation. The machine tool business is fairly active, the demand being principally for equipment for munitions plants.

TORONTO, Ont., Feb. 5.—The fuel regulations ordering a general closing down of factories and munition plants next Saturday to Monday inclusive will cause considerable loss to the concerns involved, but the situation has become so acute that something must be done. The continuous severe weather has badly handicapped railroad operations and increased the already severe traffic congestion, with the result that the movement of coal from the border has not been sufficient to take care of pressing requirements. It is estimated that in Toronto alone the saving of coal will be about 5,000 tons. The fuel regulations apply to Central Canada, from Fort William, Ont., to Riviere du Loup, Que.

### Steel

Conditions in the steel trade continue unfavorable owing to the severe weather which has prevailed for several weeks. The railways have been badly handicapped by the low temperatures, and the yards are still congested, with the result that shipments are coming in slowly. For this reason there is no improvement in the coke situation, which continues acute, and the shortage is interfering with the manufacture of steel, and relief cannot be expected in this quarter until the supply of coke is materially increased. The cold weather is also interfering with manufacturing operations at the steel plants, restricting production considerably. Adverse operating conditions will likely prevail for the balance of this month. The demand for steel for commercial purposes is showing some improvement, but deliveries have been retarded by the freight congestion. Conditions in the trade in the United States are such that steel is even more difficult to obtain than was the case a few weeks ago. Production of steel has declined on account of the severe weather, but the demand is as insistent as ever. The mills consequently are getting behind on deliveries. The freight embargo and the fact that deliveries are in a chaotic condition is still the main topic of conversation in the steel industry. New business is being held in abeyance until the situation shows signs of clearing. War orders, having first call on the available supply of steel, are consuming a greater part of the material being imported, leaving a comparatively small tonnage for ordinary consumers.

No further statement has been given out regarding the proposed increase in the production of steel in Canada. It is understood that plans are being made to utilize the full capacity of the steel plants and ultimately increase the output when satisfactory arrangements have been made in regard to securing ample supplies of raw materials. Little progress can be made in this direction until the spring, when operating conditions will be more favorable. The labor situation will also have to be investigated, as an increase in supply will be necessary to meet the demand arising out of the new conditions. There has been no official confirmation of the contract which the Canadian Car & Foundry Co. is said to have secured for freighters to be built at Fort William for the U. S. Government. It is reported that the whole of the material for the contract has been arranged for with the U. S. Government, and that construction will commence in May. There have been no price changes announced this week and the market is firm.

Under the new regulations steel plants and foundries will have to close down next week-end, Saturday to Monday inclusive. This will mean that production will be further curtailed for the time being, although it may relieve the situation later. The output of the Nova Scotia Steel & Coal Co., for the fourth quarter, 1917, shows an increase in production of ore and limestone and also finished steel and forgings, but a decline in coal, coke and steel ingots. The following are the figures in tons for the quarter ending Dec. 31:—Coal, 135,273; ore, 36,111; limestone, 19,513; coke, 18,850; pig iron, 21,304; steel ingots, 29,216; finished steel and forgings, 25,199.

The T. Eaton Co. has awarded the contract to the Dominion Bridge Co. for 8,000 tons of structural steel for a mail order department building which is to be erected near the harbor front in this city. This is additional to the contract for 20,000 tons for the retail store at Yonge and College Streets, held in abeyance until after the war. The Dominion Bridge Co. and McGregor & McIntyre, of Toronto, participate jointly in a contract calling for 1,800 tons of steel for a shipbuilding company.

### Pig Iron

The situation in the pig iron market is worse rather than better, conditions not having been improved by the severe weather, which is preventing the free movement of coke to the furnaces. Production has consequently been considerably curtailed and the furnaces are getting behind on their orders. Canadian consumers are buying iron from the United States; among these are included makers of agricultural implements who are buying in limited tonnage for foundry use. The situation across the line shows no improvement, and a number of furnaces are still banked due to lack of coke. The continued cold has done much to counteract the relief which would have resulted from the five-day suspen-

sion order. Foundries and other plants not working on war orders are practically unable to get iron.

### Scrap

The market continues dull, with a small volume of business. The outlook in the trade is still somewhat unsettled, due to conditions in the States, where new regulations are anticipated following a reorganization of the sub-committee on scrap iron of the American Iron and Steel Institute. Prices of copper and brass scraps are a shade weaker, but only the latter have declined in the meantime, new brass cuttings and No. 1 brass turnings being down 1c. Heavy melting steel and machinery cast iron, on the other hand, are firmer, and have advanced $1 a ton. The railway situation is discouraging all attempts to do business, as shipments are constantly being held up for indefinite periods.

### Machine Tools

The machine tool market is fairly active, the demand being principally for equipment for munitions plants, although a few orders have been received by local dealers for machinery for general purposes. The report that a shipbuilding plant will be established at Fort William has created considerable interest in machine tool circles, although no official statement has yet been made The Dominion Shipbuilding Co. is looking around for equipment for its new plant at the foot of Spadina Avenue. This concern will participate in the contracts for ships under the new Government scheme. In the States there is great activity in the machine tool trade, which is affecting deliveries in equipment destined for Canada.

### Supplies

Business in machine shop and mill supplies continues brisk, due principally to the activity in the munitions industry. Prices are very firm, with an upward tendency, due to the lack of raw materials, which is also creating a shortage of a number of lines, particularly on those imported from the States. Dealers have to place orders considerably ahead to ensure getting the goods when required.

### Metals

The non-ferrous metal markets are as a rule quiet and devoid of any outstanding feature of interest, except perhaps that the prices of zinc have been fixed by the U. S. Government, although the figure has not yet been given out. The copper market continues a routine affair, while the shortage of tin is still acute, with no relief in sight. Lead is firm, and some scarcity has developed. Antimony is firm, but aluminum is easier. Solders have advanced.

**Copper.**—The copper market is dull, but prices have shown no indication of going below the price fixed by the Government, and it is believed that if there should be an advance in the fixed price there would be very little copper for sale. The production situation is not as satisfactory as is desired, as there is not any enthusiasm for new development or for extension work. It is said by copper men that the rising cost of doing business, including the higher taxes, and the fact that the selling price is limited, has so reduced the probable profit that new capital cannot be attracted to any work in the industry that requires taking more risk than the average in other lines of business. Lake and electrolytic are unchanged at 29c and casting copper at 28c per pound.

**Tin.**—There is no improvement in the tin situation, and the shortage continues acute. In New York the trade is demoralized, as all arrivals and also tin in store are commandeered by the Government. There are no spot supplies of tin available, so no spot market can be quoted. The outlook is not favorable either for lower prices or ample supplies. The situation is thus very uncertain. Prices locally are entirely nominal at 80c per pound.

**Spelter.**—It is reported that the War Industries Board has fixed the price of grade "A" spelter at 12c, but this has not had any effect upon the general market, which has been left to establish its own prices. The demand is light and prices steady at 9½c per pound.

**Lead.**—The market is firm and scarce in the East, due to congestion of traffic. The scarcity is, however, temporary, as an improvement in the railway situation will relieve the tight conditions in the market. The "Trust" price is unchanged at 6.75c New York. Lead is quoted locally at 8¾c per pound.

**Antimony.**—The market is quiet and business dull. Antimony is unchanged at 18c per pound.

**Aluminum.**—The market is very dull, there being more buyers than sellers. Aluminum is quoted locally at 60c per pound.

**Solders.**—Prices of solders have advanced on account of the tin situation, guaranteed being quoted at 44¼c and strictly at 40½c per pound.

### CANADIAN GOVERNMENT PURCHASING COMMISSION

**The following gentlemen constitute the War Purchasing Commission appointed by the Canadian Government: Hormidas Laporte, Montreal, chairman; George F. Galt, Winnipeg; William P. Gundy, Toronto. Thomas Hillier is secretary, and the Commission headquarters are at Ottawa.**

## Sydney

SYDNEY, N.S., Jan. 31.—The settlement of the wage disagreement between the operators in the Sydney district and the A. M. W. of N. S. is still in abeyance pending the result of negotiations between the men and the committee sent to Cape Breton by the Minister of Labor, namely, Senator Robertson and Mr. J. C. Watters. An amicable arrangement is, however, looked for, and there is not any likelihood of a stoppage of work.

Outputs recovered somewhat towards the end of the month, helped by a spell of fine weather. The production of the Dominion Coal Company's mines in January reached 270,000 tons, comparing with 236,000 tons in December, and with 318,000 tons in January, 1917.

### Disasters Reduce Output

Another disastrous mine explosion is to be recorded. The Allan shaft mine of the Acadia Coal Co. exploded at 5.30 p.m. on Jan. 23. Nine men escaped, but the remainder of the men down the pit, to the number of 88, lost their lives. About half the bodies still are unrecovered, and the operation of restoring the mine has been hampered by heavy falls of coal and by the rising of the mine water, due to breakage of the pipes and stoppage of the electric pumps. No reliable explanation of the cause of the disaster can be given until full exploration of the workings is possible, but from indications observed it is thought the proximate cause of the explosion was a "bad shot," probably aided by dust. The Allan shaft is sunk on the Ford seam, which attains a thickness of 40 feet, and which like all the Pictou seams is very gaseous. Although the Ford seam is unusually thick, it is not as stated in all the Canadian newspapers, the "largest coal seam in the world." There are much thicker seams in America, and very much thicker seams in China.

The Ford seam has been the scene of numerous fires and explosions, and not far from the present disaster an explosion occurred in 1880 which caused the death of 44 men. The most recent explosion has caused the second greatest loss of life in mine explosions in Nova Scotia, and is greater than the Waterford explosion of last July, in which 65 men perished.

The Acadia Coal Co. also have a fire in the Albion mines, which has necessitated the closing of that colliery, and this company now has only one colliery in operation. As a result the coal shortage will be still further increased, and the future output of coal in the province will be decreased, not only by the immediate loss of the workings affected by the explosion and the fire, but by the loss of the productive labor of the 88 men killed. It may be pointed out that the combined loss of life in the Waterford and the Allan shaft explosions represents the loss of productive labor equivalent to 140,000 tons of coal per year and, in the present state of the labor market, this is a permanent reduction of output for the further duration of the war.

A coroner's inquest is in progress on the victims of the disaster, and it is expected that a technical departmental inquiry will be instituted by the Nova Scotia Department of Mines.

## Washington

WASHINGTON, Feb. 2.—Dr. Garfield's coastle fuel order now seems in a fair way to be repealed. The order which has closed down thousands of manufacturing plants in the United States has been the object of such persistent protest that it now appears that it will be revoked.

Fuel Administrator Garfield and Director General of Railroads McAdoo have held several conferences on the matter and have issued a public statement indicating that they are about to repeal the order. Public protest is not the reason which will be given officially for the withdrawal of the order, when it comes, however. Both McAdoo and Garfield have declared that the effects of the order have been so satisfactory that it will not be necessary to continue it longer.

### Fuel Order Improves Situation

It is generally admitted that the fuel and transportation situation in the United States is much better to-day than it has been for more than a month, and this in the face of the fact that weather conditions have been more severe during the past three weeks than they have been for several years. Coal is now moving to the industrial centers with greater freedom and freight—priority freight—which has been piled in warehouses is beginning to move. This condition is due partly to the embargo which Director General McAdoo placed on all non-essential freight on the two big systems in the Eastern States, the Pennsylvania and the Baltimore and Ohio.

Drastic orders concerning the consumption and distribution of coal which have been threatened from the Fuel Administration will not be put into effect if the closing order is revoked. The Canadian coal supply has been the cause of controversy among manufacturers in the United States who have had their supplies cut off. Movements to secure a closing order in Canada have lost their weight and there is little likelihood that they will ever be presented to the Canadian government in the light of present developments.

### Shipbuilding Prospects

The shipping program of the United States is shrinking daily. Difficulties which are arising from time to time make it more and more certain that the original shipbuilding program adopted by the United States will never be accomplished. The labor situation is growing more serious and shipyard workers are becoming more and more scarce.

A total tonnage of three million tons is the estimate of production now most generally accepted by conservative and well informed men in the shipping industry. All estimates above this are now being discounted. It is predicted by old shipbuilders that the fabricated steel [illegible] seriously and that the difficulties which will arise with this failure will cause a considerable shortage in the estimates of the Shipping Board.

Concrete ships are to be experimented with by the United States government. Congress will be asked to make an appropriation to build and test concrete ships. Roy Robinson, a Chicago contractor, who has made a study of the concrete ship, has presented a report to the Senate Commerce Committee which has convinced that body that the plan is not only feasible but sound. They will ask Congress to give the project the proper support in the way of an appropriation.

It is declared that the concrete ship production can greatly increase the tonnage which is now in sight and that production of this type of vessel will be a great deal more rapid than that of either steel or wooden vessels. The cost of these ships is about two-thirds of the cost of a steel or wooden ship.

If the concrete ship proves to be a success it will bring up the problem of ship machinery. Members of the Shipping Board declare that the present program of ship building will not find a shortage in ship machinery, but they declare that if the concrete ship program should be successful, that there would be a serious shortage in the machinery to equip the hulls with.

### Price Fixing Probabilities

The United States is going to be subjected to further price fixing. There is legislation now before the Congress which will give the President the same powers of administration and price fixing over steel, iron, copper, and other commodities which he now has over food and fuel. This legislation which is still in the embryo stage is most likely to meet violent opposition from all quarters. Manufacturing industries, thoroughly aroused over the fuel order which has closed their plants, are protesting that any further granting away of powers will so cripple the industries of the United States that the conduct of the war will be seriously hampered.

The discussion with reference to the creation of the office of Director of Munitions still goes on, and industry in the United States is holding off until some definite action is taken and it can see what the effects of future legislation may be. President Wilson has ordered that all discussion on this matter be quashed but nevertheless the Congress is debating the question. There is little hope that the legislation will ever be passed against the wishes of the Administration.

American railroads will not be under permanent government control unless some future Congress acts upon it. The committees considering legislation for the control of the railroads have insisted that government control of the railroads be only a war measure and have stricken out the provision in the Administration railroad bill which might be construed to mean permanent government control of transportation lines.

## Pittsburgh

PITTSBURGH, Pa., Feb. 2.—New business in iron and steel, except for the placing of orders by the Government, remains practically at a standstill, as transportation conditions have not improved. In a nutshell the situation is that the iron and steel industry is held by an incubus which it can do nothing to throw off and it is simply waiting until warmer weather dispels the incubus.

### Weather Conditions Hold Up Country

Throughout the winter, or since late in November, the weather has been uniformly bad. There has been no particular spell that has been distinctly worse than the worst of previous winters, but the rapid succession of spells of bad weather, now zero temperatures and lower, now heavy snowfalls, has been altogether unprecedented. Illustrating the situation, last Sunday night there were extremely heavy snowfalls in the east, causing the entire annulment of many passenger trains, while at the same time there was a sleet storm in the Connellsville coke region, causing deposits of sleet more than an inch thick, breaking down many telephone and telegraph wires and further curtailing the production and shipment of coke. Incidentally it may be mentioned that Pittsburgh has had its own troubles. Located in the heart aof the greatest coal producing region of the world it has been short of coal, because the railroads could not increase the service and the river coal on which Pittsburgh normally depends to a large extent has been practically altogether shut off since Jan. 3 by the Monongahela river being frozen. The three lower pools of the river are now clear of ice and steamboats are breaking the ice in the fourth pool, with many fourth pool mines all ready to start the moment the pool is cleared. Above Dam No. 5, at Brownsville, there is an ice gorge six miles long and 30 feet high in places, which there is practically no hope of removing. When the ice breaks up and the snows melt in the upper reaches of the Monongahela and Allegheny rivers, which form the Ohio river at Pittsburgh, a record flood is a possibility if not indeed a probability.

In other winters the railroads have had reserve capacity, and periods between spells of bad weather in which they could recover. This winter they had no reserve of power, but were already overtaxed and there has been no mild weather to afford them any opportunity to recover.

The Fuel Administration's plant-closer order covered the five days ended Tuesday, Jan. 22, and the nine Mondays following. It will probably be rescinded after next Monday, largely because it proves so troublesome. No great amount of relief has been afforded, but conditions have not grown as much worse as otherwise would have been the case.

### Light Operations

Steel mills in the Pittsburgh, valley and lake front districts made shipments during January equal to between 50 and 60 per cent. of their capacity. In the past week shipments have been somewhat lighter still. The greatest restriction has been due to the inability of the railroads to move the finished product. Almost the entire territory is plastered with embargoes, and permits to ship commercial steel through the embargoes are now rarely granted, and even when they are secured the time limit sometimes runs out before the necessary cars are secured. If the shipper makes sure of cars before seeking a permit demurrage usually results. Even war steel is not exempt from the embargoes in all cases. The shipments made in January were almost wholly war steel, the commercial steel shipments in the districts referred to probably representing no more than say 10 per cent. of productive capacity.

Production is no longer materially in excess of shipments as the storage capacity of mill warehouses and yards is already taxed. The difficulty in shipping commercial steel is illustrated by the situation in tin plate. This is essentially a war necessity, as it is important to have the greatest amount possible for taking care of the perishable food crops this summer and under direction of the Food Administration the tin plate mills have been striving to operate fully, the steel mills in turn endeavoring to supply them fully with steel. From the railroad viewpoint, however, tin plate is not a war material, hence it has received no preference and the tin plate mills have accumulated very large stocks, some having already been forced to shut down from their warehouse being full. The average storage capacity equals about six weeks of production. In the past week complete data have been assembled showing the destination of tin plate on order for use of the Food Administration which seeks relief from the railroad administration and an order is expected that will enable the tin plate mills to operate in full.

### No Market Demand

There is practically no demand in the open market for pig iron or steel products for commercial purposes. There is practically no enquiry, buyers show no anxiety as to the shipment of material already ordered, and their specifications against current contracts are very light. They are in the grip of the transportation situation the same as are the producers. It is simply a case of everyone waiting until the passage of the weeks brings better weather and, with the aid of the various efforts made to improve railroad conditions, a freer movement of freight.

What will then occur with the makers is anyone's guess. Production of steel will, of course, greatly increase. The consumptive requirements may increase by the same amount, by more, or by less. Upon this depends whether there will be a strong or a weak market when there is a market again. The set prices are generally observed, or rather there would be if there were any business being done. There is relatively little contract business really in force at prices higher than the Government limits. Much of the higher priced material has been shipped, while as to considerable tonnages buyers have simply refused to consider the contracts as obligations, holding that mills revised prices in the past when there was an open market decline and that the decline at the instance of the Government should be similarly regarded.

On Dec. 29, it was announced at Washington that the set prices were continued to Mar. 31, with prospect of revision by that date. A month has passed and only two months remain, but there is no clear idea of what is likely to occur. March and October are traditionally the months of heaviest production of both pig iron and steel, because the weather in those months is exceptionally favorable. There may be such a burst of production as will cause the market to break. There have been rumors of legislation by Mar. 31, empowering the Government to fix iron and steel prices, and that would be different from the present arrangement, which after all is technically only a voluntary agreement. The set prices are extremely high, more than double the average prices realized during the ten years ended with 1913, while on the other hand costs are very high because everything is high, and at the present time they are exceptionally high because operations are so irregular. One of the possibilities is that Washington will conclude to defer attacking the matter of steel prices in order to allow the industry an opportunity to strike its gait again.

## New York

NEW YORK, Feb. 2.—Current domestic orders for rolled steel products are not large but would be much heavier if the steel mills were willing to acept all the business that is offered. In the last week, several large producers have returned orders and specifications sent to them by anxious buyers because under present conditions the mills can do little more than fill Government contracts. They are making small headway against unfilled commercial orders carried over from last year.

Traffic conditions are still deplorable and lack of an adequate supply of fuel and steel is keeping many manufacturing plants from operating as much as 75 per cent. of capacity. Steel producers, taking the industry as a whole, are turning out ingots at less than 50 per cent. of capacity. A few finishing mills working exclusively upon urgent Government orders are operating 75 per cent. of capacity but most of the finishing plants are still unable to produce even 50 per cent. of capacity.

In the last few days, the Army and Navy Departments have placed liberal orders for structural steel and for wire products, immediately following the distribution of specifications against orders for ship plates and shapes by the Emergency Fleet Corporation. The Ordnance Department has placed additional orders for shells, detonators, fuses, hand grenades and shell accessories among manufacturers in various parts of the country. In turn, these manufacturers have come into the market for machinery and machine tools. Ship builders, also have placed supplementary orders for shop equipment.

Wire drawers have been allotted orders for 20,000 kegs of wire nails by the sub-committee of the Iron & Steel Institute on behalf of the Quartermaster's Department of the Army for export to France. One half of the order was given to the American Steel & Wire Co. Orders for about 15,000 kegs of nails were also distributed for domestic shipment, 5,000 kegs of which are for the Government nitrate plant near Sheffield, Ala. A smaller order calls for shipment to the Panama Canal zone. The Navy Department which continues to place orders independently of the Iron & Steel Institute, requires 20,000 kegs of nails for the powder plant at Charlestown West, Va., one half of which will also be furnished by the largest interest but only 1,500 kegs were shipped this week by all wire drawers.

In structural work interest was mainly centered in the distribution of orders for upward of 20,000 tons of shapes for military buildings in France, most of which went to independent interest. The McClintic Marshall Construction Co. has been awarded a contract for 18,000 tons for 500 hangers to be constructed in France and orders were also placed for 3,000 tons of shapes for six warehouses to be built in France. The other military buildings to be constructed in France will require 25,000 tons of steel and all of the tonnage that is not given to independent shops will be taken by the American Bridge Co. in accordance with an agreement with the Government.

One interesting development is the placing of a contract for 8,000 tons of structural shapes with the Bethlehem Steel Co. for a mail order building for the T. Eaton Co., Ltd., Toronto, Ont. The general steel fabricating contract went to the Dominion Bridge Co. It will be recalled that the large department store to be constructed by the same interest at Toronto, some time since called for 22,000 tons of steel shapes, but this has been held in abeyance. Another Canadian inquiry worthy of note is for 200 line pipe for the province of British Columbia.

Bids have been asked by the Navy Department on tools for machine shops at naval airplane stations in this country as well as in Europe and the Pennsylvania R.R. has resumed the buying of machinery for the American railroad en-

gineers in France. The Gotham Manufacturing Co., Providence, that is manufacturing [illegible] hand grenades, and the Metropolitan Engineering Co., of Brooklyn, that has an order for 1,100,000 trench mortar shells, are buying shop equipment.

### FACTORIES WILL CLOSE FOR THREE DAYS

ON the recommendation of C. A. Magrath, Canadian Fuel Controller, the Cabinet on Monday night passed an order in Council at Ottawa suspending the operation of manufacturing plants for three days, Feb. 9, 10 and 11. The only exceptions are plants which must be continuously operated seven days of the week to avoid serious injury to the manufactured products, plants manufacturing perishable foods or foods for immediate consumption, and plants devoted to the publication of daily newspapers. The order applies to all business and professional offices, warehouses, wholesale and retail stores. For the purpose of selling food only, stores may remain open from [illegible] o'clock (noon) February 9 and 11. The regulations do not apply to the heating of restaurants, hotels or places where meals are regularly served.

The regulations do not apply to Western Canada nor to the Maritime Provinces. The order, as passed, will appear to all of Ontario and Quebec from Fort William on the west to Riviere du Loup on the east. It is understood that it was the intention to pass this order last week, but it was held up owing to doubt as to further action in the United States and the possibility of a discontinuance of their order. Mr. Magrath, who is in Washington, is in close consultation with the American authorities, and is co-operating with them in every possible manner to meet the present situation. This recommendation was decided upon by him as best for the present, although further orders by him along the same lines may be issued later if necessary.

### NOVA SCOTIA OUTPUT

THE output of the Nova Scotia Steel and Coal Company for the three months to December 31 compares with production of the previous quarter as follows:

| | Dec. 31, 1917 | Sept. 30, 1917. |
|---|---|---|
| Coal, tons | 135,272 | 139,795 |
| Ore | 36,111 | 7,174 |
| Limestone | 19,513 | 17,069 |
| Coke | 18,870 | 25,268 |
| Pig iron | 21,204 | 21,874 |
| Steel ingots | 29,216 | 30,845 |
| Finished steel and forgings | 25,199 | 22,657 |

Kingston, Ont.—The City Council has decided to submit a by-law to the people for the purpose of raising by debentures $60,000 for the building of a public wharf.

# Enlarged Canadian Trade Intelligence Service

**Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.**

CHILE—Valparaiso, British Consul General.

COLOMBIA—Bogota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT—Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General..

INDIA—Calcutta, Director-General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul. Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA—Caracas, British Vice-Consul.

BRAZIL—Bahia, British Consul. Rio de Janeiro, British Consul General.

# Canadian Commercial Intelligence Service

**The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.**

### CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address, Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, 73 Basinghall Street, London, E.C.2, England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Anne's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Cantracom.

### CANADIAN COMMERCIAL AGENTS.

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—C. E. Sontum, Grubbegd No. 4 Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

### CANADIAN HIGH COMMISSIONER'S OFFICE.

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago. | 37 50 |
| Standard low phos., Philadelphia. | ..... |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 33 00 |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | ..... | ..... |
| Victoria | ..... | 50 00 |

## FINISHED IRON AND STEEL

| Per lb. to Large Buyers. | Cents |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 5 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 5 75 |
| Chequered floor plate, 3-16 in. | 13 20 |
| Chequered floor plate, ¼ in. | 13 00 |
| Staybolt iron | 8 50 |
| Bessemer rails, heavy, at mill | .... |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | *3 50 |

F.O.B., Toronto Warehouse

| | |
|---|---|
| Steel bars | 5 50 |
| Small shapes | 5 75 |

F.O.B. Chicago Warehouse

| | |
|---|---|
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

## FREIGHT RATES

Pittsburgh to Following Points

| Per 100 lbs. | C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 35.1 | 45.5 |
| Halifax | 35.1 | 45.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

## METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $33 00 | $29 00 |
| Electro copper | 33 00 | 29 00 |
| Castings, copper | 32 00 | 28 00 |
| Tin | 77 00 | 80 00 |
| Spelter | 10 50 | 9 50 |
| Lead | 9 75 | 8 75 |
| Antimony | 18 00 | 18 00 |
| Aluminum | 60 00 | 60 00 |

Prices per 100 lbs.

## PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¼ to ½ | $10 00 | $10 00 |
| Heads | 10 30 | 10 30 |
| Tank plates, 3-16 in. | 10 10 | 10 10 |

## WROUGHT PIPE

Effective Jan. 7, 1918.

| | Black | Galvanized |
|---|---|---|
| Standard Buttweld. | Per 100 feet | |
| ⅛ in. | $ 6 00 | $ 8 00 |
| ¼ in. | 5 10 | 7 23 |
| ⅜ in. | 5 10 | 7 23 |
| ½ in. | 6 46 | 8 03 |
| ¾ in. | 8 17 | 10 29 |
| 1 in. | 12 07 | 15 22 |
| 1¼ in. | 16 33 | 20 59 |
| 1½ in. | 19 53 | 24 61 |
| 2 in. | 26 27 | 33 12 |
| 2½ in. | 42 12 | 52 94 |
| 3 in. | 55 08 | 69 23 |
| 3½ in. | 69 92 | 86 54 |
| 4 in. | 82 84 | 103 00 |
| Standard Lapweld. | | |
| 2 in. | 29 43 | 35 71 |
| 2½ in. | 43 88 | 54 11 |
| 3 in. | 57 38 | 70 76 |
| 3½ in. | 71 76 | 89 70 |
| 4 in. | 85 02 | 106 28 |
| 4½ in. | 96 52 | 121 29 |
| 5 in. | 112 50 | 141 34 |
| 6 in. | 145 90 | 183 36 |
| 7 in. | 190 40 | 238 00 |
| 8 L in. | 200 00 | 250 00 |
| 8 in. | 230 40 | 288 00 |
| 9 in. | 276 00 | 345 00 |
| 10 L in. | 256 00 | 320 00 |
| 10 in. | 329 60 | 412 00 |

Prices—Ontario, Quebec and Maritime Provinces

## WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

## OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 22 50 |
| Copper, heavy | 22 50 | 22 50 |
| Copper wire | 22 50 | 22 50 |
| No. 1 machine composition | 21 00 | 20 50 |
| New brass cuttings | 16 00 | 14 00 |
| No. 1 brass turnings | 14 00 | 15 75 |
| Light brass | 10 00 | 10 00 |
| Medium brass | 14 00 | 12 00 |
| Heavy brass | 15 00 | 14 00 |
| Heavy melting steel | 21 00 | 21 00 |
| Steel turnings | 12 00 | 12 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 23 00 | 18 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 23 00 |
| No. 1 machine cast iron | 27 00 | 25 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 17 00 | 13 00 |
| Car wheels, iron | 26 00 | 25 00 |
| Steel axles | 38 00 | 30 00 |
| Mach. shop turn'gs | 9 00 | 8 50 |
| Cast borings | 12 00 | 12 00 |
| Stove plate | 17 00 | 19 00 |
| Scrap zinc | 5 50 | 6 50 |
| Heavy lead | 5 50 | 7 00 |
| Tea lead | 5 00 | 5 75 |
| Aluminum | 25 00 | 20 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent |
|---|---|
| Carriage bolts, ¾" and less | 10 |
| Carriage bolts, 7-16 and up | net |
| Coach and lag screws | 25 |
| Stove bolts | 55 |
| Plate washers | List plus 20 |
| Elevator bolts | 5 |
| Machine bolts, 7-16 and over | net |
| Machine bolts, ¾ and less | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | 10 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | add 25 |
| Nuts, square blank | add $1 50 |
| Nuts, square, tapped | add 1 75 |
| Nuts, hex., blank | add 1 75 |
| Nuts, hex., tapped | add 2 00 |
| Copper rivets and burrs, list plus | 30 |
| Burrs only, list plus | 50 |
| Iron rivets and burrs | 15 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 37½ |
| Wood screws, O. & R., brass | 32½ |
| Wood screws, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

## MILLED PRODUCTS

| | Per Cent. |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil. Head Cap Screws | net |
| Flat ⅞ But. Hd. Cap Screws plus | net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. & Semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2 in. plus | 10 |
| Studs | net |
| Taper pins | 10 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws list plus | 20 |
| Collar screws list plus 30, | 10 |
| Thumb screws | 20 |
| Thumb nuts | 65 |
| Patch bolts add 40, | 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add 7 00 |

## BILLETS

| Per gross ton | |
|---|---|
| Bessemer billets | $17 50 |
| Open-hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.

F.O.B. Pittsburgh.

## NAILS AND SPIKES

| | | |
|---|---|---|
| Wire nails | $5 25 | $5 20 |
| Cut nails | 5 70 | 5 65 |
| Miscellaneous wire nails | | 60% |
| Spikes, ⅜ in. and larger | | $7 50 |
| Spikes, ¼ and 5-16 in. | | 8 00 |

## ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 41 |
| Plumbers' oakum, per lb. | 0 09 |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila rope | 0 33 |
| New Zealand hemp | 0 33 |
| Transmission rope, Manila | 0 45 |
| Cotton rope, ¼-in. and up | 0 47 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | net |

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | 0 40½ |
| Solder, guaranteed | 0 34½ |
| Carbide, calcium | 18 to 20 |
| Soldering [illegible] | 0 55 |
| Lead, [illegible] per lb. | 0 16 |
| Linseed, [illegible] drums | 1 55 |
| White lead, pure, cwt. | 16 05 |
| Red dry lead, 100 lb. kegs, per cwt. | 15 50 |
| Glue, English | 0 35 |
| Tarred paper's paper, roll | 0 95 |
| [illegible] per gal., bulk | 0 31½ |
| Benzine, per gal., bulk | 0 30½ |
| [illegible] turpentine, single bbls., gal | 0 78 |
| Linseed oil, raw, single bbls. | 1 50 |
| Linseed oil, boiled, single bbls. | 1 53 |
| Plaster of Paris, per bbl. | 2 50 |
| Sandpaper, B & A | list plus 20 |
| Emery cloth | list plus 20 |
| Salt, [illegible] | 0 03½ |
| Salt peter, rolls | 0 05 |
| Saltpetre, commercial | 0 04½ |
| Rosin "D," per lb. | 0 03 |
| Resin "G," per lb. | 0 03½ |
| Borax crystal and granular | 0 12 |
| Wood alcohol, per gallon | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

### CARBON DRILLS AND REAMERS

| | Per Cent |
|---|---|
| S.S. drills, wire sizes up to 52 | 30 |
| S.S. drills, wire sizes, No. 53 to 80 | net |
| Standard drills to 1½ in. | 30 |
| Standard drills, over 1½ in. | 30 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 20 |
| Bit stock | 25 |
| Ratchet drills | 15 |
| S.S. drills for wood | 30 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 40 |
| Sleeves | 40 |
| Taper pin reamers | net |
| Drills and countersinks...list plus | 30 |
| Bridge reamers | 52½ |
| Centre reamers | 10 |
| Chucking reamers | net |
| Hand reamers | 10 |

### COLD ROLLED SHAFTING

| | |
|---|---|
| At mill | list plus 40% |
| At warehouse | list plus 50% |

**Discounts off new list. Warehouse price at Montreal and Toronto**

### IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 25% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 9 50 | $ 8 50 |
| Sheets, black, No. 10 | 12 00 | 12 00 |
| Canada plates, dull, 52 sheets | 9 00 | 9 00 |
| Canada plates, all bright | 10 50 | 10 50 |
| Apollo brand, 10¾ oz. galvanized | ..... | ..... |
| Queen's Head, 28 B.W.G. | ..... | ..... |
| Fleur-de-Lis, 28 B.W.G. | ..... | ..... |
| Gorbal's Best, No. 28 | ..... | ..... |
| Colborne Crown, No. 28 | ..... | ..... |
| Premier, No. 28 U.S. | 9 45 | 9 45 |
| [illegible] 10¾ oz. | 9 75 | 9 75 |
| Zinc sheets | 20 00 | 20 00 |

### PROOF COIL CHAIN

B

¼ in., $12.35; 5-16 in., $11.85; ⅜ in., [illegible]; 7-16 in., $10.90; ½ in., $11.20; 9-16 in., $11.20; ⅝ in., $11.10; ¾ in., $11.00; ⅞ in., $10.90; 1 inch, $10.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $15.50; 3-16 in., $11.70; ¼ in., $8.40; 5-16 in., $7.40; ⅜ in., $6.35; 7-16 in., $6.35; ½ in., $6.35; ⅝ in., $6.35; ¾ in., $6.35.

**Prices per 100 lbs.**

### FILES AND RASPS.

| | Per cent |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P H and Imperial | 50 |
| Nicholson | 40 |
| Black Diamond | 40 |
| J Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 37½ |
| Disston | 50 |
| Whitman & Barnes | 50 |

### COAL AND COKE

| | |
|---|---|
| Solvay Foundry Coke | |
| Connelsville Foundry Coke | |
| Steam Lump Coal | |
| Best Slack | |

**Net f.o.b. Toronto.**

### BOILER TUBES.

| Size | Seamless | Lapwelded |
|---|---|---|
| 1 in. | $36 00 | $..... |
| 1¼ in. | 40 00 | ..... |
| 1½ in. | 43 00 | 36 00 |
| 1¾ in. | 43 00 | 36 00 |
| 2 in. | 50 00 | 36 00 |
| 2¼ in. | 53 00 | 38 00 |
| 2½ in. | 55 00 | 42 00 |
| 3 in. | 64 00 | 50 00 |
| 3¼ in. | ..... | 58 00 |
| 3½ in. | 77 00 | 60 00 |
| 4 in. | 90 00 | 75 00 |

Prices per 100 ft., Montreal and Toronto.

### OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | 52 |
| Royalite, per gal., bulk | 17 |
| Palacine | 20 |
| Machine oil, per gal. | 26½ |
| Black oil, per gal. | 15 |
| Cylinder oil, Capital | 45½ |
| Cylinder oil, Acme | 36½ |
| Standard cutting compound, per lb. | 0 06 |
| Lard oil, per gal. | $2 50 |
| Union thread cutting oil antiseptic | 88 |
| Acme cutting oil, antiseptic | 37½ |
| Imperial quenching oil | 39½ |
| Petroleum fuel oil | 13½ |

### BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30-5% |
| Standard | 40% |
| Cut leather lacing, No. 1 | 1 95 |
| Leather in sides | 1 75 |

### TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 06 |
| Emery glue | 15 to 20 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 35 |

**Prices Per Lb.**

### BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 38 |
| Brass sheets, 24 gauge and heavier, base | 0 43 |
| Brass tubing, seamless | 0 46 |
| Copper tubing, seamless | 0 48 |

### WASTE.

| White. | Cts. per lb. | | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 18½ |
| Peerless | 21 | X Empire | 17¼ |
| Grand | 19¾ | Ideal | 17¼ |
| Superior | 19¾ | X press | 16 |
| X L C R | 18½ | | |

**Colored.**

| | | | |
|---|---|---|---|
| Lion | 15 | Popular | 12 |
| Standard | 13½ | Keen | 10½ |
| No. 1 | 13½ | | |

**Wool Packing.**

| | | | |
|---|---|---|---|
| Arrow | 25 | Anvil | 15 |
| Axle | 20 | Anchor | 11 |

**Washed Wipers.**

| | | | |
|---|---|---|---|
| Select White | 11 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING.

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

### ANODES.

| | |
|---|---|
| Nickel | .50 to .54 |
| Cobalt | 1.75 to 2.00 |
| Copper | .44 to .46 |
| Tin | .49 to .56 |
| Zinc | .23 to .25 |

**Prices Per Lb.**

### COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | 42 50 | 43 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 46 00 | 44 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 48 00 | 48 00 |
| Copper sheet, planished, 16 oz. base | 57 00 | 45 00 |
| Braziers,' in sheets, 6x4 base | 45 00 | 44 00 |

### LEAD SHEETS.

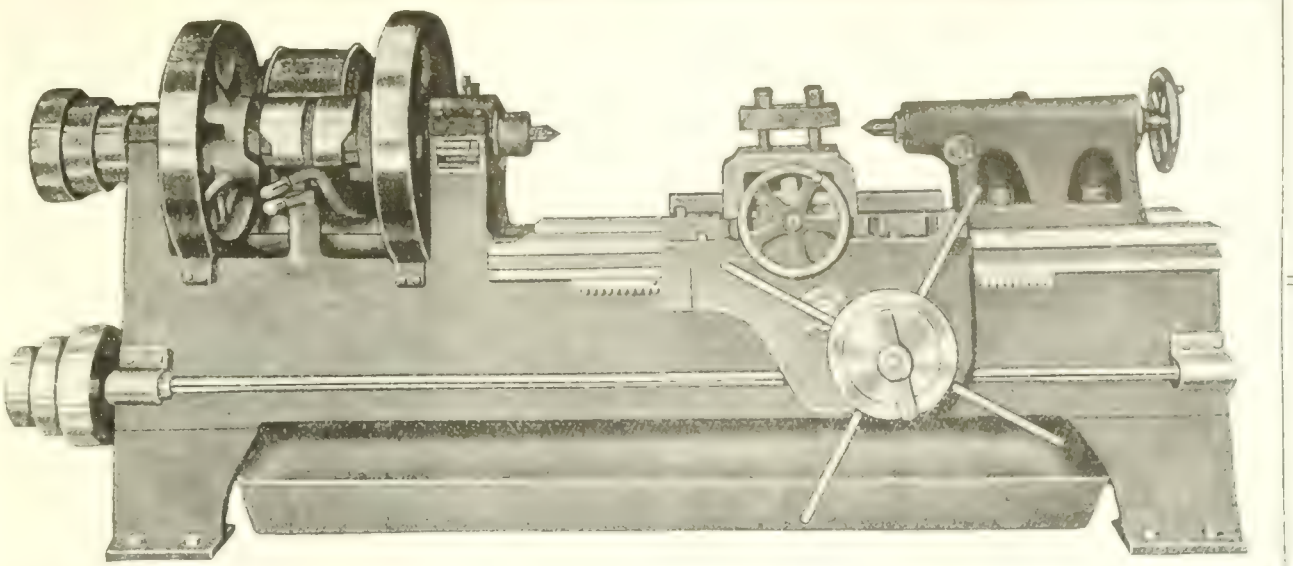
| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $13 25 | $13 25 |
| Sheets, 3½ lbs. sq. ft. | 13 25 | 13 25 |
| Sheets, 4 to 6 lbs. sq. ft. | 12 50 | 12 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS.

| | |
|---|---|
| Acid, boracic | $ .15 |
| Acid, hydrochloric | .05 |
| Acid, hydrofluoric | .14½ |
| Acid, nitric | .10 |
| Acid, sulphuric | .05 |
| Ammonia, aqua | .08 |
| Ammonium carbonate | .15 |
| Ammonium, chloride | .11 |
| Ammonium hydrosulphuret | .40 |
| Ammonium sulphate | .07 |
| Arsenic, white | .12 |
| Copper, carbonate, anhy | .35 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .70 |
| Iron perchloride | .20 |
| Lead acetate | .16 |
| Nickel ammonium sulphate | .12 |
| Nickel carbonate | .35 |
| Nickel sulphate | .15 |
| Potassium carbonate | .75 |
| Potassium sulphide (substitute) | .20 |
| Silver chloride (per oz.) | .65 |
| Silver nitrate (per oz.) | .55 |
| Sodium bisulphite | .10 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .41 |
| Sodium hydrate | .04 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | .14 |
| Tin chloride | .60 |
| Zinc chloride | .60 |
| Zinc sulphate | .09 |

**Prices per lb. unless otherwise stated.**



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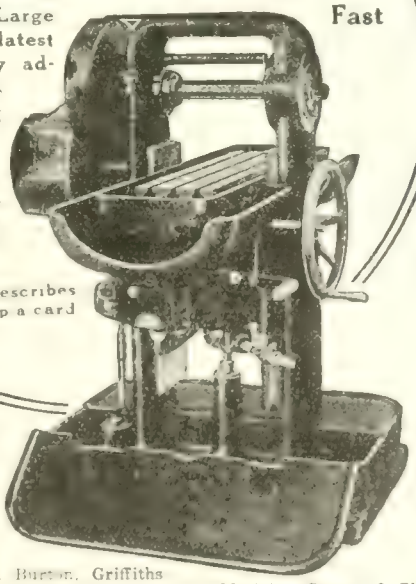

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# NOSING DIES

## *For All Sizes of Shells*

Recently we told in this space of a Nosing Die in use in our own shops which had nosed 35,000 shells, and was still working. This die is still in use, and doing good work.

We now publish the following letter from one of our customers as a further proof of the long life of our CHILLED IRON NOSING DIES.

Messrs. March & Henthorn,
Belleville, Ont.

Gentlemen:—

We have been using your shrunk and [illegible] for some months past and they have given us better satisfaction than anything we have yet [illegible] for the purpose for which we are using them, having nosed nearly 10,000 shells and to all appearances [illegible] as good as ever and no doubt will [illegible] more.

We would say the [illegible] is an expensive problem for us, as we know of nothing, at several times the price, which will give us the same satisfaction.

Yours truly,

[illegible]

We make these Chilled Iron Nosing Dies for the various sizes of Shrapnel and High Explosive Shells, and also for the .75 Millimeter French Shell.

We also make Chilled Iron Sleeves for Forging Billets for the 75 Millimeter Shells.

## MARSH & HENTHORN, Ltd.

BELLEVILLE ONTARIO

# INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

## ENGINEERING

Trenton, N.S. — A fire at the Nova Scotia Steel & Coal Co's plant here did about $4,000 damage.

**Montreal, Que.** — Fire has destroyed the plant of the St. Lawrence Welding Co., 138 Inspector street.

**Quebec, Que.**—Price Brothers & Co., Quebec, contemplate the erection of a $30,000 pulp and paper mill on the River Batiscan, near St. Narcisse.

**Toronto, Ont.**—The Turnbull Elevator Co., has been given a building permit to erect a one storey brick factory at 251 Richmond street to cost $20,000.

**Toronto, Ont.**—Canadian Aeroplanes Ltd., have a building permit for constructing two sets of brick dry kilns on Dufferin street near Lappin avenue to cost $9,500.

**Guelph, Ont.**—Damage to the extent of about $3,500 was done by fire, smoke and water at the building owned by the Light and Heat Commission on Huskisson Street on Jan. 30. The loss is covered by insurance.

New Ross, N.S.—The mill and all the equipment of the Nova Scotia Manganese Co. at New Ross was completely destroyed by fire on Jan. 26. The loss cannot be replaced with less than $100,000 and there was only a few thousand dollars insurance.

Prince Rupert, B.C.—W. P. Hinton who was here recently, says that the Grand Trunk Pacific will spend $250,000 in Prince Rupert this year on a brick railway station to meet all requirements for ten years; machine shops and round house at Cameron Cove, and a 1,000-foot wharf.

**Toronto, Ont.**—The Toronto Laundry Machine Company's plant was badly gutted by fire on Tuesday morning. The damage is estimated at $100.000 on the building and machinery, which is covered by insurance. The fire was caused by a resin tank boiling over in the shell-filling room.

**Toronto, Ont.**—The Liederkranz Club property on Richmond Street west has been sold to the Turnbull Elevator Co. for the amount of the assessment of the land and building, $40.000. The property has a frontage of 106 feet and is 160 feet in depth. Purchasers will erect a machine shop on that part of the property not occupied by the German Club premises.

Nelson, B.C. — The Waneta Power Co's big water-power plant on the Pend l'Orelle River, south of Nelson, is nearing completion. Preliminary construction work has been in progress for some years, though the company has but recently been incorporated, with a capital of $1,500,000. Power will be supplied to industries of both sides of the international border.

**Hamilton, Ont.** — The local Hydro Board has decided to reduce the power consumption here by the drastic method of cutting off non-essential industries one day a week. Hamilton is about 1,500 kilowatts short of its requirements, and it was thought that by cutting off certain industries rotation for one day a week this could be made up, and munitions plants and food-producing concerns could keep going without interruption. Several times of late all plants depending on Hydro have been cut off owing to this city having exceeded its limit, and it was thought this would be the most effective and most satisfactory way of meeting the situation.

**Cornwall, Ont.**—The St. Lawrence Power Co's. plant at the Sheiks Islands dam, which supplies electric power to several industries in Cornwall, is completely out of commission as a result of the high water. All local plants are shut down and this may last until the water recedes and repairs can be made. The water rose nine feet above the floor in the power house, putting the generators and transformers completely under its surface. Officials of the company stated that it would take at least a week to dry out their machinery and have it ready for action after the power house is cleared of water. The Stormont Electric Light & Power Co is doing all in its power to relieve the lighting situation in town by transferring their power wherever possible.

## MUNICIPAL

**Perth, Ont.**—The Town Council will ask the Provincial Legislature for a bill to confirm a by-law in connection with a bonus of $25,000 by way of a loan to the Perth Carpet Co.

**Niagara Falls, Ont.**—The Hydro Commissioners of Ontario have agreed to let the City of Niagara Falls tap the new pipe which is being laid with a 24-inch main, which will give this city all the water it needs for many years to come. At the same time this will only be a temporary arrangement, as the city is negotiating with the Hydro for a permanent supply from the Power Canal being constructed.

**Niagara Falls, Ont.**—Work is already well started upon the new pipe which is to supply 50.000 more horse-power for the Hydro. The pipe, which is 13½ feet in diameter, is to be run through Queen Victoria Niagara Falls Park. The work on the Chippawa-Queenston Hydro Canal is proceeding in spite of the severe weather, though it is exceedingly difficult to get men to stay on the job. As soon as weather conditions prove more favorable the Hydro engineers will put a new impetus on the job. The railway along the power canal is progressing and preparations are being made for dredging.

## GENERAL

**Pictou, N.S.**—The Atlantic Milling Co. may build a mill here.

**Vancouver, B.C.**—The Sidney Rubber Roofing Co., Sidney, Vancouver Island, contemplate the erection of a $125,000 factory.

**Quebec, Que.**—Work on the extraction of coal from a mine discovered on the cliff near Levis has started. It is not yet established whether Quebec only has a stray deposit of coal or whether it is a far-stretching vein.

**St. Thomas, Ont.**—A valuable peat-bog has been discovered on the farm of D. A. Campbell, in Southwood Township, a few miles west of St. Thomas. This bog is about six acres in extent, and the peat is an excellent quality and burns readily in grate and stove.

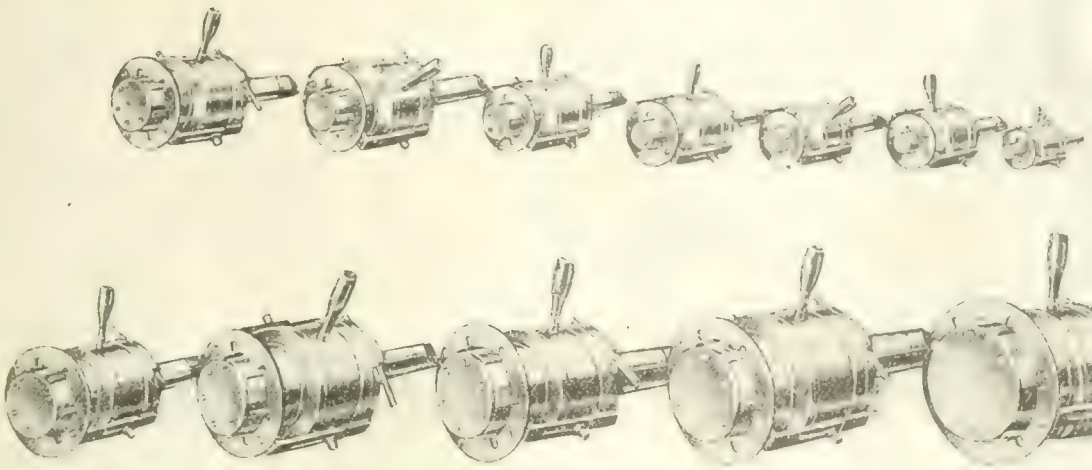
## BUILDINGS

**Toronto, Ont.**—A building permit has been issued to the Adams Furniture Co. to construct on elevator shaft in warehouse at 227 Victoria street, to cost $2,000.

**Ottawa, Ont.**—The Dominion Government purposes to erect in Ottawa a large office building. It will be put up in the coming year if plans now under way materialize. It is undecided yet whether the site will be on Wellington Street, where the Government owns all the property on the north side to Pooley's Bridge, or elsewhere. The plans are now being considered by the authorities of the Department of Public Works, under Hon. F. B. Carvell. The new building would cost more than a million dollars.

**Toronto, Ont.**—The Finance Committee of the Board of Education, at a special sitting held recently for the purpose of considering the estimates prepared by the several committees and officials, sent forward to the board without recommendation the Property Committee's request that $150,000 be included in the estimates for the building of a new Rose Avenue School. Previous appropriations will provide for the Glenholme avenue school, which is to cost $100,000, and Glengrove avenue school, which is to cost $70,000. The committee also included in the estimates $1,050 to equip three new household science centres, and a similar amount to equip three new manual training centres.

# GEOMETRIC TAPS



# FOR U.S.

## *SIZES ¾" TO 6"—AT A U.S. ARSENAL*

THIS illustrates only one of the groups of Geometric Collapsing Taps that have gone into United States Arsenals and Navy Yards to bear out the reputation that attaches to all Geometric Thread Cutting Tools.

These taps are equipped with the roughing and finishing attachment, a feature of Geometric Taps that are required for close work.

A micrometer scale adjusts them for a tight or loose thread. Because of the adjustable feature, Geometric Taps always produce accurate threads, no matter how often the chasers have been ground.

When ground beyond further use, the chasers may be replaced, while the tap remains as good as new.

Chasers recede automatically when the required depth of thread is reached.

Geometric Collapsing Taps can be fitted to Screw Machine or Turret Lathe, also live spindle.

Why not put your tapping proposition up to a Geometric?

**THE GEOMETRIC TOOL COMPANY**
**NEW HAVEN CONNECTICUT**

***Canadian Agents:***

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B.

# PERSONAL

Gordon Grant formerly chief engineer of the National Transcontinental Railway, has been appointed expert adviser to the Minister of Railways.

A. E. Warren, general manager of the Canadian Northern Railway, has been appointed to the Government service as Deputy Minister of Railways.

William Allan Foley, who for some years was superintendent for Goldie & McCulloch Co., Galt, Ont., died in that city on Jan. 27, in his 75th year. The deceased had lived in Galt over fifty years.

Thomas Robb, manager and secretary of the Shipping Federation of Canada, has been appointed chairman of the commission which will investigate pilotage conditions at Halifax and other Lower Province ports.

**William R. McCulla** is now affiliated with the aircraft division of the Willys-Overland Co., at Elmira, N. Y., and Toronto, Ont., having resigned as aircraft motor engineer of the Packard Motor Car Co., Detroit.

**R. W. Williamson**, assistant superintendent of the munition plant at the Renfrew Machinery Co's factory at Renfrew, Ont., has resigned to take up a position with the T. A. Gillespie Co., Perth Amboy, N.J., under the Ordnance Department of the United States Government.

**Arthur B. Sweezey**, who has been attached to the New York office of the Cunard Line for more than twenty-six years, has left for Vancouver to establish an office in that city for the company. This is the first of a series of branch offices which the Cunard Co. will establish in various parts of the world.

**Marcel Beullac**, engineer of the Dominion Bridge Co., Lachine, Que., died suddenly on Jan. 27, at the age of forty-six years. Mr. Beullac was graduated with honors from Laval in 1897, and had become prominent in his profession. He was an ex-president of the Veterans of Land and Sea, and fought with the French army in the present war.

**Thomas F. Hodgson**, sales representative of the Steel Company of Canada, Toronto office, has been granted leave of absence for two months on account of ill-health. Mr. Hodgson has gone to Jacksonville, Fla. Before leaving for the South he was presented with a purse of gold by his friends, the presentation being made by Frank E. Barchard, secretary-treasurer of Ward 6 Liberal-Conservative Association, of which Mr. Hodgson is president.

**William A. Noble**, chief engineer at the Normal School, Toronto, for the past twelve years, died suddenly on Monday morning at the home of his brother, Trustee Dr. John Noble, 219 Carlton Street. A few days ago he was seized with la grippe, which resulted in complications. The late Mr. Noble, who was born in Peel County 57 years ago, had spent the last twenty years in Toronto. He was a member of the Masonic order and a member of L. O. L. No. 140. The body will be interred at Mono Centre.

**Edward R. Stettinius**, a member of the firm of J. P. Morgan & Co., New York, has been appointed surveyor-general of supplies for the United States army. Mr. Stettinius was president of the Diamond Match Co., Chicago. When J. P. Morgan & Co., on January 15, 1915, became purchasing agents for the allies in the United States, they retained Mr. Stettinius in an advisory capacity and later admitted him as a partner because of his ability. Mr. Stettinius was born in St. Louis in 1865, and was at one time connected with the Stirling Co. and the Babcock & Wilcox Co., of Chicago.

**A. D. Armitage** has been appointed president of the Whitman & Barnes Mfg. Co., Akron, Ohio, and St. Catherines, Ont., in succession to A. B. Rinehart. Mr. Armitage has been continuously connected with the company 25 years at its three factories and offices in Akron, Chicago and St. Catherines, Ont. He started as mechanic in the Akron factory Sept. 1, 1892, became purchasing agent in 1900, was transferred to the Chicago factory in 1902 and made superintendent of that plant in 1904. In 1908 the board of directors elected him general manager of the three factories and manager of sales for Canada. At the annual meeting in 1915 he was elected vice-president and manager of the Chicago and Canadian factories with charge of sales at those offices. His various official positions at the three factories and offices during his period of connection with the company particularly fit him for the office of president.

# TRADE GOSSIP

**Port Colborne, Ont.**—Town Council contemplate the installation of a waterworks plant and pump equipment.

**Norwich, Ont.**—Town Council propose enlarging the pump house and installing additional pump at a cost of $4,000. Engineer, F. J. Ure, C.E., Woodstock.

**Regina, Sask.**—The T. Eaton Co., of Toronto, will build a warehouse here at a cost of $350,000. The architects are Woodman & Cubbidge of Winnipeg.

**Kitchener Customs.**—The Customs returns for the month of January amounted to $81,566,700, a decrease of $22,-047.30 in the collections for the same month last year.

**Montreal, Que.**—An influential deputation from Sault Ste. Marie, Ont., came to the city to interview F. W. Clergue, president of the Universal Transmissions, Ltd., regarding the construction of a shipbuilding yard and drydock at the Soo.

**The Empire Waterworks Supply Co.**, of Winnipeg, has been awarded contracts from the Greater Winnipeg Water District for three 24-inch Rensselar gate-valves, all of the automatic air cluster valves and sluice gates, the latter being Coldwell and Wilcox.

**Steamer Bermudian Sunk.**—Word has come to the Marine Department at Ottawa that the steamer Bermudian, taken over by the Admiralty from the Canada Steamship lines, has sunk in Alexandria Harbor in the Mediterranean. It was due to an accident. The ship is to be salved.

**U.S. Authorizes Increase in Coal Rates to Canada.**—Filing of tariffs providing for increase of fifteen cents a ton on coal from points in the United States to Canada was authorized on Jan. 29 by the Interstate Commerce Commission. This follows the action of the Canadian Public Utilities Commission in approving such an increase.

**Turpentine Controlled in England.**—Turpentine has now been placed under British Government control. Licenses are required for all dealings exceeding an aggregate of five gallons during any one calendar month. The order covers all substitutes capable of being used as a substitute for spirits of turpentine except motor spirit and benzine.

**Vancouver, B.C.**—The Lyall Shipyards at North Vancouver are beginning to look forward to another launching, the present indications being that the furthest advanced of the Munitions Board wooden steamers will be ready for the water within the next three weeks. The yard is getting ready to fit tail shafts, which are expected to arrive from the East shortly.

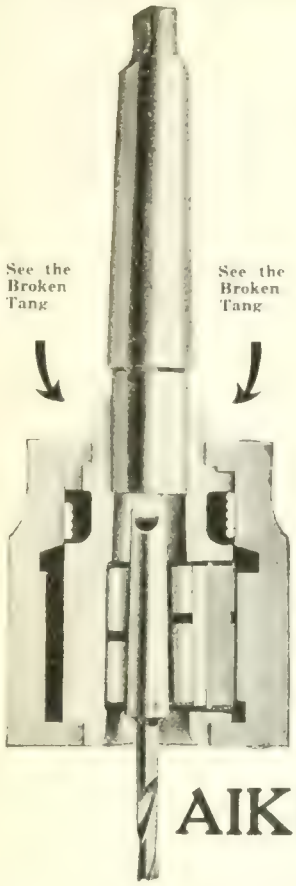
**U.S. Government Buys Platinum.**—A tentative price of $90 an ounce has been set by the U.S. Government for the purchase of 21,000 ounces of platinum recently imported from Russia. Bankers in Petrograd who financed the collection of the metal will be allowed to produce proof of the expense incurred if they think a higher payment should be made.

**Probe Pilotage System.**—The Minister of Marine and Fisheries will, in the course of a few days, create a commission to investigate the pilotage systems in operation at the port of Halifax, and other important ports. In view of the recent disaster at the port of Halifax, the commission will first direct the inquiry into the pilotage system and its operation at that port.

**Vancouver, B.C.**—Confirmation that the British-Canadian Lumber Corporation has entered into an arrangement with the Masset Timber Co. to log for high grade aeroplane spruce on the limits of the former company on Masset Inlet, was admitted by J. T. T. Paxton, receiver and manager of the British-Canadian Lumber Corporation.

**Canadian Firms Doing Business With the U.S.**—The United States War Trade Board, 1435 K. Street, Washington, D.C., invites Canadian firms to communicate direct with the Board so that such firms doing an import or export business with the United States may have their names and addresses placed on the mailing list of the War Trade Board to receive direct, copies of all publications issued by that Board.

**U.S. Zinc Prices Fixed.**—A report from Washington says that zinc prices have been agreed upon by representa-




Aikenhead's

# Wahlstrom Chuck

Because ... and ... this New Wahlstrom chuck is a power-driven proposition. It entirely eliminates ... of time and motion.

**Does not Grip the Tool by the Tang**

It grips on the cut or shank, so you may use interchangeable M.T. Shank Tools whether they have a tang or not.

The cam action is such that the resistance on the tool governs the holding power of the jaws. Slippage is impossible.

No keys, no collets, and tool changes made in ten seconds without stopping spindle.

We have Wahlstrom's for straight shank tools as well as for taper. Write

## AIKENHEAD HARDWARE LIMITED

**17, 19, 21 TEMPERANCE STREET, TORONTO**

# Oster Bull-Dog Die Stocks

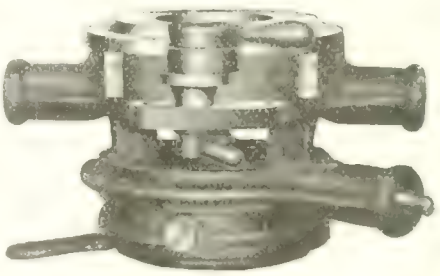
1. Self-locking Dies
2. Self-locking Guides
3. No Resetting
4. No loose bushings
5. No small parts

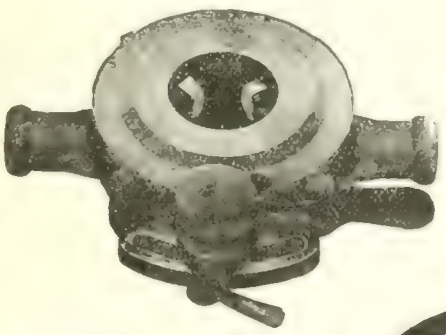
In Oster Bull-Dog Die Stocks you have an adjustable stock without small parts to lose or get out of order, and with nothing to break in use. Levers are made of solid drop-forged steel, and one continuous bolt with a locking handle completes the whole.

To set die stock for threading, simply move both levers to the right. Open or close the dies by one movement of the releasing lever. Change from one size to another, or set for over or under size by movement of the adjusting lever.

Other exclusive Oster ... features better the work and save much time. Write:

**Positive Lever Lock "The Bull-Dog Grip Never Slips"**





Oster Bull-Dog Die Stocks in Nos. 101 to 105, as shown above, thread from ⅛" to 3" pipe.

Aikenhead's

**17, 19, 21 Temperance Street TORONTO, CAN.**

Oster Ratchet Die Stock shown above is made without a leader screw, making it possible to furnish with dies for a longer range of sizes. It can be fitted with dies for threading casing of any special pitch.

taxes of the Government and the municipality, and will be assessed upon. It is expected that the Government manufactures of basic iron, copper and steel, the zinc producers said such action would stabilize the market and increase the output.

Dominion Customs Receipts.—Customs receipts for the ten months of the fiscal year ending Jan. 31 totalled $176,562,... as compared with $157,...,410 over the same period last year, when they amounted to $119,...,796. A decrease of $2,637,571 in receipts for the month of January this year as against January, 1917, is shown by the monthly customs statements. Last year receipts for January totalled $12,936,314, while this year they amounted to $10,298,742.

Halifax, N.S.—Another shipbuilding plant has been established at Meteghan River by the R. H. Rowes Construction Co., of Boston and New York. The president of the company is George D. Morecroft. A lease for term of years has been taken of the shipyards of the late James Cosman at the mouth of the Meteghan River. Already, mills and pattern shops, equipped with the latest improved shipbuilding machinery, have been erected and are now working.

**Niagara Falls, Ont.**—The Water Commissioner of Niagara Falls, Mayor Stephens, C. C. Cole, and T. E. Ferris, have interviewed heads of the Hydro-Electric with reference to making plans for new source of water supply for Niagara Falls, thus doing away with difficulties met with every Winter by ice blocking the intake on the river. One plan proposed is to give Niagara Falls a supply of water from the new Chippawa power canal, now under course of construction.

**Cunard, Anchor and Donaldson Lines Unite.**—Announcement of a steamship merger that may mean a great deal to the development of British and Canadian after-the-war trade was made last week at the Montreal office of the Cunard Line. The Cunard, Anchor and the Anchor-Donaldson lines were joined under one management on Jan. 1. They will be operated, so far as their Canadian business is concerned, under the supervision of the Robert Reford Co. instead of through American offices, as heretofore. Joint offices have been established in Winnipeg and Vancouver.

**Demand for Stone-Crushing Machinery in New Zealand.**—The Thames County Council has authorized the investment of $24,332 in quarry equipment and appliances for the production of crushed stone to be used in the development of better roads in that country. Communications addressed to the chairman of the County Council at Thames, New Zealand, will reach the right parties in connection with this development. This is probably the beginning of many other similar undertakings in different parts of New Zealand, for there seems to be a determined move in favor of better roads for the country.

**Chatham, Ont.**—The Chatham Public Utilities Commission is considering the advisability of asking local manufacturers using Hydro power to operate their plants on night and day shifts in such a manner as to prevent any heavy peak loads at certain hours. The consumption of power in Chatham is considerably in excess of the allotment, resulting in the street lights being turned off at night and industries operating at night forced to economize. The normal consumption is 1,132 horse-power, while the city under the new orders is allotted 540 horse-power during the day and 940 at night.

**Building New Sub Fighters.**—A report from Washington states that new submarine fighters of a powerful type are about to be turned out in the United States in large numbers. Contracts for the new craft have been placed with the Ford Motor Co., of Detroit, Mich. All parts of the ships except the engines are to be fabricated in Detroit and the parts shipped to to the seaboard, where they will be assembled. Changes in the Ford plant to permit the handling of the work have progressed so swiftly, Mr. Daniels said, that deliveries on the contracts during the coming summer are assured.

**Canadian Car and Foundry Co. to Build Ships.**—It is reported that the Canadian Car and Foundry Co. has closed a contract for building steel ships at Fort William, Ont., for the United States Government to the value of $10,000,000. It is understood that tenders are to be called shortly for the construction of a new building, 220 by 200 feet, in which the boats will be built, and a marine railway and slip will also be built for launching the boats as they come from the works. The whole of the material for the contract has been arranged for with the United States Government, and shipbuilding will commence in May.

**May Build Foreign Ships at Coast.**—Word has been received in Vancouver, B.C., that the Dominion Government will use its endeavors to have the restrictions removed against the building of ships in British Columbia for foreign registry. While nothing official has been given out, it is pretty generally understood by the firm interested in the securing of foreign contracts that their case is receiving more than sympathetic consideration at Ottawa. In the event of the Imperial authorities taking the ban off the construction of ships for foreign contracts, it is stated that there are contracts for several French ships that can be signed in Vancouver forthwith and construction proceeded with immediately.

**Trade Journals Exhibit at Newark.**—An exhibit of trade journals is being held in the Newark Library Building, Newark, N.J. from Jan. 10 to Feb. 12 inclusive. The exhibit will include twelve hundred of the larger and more important trade journals published in the United States and Canada covering every known industry. They are so displayed that each magazine may easily be seen and handled by visitors. The journals were first collected by Miss Adelaide Hasse, chief of the Economics Division, New York Public Library, and shown at the annual convention of the American Library Association at Louisville, June, 1917. They were borrowed by the Newark Library and Museum and are being exhibited as described in the art gallery of the museum in the Library building.

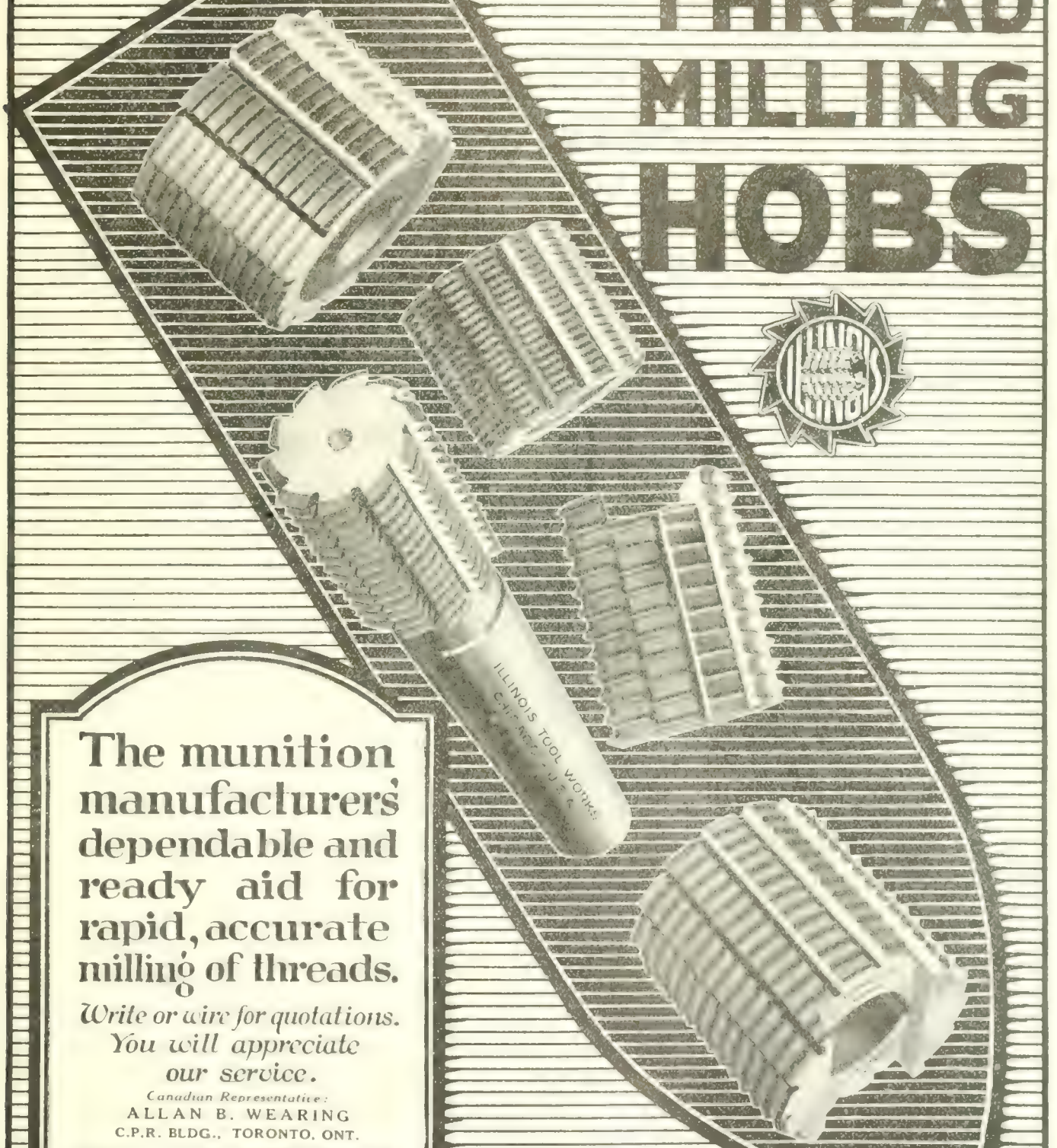
**New Patents Issued.**—The following is a list of Canadian patents recently issued through the agency of Messrs. Ridout & Maybee, 59 Yonge Street, Toronto, from whom further particulars may be obtained: Alex. Lamblin & Horace P. Cousin, radiators for motors of dirigibles and aeroplanes; James L. & Ernest Scott, friction driven drop hammers; Geo. W. Berry, constructing lid hinges for sheet metal receptacles; Theodore M. Coressy, auxiliary air admission devices for internal combustion engines; Cecil M. Dyer, apparatus for use in the carburetion of hydro-carbon liquids; George A. Guess, processes of electrolytically separating nickel from copper; B. H. Montgomery & J. B. Dingwall, hose reel; Wilard Chipman, speed recorder; Charles Haythorpe, the purification of water.

**Plan to Relieve Power Situation.**—The question of the shortage of electrical energy, particularly in the Niagara power zone, was discussed at great length at a meeting of the Ontario Municipal Electric Association at the City Hall, Toronto, on Jan. 30. It became clear that the two main obstacles to a continuous supply of power were the ice troubles in the Niagara River and the inability of the power companies to prevent breakdowns. If all plants could be operated at full capacity continuously there would be sufficient power available to meet existing demands. In addition to this it was apparent there was a lack of co-operation between the private power corporations and the Hydro Commission. A resolution was carried favoring the appointment of Sir Adam Beck as power controller for Ontario to act with Sir Henry Drayton.

**Vancouver, B.C.**—Messrs. Norman R. Wilson and H. Stainton, the two experts brought from the East by the Fire Underwriters' Association last summer to investigate the efficiency of the city fire department, recommended the purchase of two fire-boats, according to a report made by Fire Chief Carlisle to the civic fire and police committee recently. One of these boats would be for False Creek and one for Burrard Inlet, the former to be placed in service with as little delay as possible. It was recommended by the investigators that the boats be equipped with pumps capable of delivering 5,000 gallons a minute at a pressure of 150 pounds to the square inch, and with machinery to drive them at a speed of not less than twelve miles an hour. A motor-driven watertower for each boat was also advised.

# ILLINOIS

## THREAD MILLING HOBS




**The munition manufacturers' dependable and ready aid for rapid, accurate milling of threads.**

*Write or wire for quotations. You will appreciate our service.*

*Canadian Representative:*
ALLAN B. WEARING
C.P.R. BLDG., TORONTO, ONT.

## ILLINOIS TOOL WORKS, CHICAGO, U.S.A.

The Columbus Chain Co. with factories at Columbus, Ohio and Lebanon, Pennsylvania, and the McKinnon Chain Co. manufacturers at Buffalo, New York and St. Catharines, Ont., have been united under the name of the Columbus McKinnon Chain Co. The new company have formed a Canadian organization, known as McKinnon Columbus Chain Ltd., with general offices at St. Catharines, Ont. Besides offering the trade a [illegible] electric welded chain, it is the intention in the near future to manufacture fire welded chain at St. Catharines under supervision of experienced men from the Columbus plant. The new company will therefore be in a position to offer the well known chain of the Columbus company but manufactured in Canada. Until the Canadian plant is in operation orders for fire welded chain will be imported from Columbus, Ohio.

**Smelters Operating at High Efficiency.**—Plants of the Consolidated Mining and Smelting Co. at Trail, B.C., are now operating highly efficiently according to Managing Director J. J. Warren. By the installation of most modern machinery and the prompt adoption of the latest practicable improvements, the company is now able to turn out fully as much metal with its present staff of 1,200 men as with 1,600 several months ago. So that it is able to maintain its output in spite of the heavy reduction in staff due to enlistment in the army; and moreover, a considerable economy is affected by the saving of some $40,000 a month in wages. "The plants of the company have been built primarily to take care of the peace needs of Canada, in the metals it produces; so that war orders are only incidental to the successful operation of the company, and not absolutely essential, as in the case of some corporations. In this connection it is pointed out that the company will be able to continue a steady regular business when there are no more war orders to be obtained."

**Canada Iron Foundries' Situation Improving.**—A substantial increase in sales and earnings in 1917 permitted of a further strengthening of the position of Canada Iron Foundries, Ltd., successor to Canada Iron Corporation, when went into liquidation about four years ago. The reorganized company, in its second annual report, submitted to shareholders at a meeting in Montreal on Feb. 1, reported an increase of 44 per cent. in the year's sales, which make the total for the twelve months ending September 30th last about $2,849,000, against $1,979,933 the previous year. If allowance is made for the change, the foundries' earnings for the year amounting to $528,097, compare with $337,692 in 1916. Including $14,160 earned as interest, discount, etc., the net revenue of the year was $542,257. During the year the company sold its furnace at Midland, Ont., for $325,000 and completed extensive improvements to the plant at Three Rivers, Que. The company did not operate its mines or furnaces owing to prevailing conditions in the trade.

**Power Shortage for Hamilton Industries.**—Unable to secure a sufficient supply of power to meet the demands, the Hamilton Hydro Electric Board has been forced to issue an order that all industries operating by Hydro power, save the manufacturers of munitions and essentials shall close down one day a week until the present situation has been relieved. This action became imperative owing to the inconvenience and losses the manufacturers were suffering by reason of the frequent interruptions in the service resulting from the Ontario Commission shutting off the entire city every time it went over its load limit of 7,500 kilowatts. The shortage of power in Hamilton amounts to about 1,500 kilowatts, and by shutting off one-sixth of the non-essential industries each day the local commission hopes to be able to provide a steady service for the balance. Manufacturers will be given due notice of the days on which they will be expected to shut down, and non-compliance with the order may mean that they will be shut off altogether.

**National Clay Products Association Convention.** — The Canadian National Clay Products' Association, in session at the Prince George Hotel, Toronto, on Jan. 29 decided, after considering the suggestion of Dr. Wilfrid Grenfell that brick dwellings might be erected in Labrador, to render the distinguished missionary every assistance in testing the clays to be found in the far nothern region. Consideration will be given to the establishment in Toronto of a school of ceramics. At present students desiring to study this practical and useful trade are obliged to take their courses at schools of ceramics in different parts of the United States, several of which have well-equipped laboratories. It has been suggested that a laboratory be placed in the Central Technical School and equipped with kiln and machinery. The following officers were elected for the current year: Past President, A. F. Greaves-Walker, Baltimore, Md.; President, Thomas Kennedy, Swansea; Vice-Presidents, Wm. Burgess, Tomorden; Ryland H. New, Hamilton, and G. Angus German, Toronto; Secretary-Treasurer, Gordon C. Keith, Toronto.

## TENDERS

**Halifax, N.S.**—Tenders will be received until Thursday, Feb. 14, 1918, for the reconstruction of steel roof trusses, Drill Hall, Halifax, N.S. Plans and forms of contract can be seen and specification and forms of tender obtained at the offices of the Chief Architect, Department of Public Works, Ottawa, of the Overseer of Dominion Buildings, Post Officer, Montreal; of the Clerk of Works, Postal Station "F," Yonge St., Toronto, and of the Clerk of Works, Halifax, N.S.

**Melbourne, Australia.** — Tenders for the following may be adressed to the Director of Navy Contracts, Navy Office, Melbourne: Supply, delivery and erection at Garden Island, of one (1) 200 horse-power prime mover set of either semi-Diesel type or other heavy oil engine direct coupled to 2-65 K.W. 240 volt D.C. electric generating set. All accessories, tanks and fittings to be supplied by tenderers as per specification. Date of closing June 7, 1918. Tender forms are open for inspection at the Department of Trade and Commerce, Ottawa. File No. 20117.

**Ottawa, Ont.**—Tenders will be received until March 18, 1918, for heating and ventilating equipment required in the reconstruction of the Parliament Buildings. All tenders to be based on the execution, erection and completion; together with the furnishing of all materials, tools, appliances, scaffolding, apparatus and labor required for the installation of the heating and ventilating equipment as called for in the plans and specifications. All information can be obtained at the office of the General Contractors, P. Lyall & Sons Construction Co., Ottawa. A set of plans and specifications may be had by depositing an accepted bank cheque for twenty-five ($25.00) dollars made payable to the Honorable the Minister of Public Works, which will be returned if the intending bidder submits a regular bid.

**Ottawa, Ont.**—Tenders will be received until March 18, 1918, for rolled steel casements and bronze covered frames and sash for the Parliament Buildings. All tenders to be based on the execution, erection and completion; together with the furnishing of all material, tools, appliances, labor, etc., as required and described by the plans and specifications for (a) rolled steel casements; (b) bronze covered frames and sash. Separate tenders to be submitted for "a" and "b." The work included under this contract shall be commenced immediately on the signing of the same, or at such time as may be directed, and be carried out in such a manner as to insure the completion thereof by Sept. 30, 1918. Plans and specifications, and any other information required can be obtained at the office of the General Contractor, P. Lyall & Sons Construction Co., Ottawa.

## MARINE

**Toronto, Ont.**—The second Norwegian freighter which is being built at the Polson Iron Works will be launched on Monday morning. The ice in the bay which is nearly five feet thick will have to be cut away near the ways to permit of the vessel being put in the water.

**Victoria, B.C.**—The name of the wooden steamer, War Tyee, was changed to War Yukon a few days before being launched. The War Yukon will be the first vessel of the Imperial Munitions Board to get her machinery, and will, no doubt, be the first of the twenty-seven under construction to get away to sea. She has reached the stage when she is ready for installation of her engines.

**Vancouver, B.C.**—The steel steamer Alaska, launched from the Coughlan lards on Jan. 19, has been moved to the fitting-out berth and work will be commenced installing the engines and boil-

# One of the Thirty-two Millhollands in a Plant at Toronto, Canada

Known to friendly rivals as the plant with quantity production "down pat."

Many other plants have a similar reputation. They are also equipped with

# Millholland Turret Screw Machines

The Millholland is the machine powered to do and to keep doing output stunts that gladden the heart of operator and owner.

Strain of heavy cuts? The Millholland knows no strain. Note the powerful double friction, back-geared head.

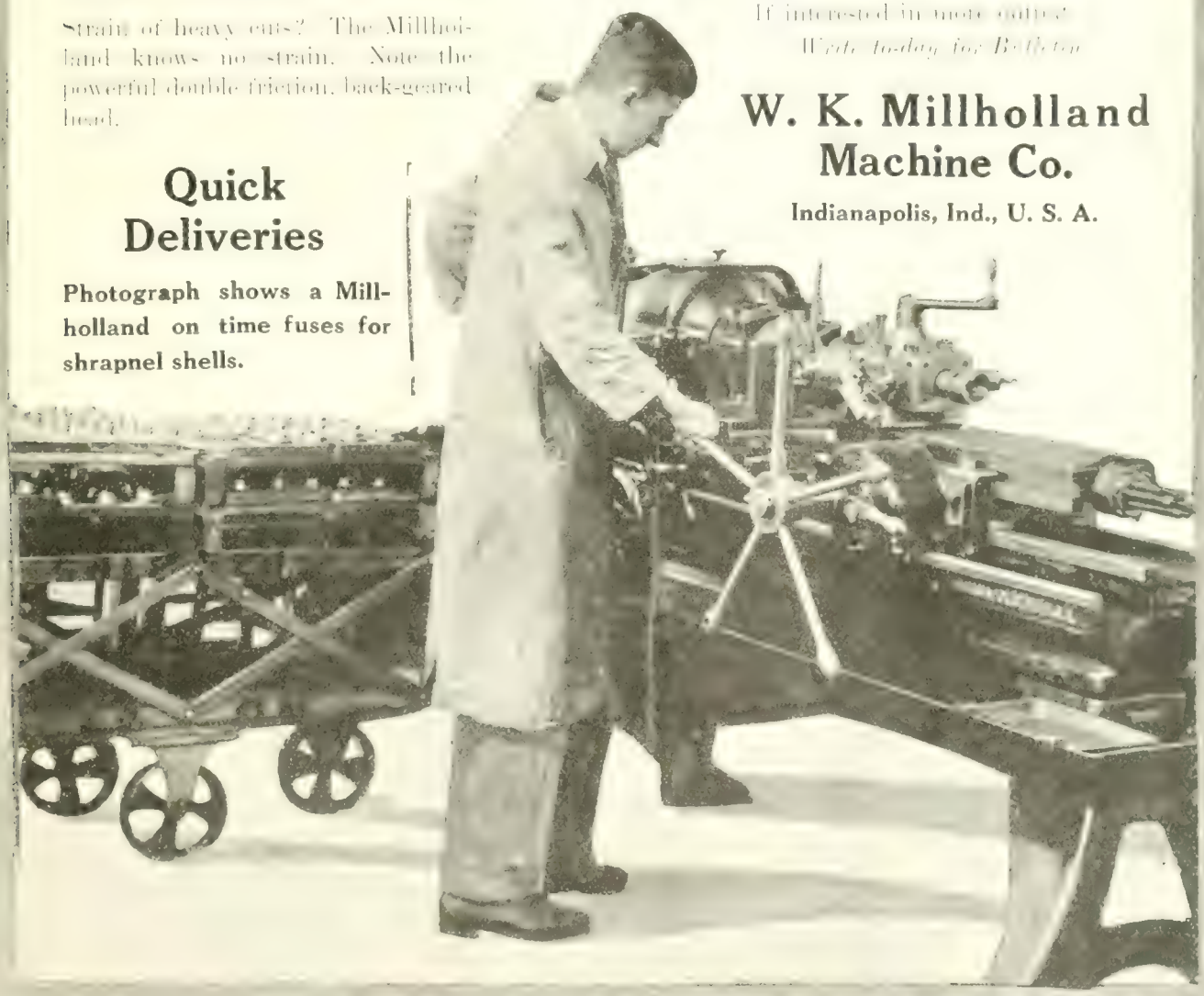
If interested in more output
*Write today for Bulletin*

**W. K. Millholland Machine Co.**

**Indianapolis, Ind., U. S. A.**

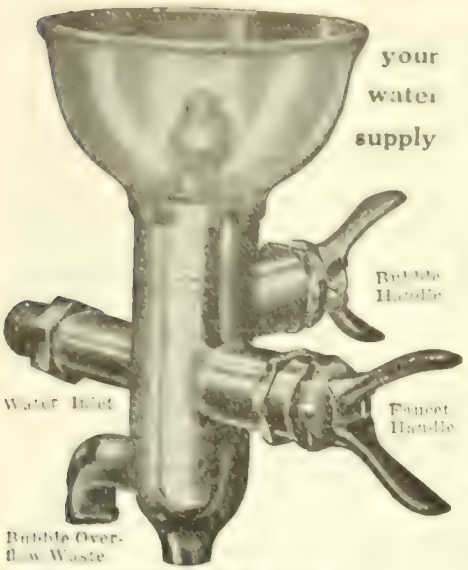
## Quick Deliveries

**Photograph shows a Millholland on time fuses for shrapnel shells.**



"PURO-FY"

(MADE IN CANADA)




THE American Museum of Safety conferred a Gold Medal Award upon the Puro Sanitary Drinking Fountain at the First International Exposition of Safety and Sanitation.

The Puro Sanitary Drinking Fountain won because it deserves to win. Puro had merits that made it stand head and shoulders above any other drinking apparatus.

**Safe Simple**
**SANITARY Economical**
**Quickly Attached**

These are the qualities that forced the leading safety and sanitary engineers to pick Puro in preference to all others.

No device can be as efficient that does not contain all these qualifications, and Puro was not built for first place. Puro was first.

Don't be satisfied with half way goodness, or make-shift drinking arrangements for your employees.

If the men in your factory must drink, give them a clean drink.

Puro is [illegible] not rust or corrode.

Puro is economical. It allows just the proper amount of cool fresh water to come through the bubbler. No spurting, no overflowing to waste. Puro regulates itself. You can "PURO-FY" in five minutes.

Tell us how many men in your factory and your water pressure in pounds—

We will tell you just what it will cost to "PURO-FY" YOUR WATER SUPPLY.

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ers. The engines are coming from the East, but the boilers were made at the Coughlan yards. The next vessel to be launched from the yard will be the War Camp, which will be sent down the ways some time this month.

**Victoria, B.C.**—Capt. T. E. Gilmour, of this city has invented a caulking machine. The machine consists of two V-shaped guides which force the oakum under two revolving steel disks, the latter being hammered by compressed air into the seams, a handle to draw and steer the machine along the seams, and eight tension springs to hold the guides in position make up the device. It is claimed that the machine can caulk at the rate of 600 feet per hour.

## INCORPORATIONS

**The Waneta Power Co.** has been incorporated at Victoria, B.C., with a capital of $1,500,000 to take over the business of the Waneta Development Co. of Nelson, B.C.

**The Colonial Shipping Co.** has been incorporated at Victoria, B.C., with a capital of $40,000 to construct and operate vessels of all kinds with head office at Vancouver.

**John Meston & Co.** has been incorporated at Victoria, B.C., with a capital of $10,000 to carry on the business of iron founders and mechanical engineers, etc., at Victoria, B.C.

**The Allan & McKelvie Engineering Co.,** has been incorporated with a capital of $50,000, at Victoria, B.C., to acquire and take over as a going concern the firm of Allan & McKelvie of Vancouver, brass, iron and steel founders, marine and mechanical engineers, etc.

## CONTRACTS

**Toronto, Ont.**—The Dominion Bridge Co. and McGregor & McIntyre have secured a joint contract for 1,800 tons of steel for a shipbuilding concern.

**Toronto, Ont.**—The T. Eaton Co. has awarded the contract to the Dominion Bridge Co. for 8,000 tons of structural steel for a mail order building to be erected near the harbor front.

## BOOK REVIEWS

**Principles of Iron Founding,** by Richand Moldenke, E.M., Ph.D.; 517 pages, 6 x 9 in., illustrated; published by McGraw-Hill Book Co., Inc., New York. Price $4.00 net, postpaid.

Following this is a brief outline of iron metallurgy dealing with the relation of iron to each of the principal elements met with in foundry work, after which chapters V to XIII deal with properties, materials, processes and results, the properties of cast iron being dealt with in 80 pages alone.

To progressive foundrymen in the western hemisphere, the name of

Moldenke is indicative of all that is authentic in iron founding, and this book, which embodies the principles developed by the author during an exceptionally efficient lifetime, is an excellent example of a modern technical treatise. It deals directly and lucidly with the basic principles underlying the best modern foundry practice, and contains just sufficient historical data to make the foundryman realize the dignity of his calling and the dependence of modern civilization on the accomplishments of the moulder and cupola man. The manufacture of iron is traced from ancient times down through the development of it in Europe and latterly in America. The second chapter, dealing with the industrial status of the foundry contains desirable information regarding allied industries and their relation to the foundry—i.e. the status of the foundry in relation to manufacturing enterprise, producers of raw materials, purchasers of castings commerce and finance, exporting and banking; inter-foundry relations; association activities; internal foundry conditions. Chapter III. deals with foundry organization.

The treatment of the various sections is particularly complete, technically accurate, and possesses a readability equalled by few technical works and excelled by none.

## CATALOGUES

**New Catalog of "Beaver" Tools.**—The Borden Co., Warren, Ohio, has just issued its 1918 catalog of "Beaver" easy working die stocks and square-end pipe cutters. This catalog is said to be the finest tool catalog ever issued, and its attractive appearance indicates that no expense has been spared in securing the services of the best artists and printers. This book is printed in two colors, on high grade paper, and illustrates in a complete and artistic manner the complete line of the "Beaver" product. Several new "Beaver" tools are shown for the first time in this catalog—one of the most popular of these being the new No. 3 "Beaver" Junior ratchet die stock, which is built on the unit plan to thread pipe from ⅛ in. to 1 in. inclusive. While this expensive catalog is not intended for general distribution, the Borden Co. will undoubtedly send a copy to any of our readers who will write a letter or card stating that they are interested in "Beaver" tools.

Engineering and Machine Works of Canada Ltd. has been incorporated at Ottawa with a capital of $1,000,000 to take over as a going concern that part of the Jenckes Machine Co's. business heretofore carried on at St. Catherines, Ont.


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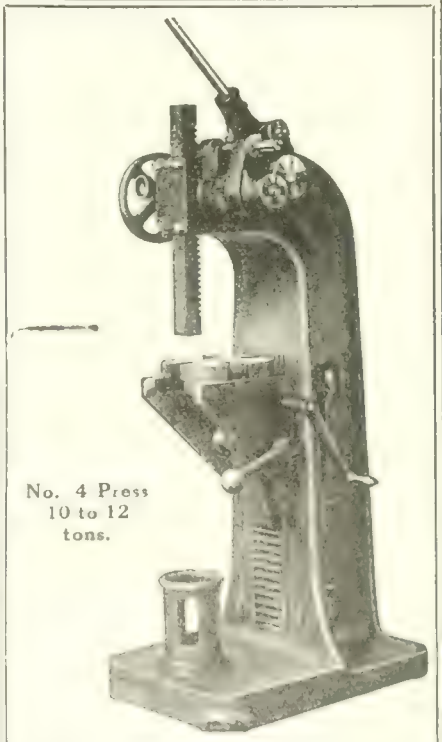
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# CANADIAN MACHINERY

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*A weekly newspaper devoted to the machinery and manufacturing interests.*

Vol. XIX. TORONTO, FEBRUARY 14, 1918 No. 7

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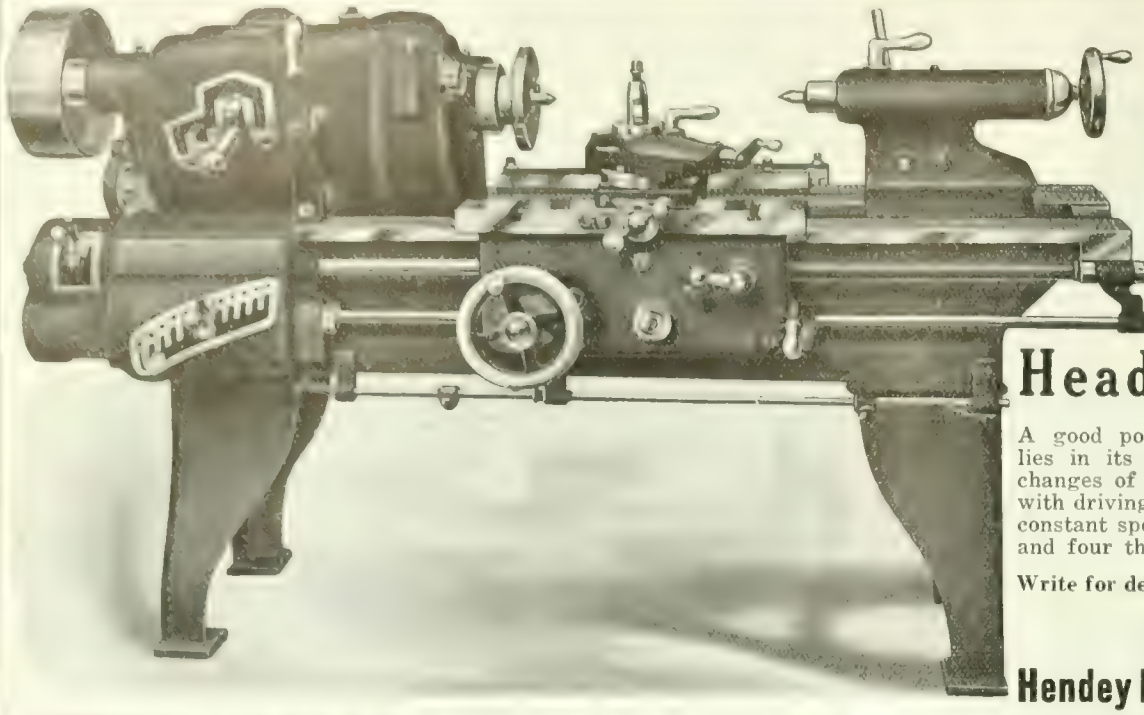

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# Some Applications of Air-operated Machine Tool Equtpment

Staff Article

*The tendency to use specialized equipment when the object is either to produce expense is now thoroughly established among progressive manufacturers and the resume of various applications of compressed air to increase production and save labor forms the accompanying article should serve a helpful purpose in refreshing the minds of many readers.*

IN continuance of an article on air operated mechanism as adapted to machine tool operation, which appeared in our issue of January 3, the following article describes several additional applications, more particularly to shell work:

### Control Valve

Control of the air for pneumatic equipment is generally obtained by the use of some type of three-way valve, as it is necessary to have an efflux for the discharged air and also a passage for the incoming supply. A valve that has been used with considerable success in the main line of an air system is shown in Fig. 1. This valve is attached in such a position that it is within easy reach of the operator. As the purpose of pneumatic equipment in conjunction with machine tools is to facilitate operation and speed up production, it is obvious that the essential factor is rapidity of action, and it is, therefore, important to locate operating valves so as to be conveniently manipulated by the workman when standing in a normal working position. The valve here illustrated is of the revolving disc type, contact being made on two flat surfaces. The cover B is secured to the body A and made airtight by the gasket shown. To prevent air leakage around the stem the gland C is provided, packed as indicated at D. The air supply enters at G, above the disc E of the valve, thus maintaining a constant pressure and keeping the valve to its seat. Operation of the handle F brings the holes H and I in line for the passage of the air to the pipe line. By providing additional openings in the base more than one line can be supplied. The movement of the valve spindle is regulated by a screw in the body of the valve, a suitable slot being cut in the side of the disc.

### Quick Return for Carriage

In order that maximum production may be maintained it is necessary to give special attention to the physical requirements of a workman in the performance of his duties. Properly cared for, a machine tool will accomplish as effective work at the close of a day as at the beginning. On the other hand, the man at the machine will invariably feel the strain of his continual exertions and his enthusiasm or "pep" deteriorates as the day advances. To minimize this inevitable fatigue is a step toward higher efficiency, as the conservation of physical energy, often expended in unproductive labors, is very often of primary importance. Apart from the actual handling of the work to and from the machine, the manipulation of the latter usually involves considerable exertion on the part of the workman, which in time affects his ability to perform his task as accustomed to during the earlier hours of the day.

A feature in connection with the operation of machine tools, more especially

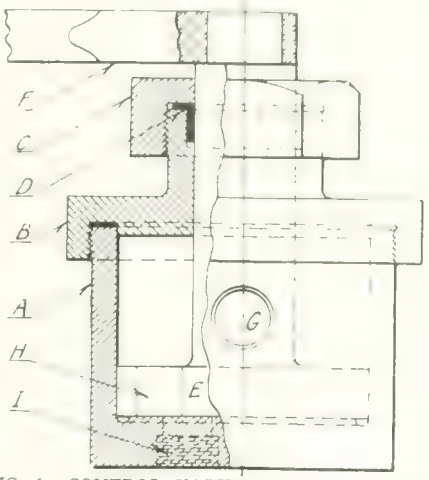



FIG. 1. CONTROL VALVE FOR AIR CHUCK.

lathes of the heavier variety, is the backing off of the carriage after a cut has been accomplished. In the case of quantity production the labor necessary for this return operation requires the expenditure of much energy which might be profitably utilized to better advantage in other directions. This possibility was early recognized by many manufacturers, and with the purpose in view of relieving the workman, and at the same time facilitating the operation of moving the heavy carriage, small long pneumatic cylinders were placed on the back of the lathe for rapidly returning the saddle to the extreme back position (Fig. 3). The cylindrical portion A of these cylinders is made from suitable pieces of smooth bored tubing, the heads B B being held in position by means of the long rods C. The cylinder is supported by the brackets D and E. The outer end of the piston rod F is secured to the ell bracket G that is bolted to the under side of the machine carriage. When the cut is being taken the piston is free to travel in the cylinder, and when the cut has been completed the air is allowed to enter the cylinder at the end D and the piston and likewise the saddle is forced back to a non-working position. Where compressed air is in use for the operation of chucks and other appliances the installation of a quick return labor-saving device on heavy tools will often prove of inestimable value.

### Vertical Chucking for Bench Work

In the manufacture of shells many plants require the use of nose plugs for certain of the machining operations. Previous to the adoption of compressed air for such purposes, the shells were usually placed in an ordinary vise or special clamping chuck and held while the plug was screwed in. The manual requirements in the tightening and relieving of these primary chucking devices were not conducive to maximum output, so that many establishments have replaced these appliances by others operated by compressed air, assuring more rapid and reliable operation. Fig. 3 illustrates a vertical air chuck adapted for the holding of shells while the nose plugs were screwed in. The body A, forming the outer casing of the chuck, is secured to the bench as shown. The steel collet B, made in three sections, has a flange on the inner end that fits in a groove in the piece C. The piston rod is connected to this piece as shown at D, the lower end of the rod being secured to the piston E. The cylinder is suspended from the chuck body

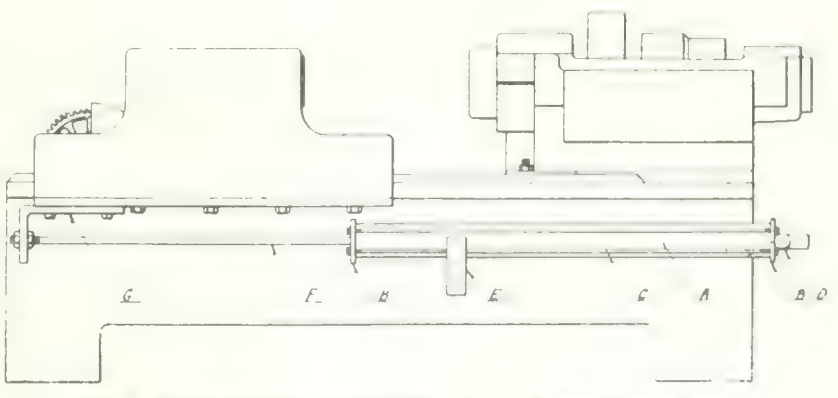



FIG. QUICK RETURN ATTACHMENT FOR LATHE CARRIAGE

by means of the tube F, the gland G being fitted to prevent air leakage. The cylinder is composed of three parts, the cylindrical portion I and the two heads J and J, the upper one being fitted with a stuffing box as shown, the whole being held by the bolts K. Openings are placed in both heads for air supply, L being the pressure side when holding the work and M the entrance for release of the chuck, the control being obtained by a three-way valve.

### Pulling Band Over Shell

When placing the copper band over the shell and locating it in position in line with the groove, preparatory to compressing it in the hydraulic press, considerable difficulty has often been experienced owing to the necessity of forcing or hammering it to the required position. This process not only retarded the output, but very often the band would enter at a slight angle, so that when pressure was applied it was sometimes found that the fit of the band in the groove was not uniform, consequently giving rise to possible rejection when inspected. Often such a band when taken from the press would appear perfectly sound, but after being machined slight defects would occasionally develop which, upon inspection, would necessitate the removal of the band.

Efficient methods, in what might be classed as insignificant details, are very often found to be economic factors in the problem of quantity and quality production. Where some simple and easily constructed device can be readily adapted to eliminate, or even reduce, the possibility of mistake or faulty work, the initial expense should not deter one from

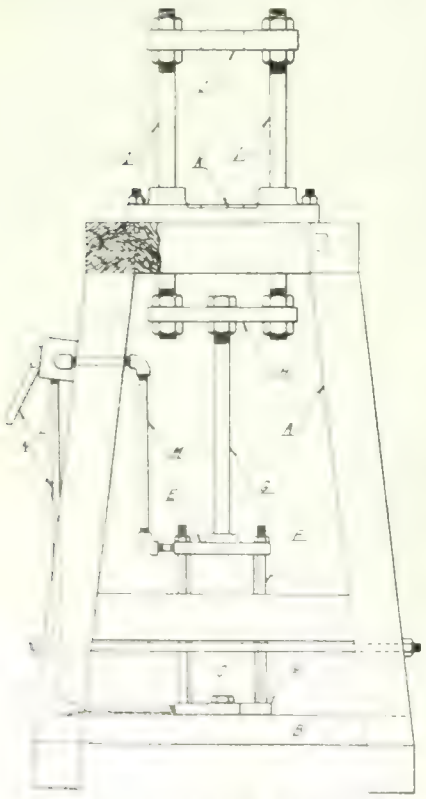


FIG. 4 APPARATUS FOR PULLING BAND

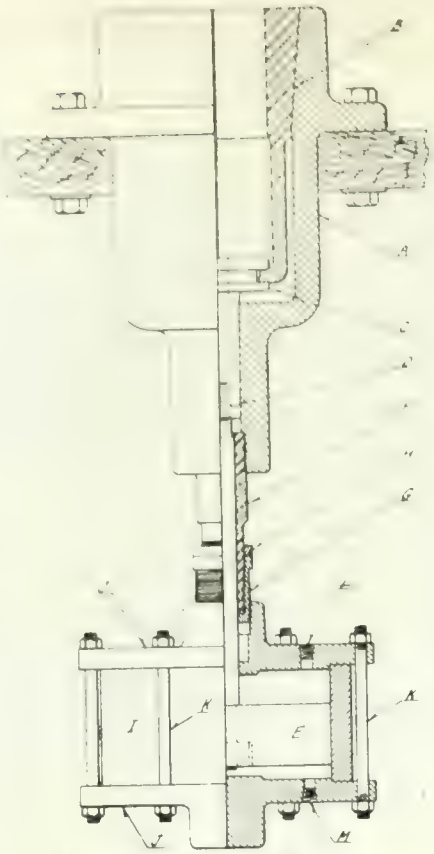


FIG. 3 AIR CHUCK FOR SCREWING IN NOSE PLUG

trying it out, if only to test its serviceability. A little experiment often results in a great saving of time and material.

The sketch of the "press" illustrated in Fig. 4 shows the method adopted in one shell plant for overcoming the trouble arising out of the unevenly pressed bands. With this device the copper bands are drawn over the shells quickly and uniformly, so that it is a rare exception to have a shell rejected on account of a misplaced band. The framework A is made of 3-inch square scantlings, the bottom brace B acting as a support for the pneumatic cylinder C; this cylinder is made of a straight tube and two heads held together by the bolts F. The upper end of the piston rod is connected to a plate H, the outer end of which carries the draw bolts I, the plate J on the top of these bolts being bored in the centre to pass freely over the body of the shell. The base plate or bolster K is provided with a recess of sufficient depth to allow the band to be pulled to a definite position in line with the prepared groove. The operating valve L is located on the side within easy reach of the operator. The valve is of the three-way type, so that air can be supplied to either end of the cylinder as desired.

### Pneumatic Clamping Device

During the past few years increasing attention has been given to the application of compressed air for various clamping purposes. By the use of suitable apparatus air operated clamping devices may be brought to a high state of efficiency. If used direct it is essential that the piston packing be perfectly airtight or trouble will eventually develop. However, the general practice is to provide a system of cams or levers to assure positive action of the clamping points. As stated before, two of the great advantages of pneumatic appliances are the rapidity with which the pressure can be applied and the releasing of the workman from the physical exertion required for hand-clamping arrangements. Where heavy cutting is a factor of the work it is absolutely necessary that the pressure exerted on the clamps be sufficient to prevent any possibility of the work slipping under the action of the cutting tools, and to obtain this by the pull of a wrench on a nut or bolt requires a tremendous strain on a man's arms, which, when continued at short intervals, must sooner or later result in fatigue and consequently loss of productive power.

An interesting and highly effective clamping arrangement for heavy work is illustrated in Fig. 5, it being adapted for use on the special Gorton cutting-off machine. The initial pressure is exerted by means of air or water forced into a cylinder placed to one side of the machine; by a system of levers the final pressure on the work is magnified many times. On the out end of the piston rod is a forked cross head that slides on two

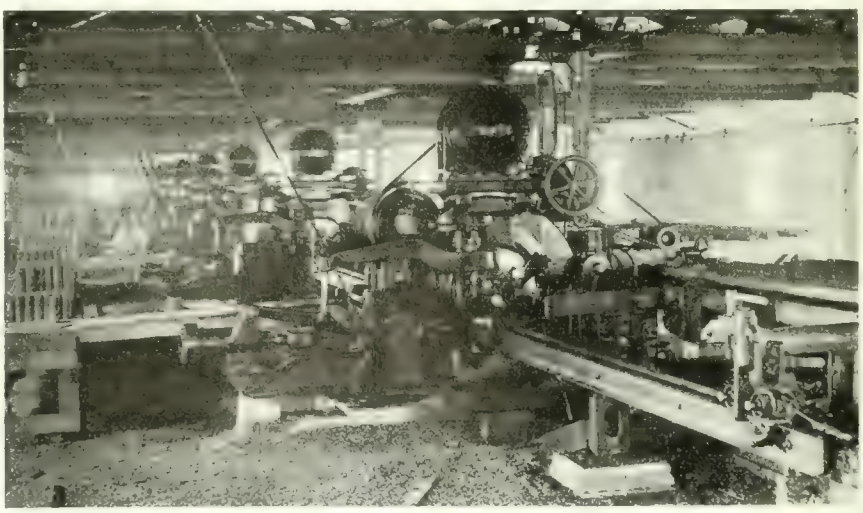


FIG. 5 SINGLE CLAMPING DEVICE ON GORTON CUTTING-OFF MACHINE

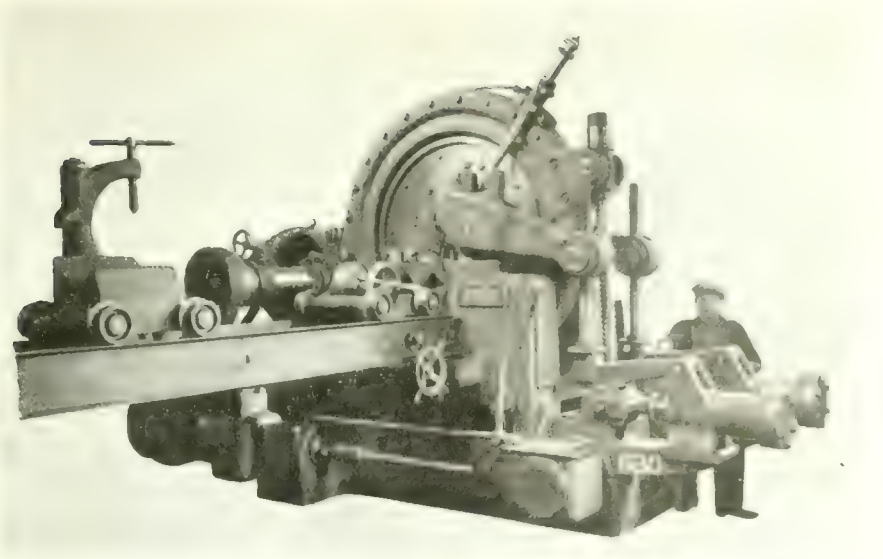


FIG. 6. DOUBLE CLAMPING DEVICE ON GORTON CUTTING OFF MACHINE

steel shoes located horizontally and secured to the top of the cylinder supporting base. In the forked cross head is fitted a steel pin that carries the large ground chilled roll that operates the swinging lever shown. The action of this roller motion is on the principle of the wedge, with the vertical movement becoming less and the pressure greater as the piston advances. The top lever, which is in the ratio of 6 to 1, increases the holding power still further.

Where clamping is necessary on either side of the cutting head the clamps are fitted in duplicate as shown in Fig. 6. The arrangement is similar in each case, but in the double type the fixed rod used between the two levers is replaced by the large adjusting screw to facilitate the operation. This screw passes through a 6-inch cylindrical nut, journaled in the long arm of the main clamping lever. Through the short end of this lever is the main clamping screw, also adjustable, and the lower end is provided with a tempered tool steel dogging point for biting into the work and assisting in preventing slippage of the bars.

### Development of the Self-Contained Spindle

No other detail in connection with machine shop operation has been given greater thought and attention during the past three years than that of chucking. To attain and maintain a high percentage of efficiency in quantity production of any description the handling and holding of the work is of vital importance, not alone from the viewpoint of speed, but also from the viewpoint of service and economy. The abnormal requirements of the munitions making industry have undoubtedly been the primary factor in the development of effective methods for holding shells during machining operations, and the outstanding feature of these chucking appliances is the preponderance of air operated equipment. It is not that the use of air gives a greater gripping power than the hand wheel operated draw rod, but with the pressure exerted being relatively the same the preference is with the pneumatic devices, due to the celerity of its action and likewise to the fact that the workman's energies, which must be severely taxed in the hand chucking process, can be conserved for other and more productive purposes. In the early stages of the struggle for mastery of the shell-making problem manufacturers were forced to adopt many different methods of chucking devices for the various sizes of shells. In the incipient period of munitions activity the equipment then in use was not very well adapted to perform the volume of work that is now possible from the large variety of machines that have been specially developed for certain and specific purposes. However, it was only a short time after the industry was well under way that engineers and mechanical men began to realize the possibilities of the single purpose machine, and in recognizing the advantages of such tools applied themselves to the task of redesigning the existing equipment so that maximum production could be attained.

In reconstructing these machines the chucking of the work was given equal consideration with the machining of the shells, and where a supply of compressed air was available or contemplated the incorporation of air operated chucks or mandrels was widely adopted. With the exception of the variation in the design of pneumatic chucks the principle of their action remains the same, each separate chuck having been developed from the experience or practice of the shop in which it has been used. The impetus that has been given to this particular phase of machine tool construction during recent years has greatly altered the head stock design of those lathes adapted for the special purpose of shell manufacture. To increase the rigidity and make it possible to take deeper cuts and heavier feeds, the chuck proper has been incorporated in the main spindle of the machine so that the body of the shell will be practically in line with the main front bearing, thus eliminating excessive overhang, which often requires an additional steady-rest to support the outer end of the shell or auxiliary chuck.

### Combined Chuck and Spindle

An instance that will demonstrate the evolution of the self-contained chuck and spindle, which, in conjunction with its pneumatic control, materially facilitates the operation of the machines and increases the efficiency of the individual operator, is given herewith. Desiring, if possible, to increase the output of a Hall cutting-off machine, a large railroad shop designed and constructed a special spindle to take the place of the standard one, and fitted it with the necessary collet chuck and air operated cylinder. A sketch of the entire spindle is illustrated in Fig. 7. As can be seen the cast iron spindle A is constructed so as to be as light as possible consistent with ample rigidity and operation. Fitted to the cylinder B, which is threaded to the rear end of the spindle, is the piston C, which in turn is connected to the collet chuck by means of the push rod D, the gland E being provided to prevent the escape of air. In addition to the action of the air the piston leathers are forced to the walls of the cylinder by means of the spring ring G. Supplementing this is a small packed ring H in the middle of the piston width. The head of the piston carries the air connection J. Secured to the forward end of the connecting rod D is the machine steel piece K that carries the tail end of the three uniform sections

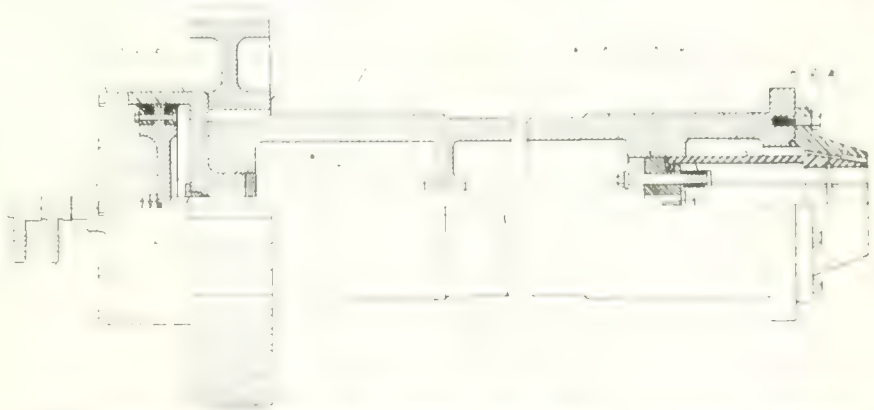


FIG. 7. SPECIAL AIR CHUCK AND SPINDLE FOR HALL CUTTING OFF MACHINE

of the collet jaws. It will be noted that the core of the spindle has a smaller diameter to provide a support for the block K and also the rear end of the jaws. A washer-like plate M is bolted to the front end of the spindle, the interior being bored tapered to suit the angle on the outside of the jaws; these latter being kept in their relative positions by means of three collet keys N. Spring rings O and P are fitted to free the jaws after the air pressure has been removed. When the work is released it is automatically ejected by the bolt Q, acted on by the compression spring R. To provide additional stability to the push rod it is supported midway by the bearing S.

In commenting on this particular chuck the superintendent said that it had been originally equipped with a collet that was solid at the rear, being split for a distance of about seven-eighths of its length from the nose or open end. As the collet was initially bored to a normal diameter it was obvious that a shell under size would have a tendency to receive the maximum pressure at the extreme forward end, while a shell over size would show a tendency to take the grip at the back. In order to eliminate these objections it was decided to make

To emphasize the importance of carefully fitting the piston to the cylinder the following incident may be of interest. Shortly after the change was made on the Hall cutting-off machine, mentioned above, complaints were made that

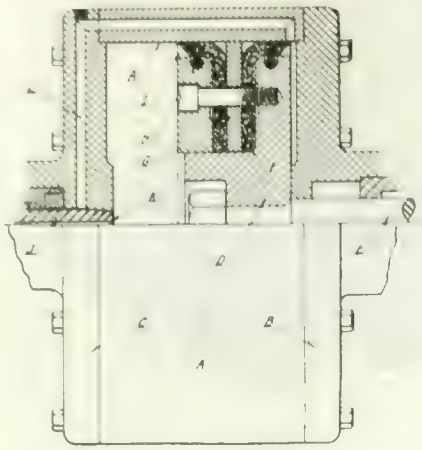


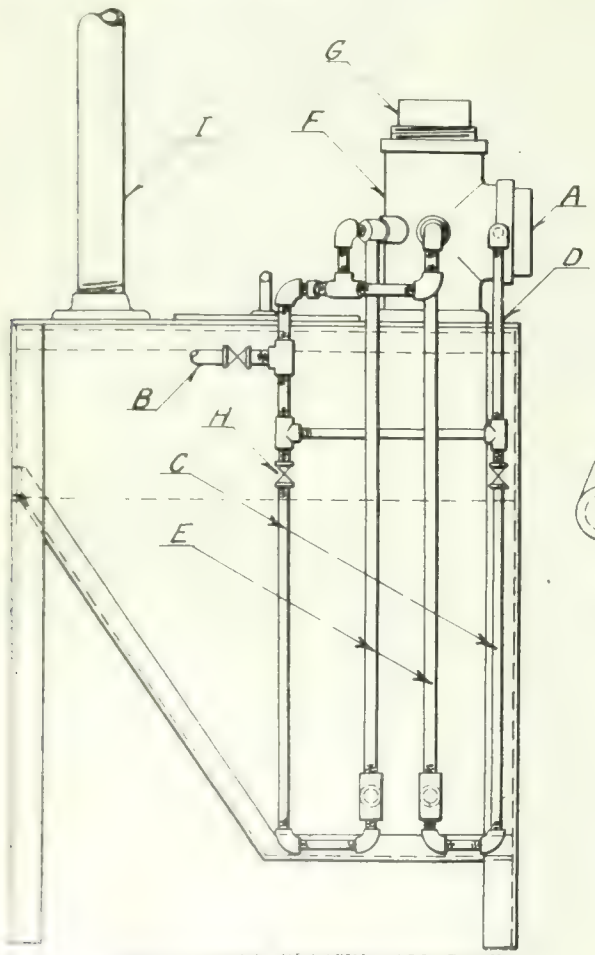
FIG. 8. ARRANGEMENT OF 6½ IN AIR CYLINDER.

this particular chuck would not hold, the shell showing a tendency to slip when the tools were forced into the metal. Upon examination it was found that the air was leaking past the piston packing, creating an equal pressure on either side, and destroying the initial grip of the jaws. This trouble was soon overcome by smoothing out the bore of the cylinder and using sound packing leathers.

### Special Piston Design

To be assured of positive and reliable action of any air operated appliance it is essential that the initial pressure acting on the piston should be maintained during the desired period. To attain this it is obvious that the bore of the cylinder should be smooth and parallel, and that the leathers or other packing rings should have perfect contact with the cylinder walls. An arrangement of a 6½-inch cylinder that has given very good satisfaction is shown in the sketch Fig. 8. The body A is made of a short piece of casting bored to the required diameter and fitted with two heads (made from the same pattern) held in position by the bolts shown. This method provides a convenient and economical means of repair, as the cylindrical portion, which is most liable to wear, can be readily renewed with little loss of time; a feature of considerable importance when a machine tool is a unit series production.

The piston D is made in several sections with the leathers separated by the middle washer, the whole being firmly held together by the clamp washer and bolt shown. It will be noticed that the leathers are forced to the walls by the expansion of the spring rings H, and in addition to this the leathers are beveled at I to allow the air to exert a side pressure and thus increase the tightness of the joint. In the construction of this cylinder no reliance has been placed on a spring for releasing the chuck, the piston




...ND BLASTING APPARATUS.

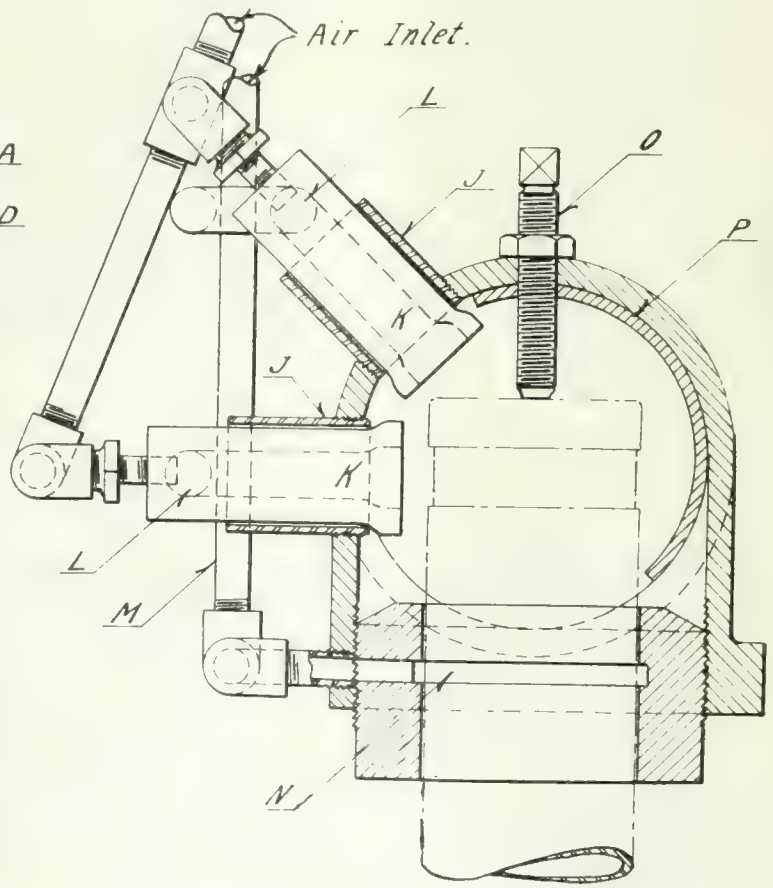



FIG. 11. DETAIL OF BLASTING NOZZLES.

being under positive control by admitting the air to either side of the piston as required. By this means the same cylinder can be used for a pushing or pulling action on the chuck mechanism. To force the piston in a forward direction the air enters the central passage K, and for the return movement the air is admitted into the space between the central tube J and the bore of the head C, and thence to the passage L to the opposite side of the piston.

A somewhat similar piston arrangement is illustrated in Fig. 9; in this design the separating washer is eliminated, but otherwise the construction is much the same. It will be noticed that the duty of the spring rings shown in the previous sketch is performed by the air itself, which is admitted to a chamber back of the piston leather and acts at right angles to the movement of the piston. It will also be seen that the left-hand leather is protected by a ring of metal that forms one side of the air pocket.

### Sand Blasting Apparatus

Sand blasting is a process that has been in use for a long period, but its progress has been greatly stimulated during recent years through its adaptation for the cleaning of shells after the heat treatment or hot-nosing of the open end. Before the copper band can be pressed on it is imperative that the scale created from the heating process be entirely removed from the surface of the metal to avoid serious complications during subsequent operations. Various designs of sand blasting devices have been constructed for these cleaning requirements, both for the interior and exterior of the shells. Many of those now in use have been developed in the respective shops, which has been responsible for the variation of their construction, although the principle of their action is invariably identical—that is, the vortex of the air and sand, as great velocity is required to cut the scale that clings to the metal, leaving the surface smooth and clean.

The general arrangement of one of these shell-making accessories is shown in Fig. 10. The sand supply is contained in a sheet steel tank that forms the body of the apparatus. In order to clean the base and rifling groove of the shell it is placed in the side opening A of the large standard pipe tee F, the top end of which is closed by the plug G, the lower end being fitted to the top of the steel tank. The air supply, at an approximate pressure of 8 lbs. per sq. in., enters at the point B, and through the system of piping forces the sand from the tank to the tee at the top. The air passes through the pipes C C and forms a suction in the sand delivery pipes E E, so that the sand is drawn upwards and blown with considerable force to the desired point on the shell body. An auxiliary supply of clean air is discharged through the pipe D for a purpose explained in the following paragraph.

In Fig. 11 is illustrated a sectional detail sketch of the nozzles and blasting

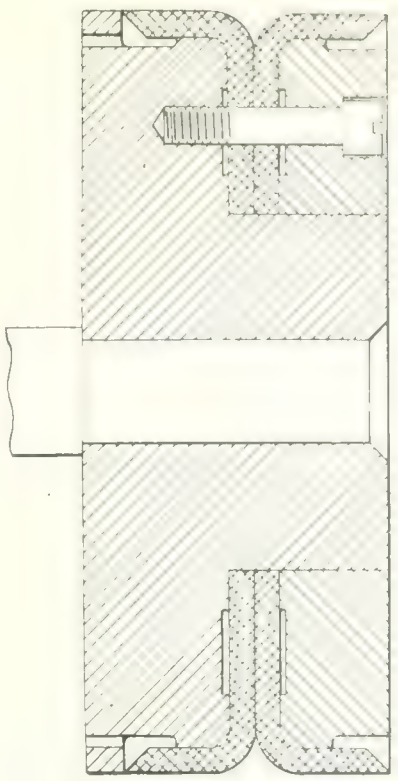


FIG. 9. ALTERNATIVE ARRANGEMENT OF AIR PISTON

chamber. Threaded to the body of the tee F are the two casings J set at an approximate angle of 50 degrees with each other. Through these the discharge nozzles K are located, and the mouth is enlarged to spray the sand and also to provide a check to the flying sand to prevent the same from backing up through the space surrounding the nozzles. As the mixture of air and sand is drawn up through the opening L it receives the additional force imparted by the clear air entering from a horizontal direction. Leading upwards from the cross pipe M a portion of the clear air is delivered through the pipe D (previously mentioned) and into the groove N that is cut in the bore of the bush A. The object of this is to form a film of air about the shell and to assist in preventing the sand from coming out at this point. The position of the base of the shell in the sand blasting chamber can be regulated by the adjusting screw O. To avoid the destruction of the cast iron tee the steel plate is fitted in so that, as the action of the sand affects this plate, the same can be renewed by removing it through the top opening of the tee and inserting a new piece. The air after being used passes out through the 2½-inch exhaust pipe I, the sand, owing to its greater weight, remaining in the supply chamber.

### Feeding of Cutting Tools

An interesting application of compressed air for the operation of a machine tool is shown in Fig. 12. It is here used for the feeding of facing cutters to the end of cast iron fuses. In the manufacture of these cast iron fuses it was found advisable to remove the rough skin before the same were handled in the automatic machines owing to the rapid destruction of the cutting edges of the tools when removing the hard scale. The adoption of the method here described facilitated the operation and greatly increased the efficiency of the finishing machines. The cast iron fuse A is held

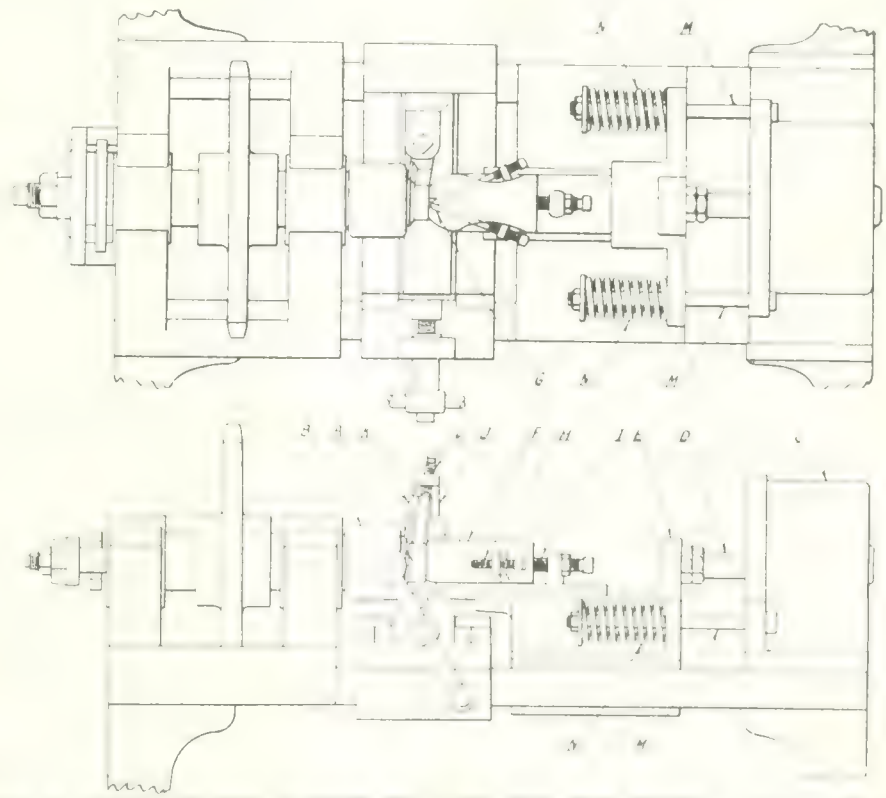


FIG. 12. ROUGH TURNING MACHINE FOR CAST IRON FUSE BODIES. AIR-OPERATED CARRIAGE IS RETURNED BY HELICAL SPRINGS

ing in the chuck is bored taper to fit the driven by means of small raised portions cylinder C is secured to the end of the machine bed, the outer end of the piston being connected to the longitudinal slide centre line of the machine, with the cut- plug contained in the centre for regulating the depth to which the tools shall enter the work. The pressure applied for this facing operation is derived from the air cylinder. At the back of the cross slide is located a bracket that carries another tool K for roughing off the metal on the body of the fuse; this tool is adjustable to height by means of the screw L. While the operation of these tools can be made simultaneously, the general practice is to allow the facing tools to accomplish their work and, while the stop block is pressed against the end of the fuse, the cut on the outer surface is taken, the action then being more rigid and regular. When the fuse has been roughed off the air is released and the tools are backed off by the reaction of the springs N pressing against the washer on the bolt M and the flange of the rod E. One of these springs is placed on either side of the carriage so that the thrust will be uniform.

### Cleaning Powder Chamber

One of the requirements in the manufacture of shrapnel shells is the removal of all foreign matter from the powder chamber after the parts have been assembled. The natural method of accomplishing this is by means of a blast of compressed air forced into the central tube which will, in being exhausted, carry with it any dirt that may have lodged in the tin powder cup at the base of the shell. When these shells are loaded their approximate weight is 18 lbs., and in the handling of large quantities it requires considerable energy to maintain a production consistent with the cost of the operation. In order to facilitate the removal of such heavy particles that might not be removed unless gravity was resorted to, the arrangement shown in Fig. 13 was adopted by one concern for this particular duty. A cast iron bracket A was secured to the side of a bench in almost a vertical position, so that the shell could be placed in with the open end downwards, the nose resting in a suitable hole in the bottom flange B; the upper end was provided

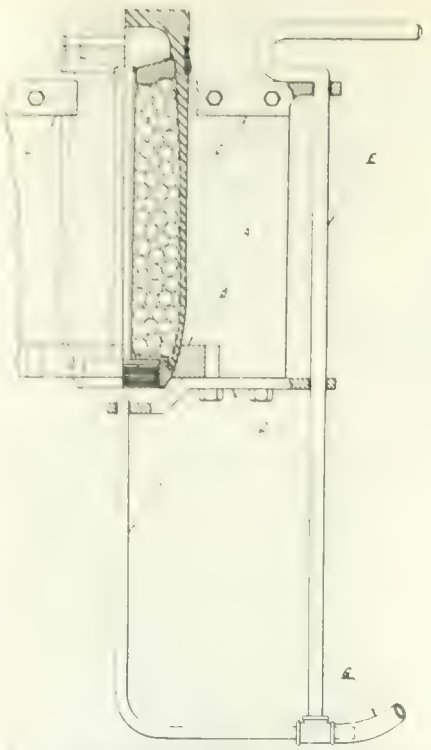


FIG. 13. CLEANING OUT THE POWDER TIN IN SHRAPNEL SHELL.

has been placed in the fixture and the air turned on, the rod E is raised and lowered a few times, which elevates the pipe F into the central tube and all dirt is removed, heavy portions falling by their own weight.

## WOMEN WORKERS IN A FORMERLY EXCLUSIVE FACTORY

By G. C. White.

IN these days of munition industries when such large quantities of men are being employed the manufacturers are somewhat at a loss to know where the help is to come from. The answer is female help. Women have proven that they are as intelligent as men and they certainly are more careful, moreover, being largely employed on specialist operations a great mechanical knowledge is not necessary but rather greater concentration of effort and dexterity.

The great secret of success in using women is to conserve their energy. Not being as strong as men the hours must be shorter, rest rooms should be provided, they should have backs to their chairs and the work should be handy to the machine and should not necessitate lifting or unnecessary handling or carrying. Statistics show that after 8 hours production drops and the gang should be changed. If the work is of such a nature that it can be placed on pegs on trays, in holes on boards or in boxes, a man can look after the handling from machine to machine. Women have and are also being used as tote box carriers.

### Peculiarities of Women

Women must have more definite instructions than a man as to how to use their hands and frequently it is necessary to repeatedly spend time coaching them. Some will forget from day to day, others like men try their own ideas which are not always the best. Men will not always do things the way they are told as they think their own methods are superior, whereas most women will take your suggestion and even though the movements are awkward they will persevere and ultimately increase the output. A man will suit himself when your back is turned.

Toolsetters should be employed to make all the adjustments and where only a drill or similar tool requires changing the operator will do this herself. Men will increase the repair gangs' cost by adjusting and interfering with the details of the fiixture or machine, women will leave those details with which they are unfamiliar severely alone.

Where small fine delicate work is being done a woman's fingers are more suitable than a man's and if a detailed comparison is made they will soon demonstrate their superiority.

Many women are clerks and time and piece work records are among their various occupations. The class of work to which they may be put varies with their character and interest and the better judgment one uses in assigning them to the various classes of work the better will be the ultimate results.

### Their Capabilities

On the Continent where compulsory military service is in force and was before the war the women carried on the business, or ran the farm as the case might be. If women can do this or heavy work similar to what they are doing on munitions in England and France where not so much attention is paid to their comfort, and where there are no such organized carrying systems as we have on this side, why should they not then do our work? Of course our type of woman is entirely different but from my own personal experience I can say that if due thought is given to their strength, mental ability, etc., and if conditions are made to suit each individual, there will be no reason to worry about what a woman can do, as she can and has proved herself to be as efficient as a man but we must not try to make a mechanic of a woman in 10 days and compare her with a man who has been on the job as many years.

## THE LEAD ACCUMULATOR AS A FACTOR IN TRANSPORTATION

By C. T.

IT is a rather surprising fact that the lead accumulator, as a source of motive power for electric pleasure vehicles, trucks, factory trucks, etc., has not become more general, considering the number of good sound business reasons in favor of its use in such applications. A little study of the accumulator itself will enlighten the reader on the main conditions retarding its adoption.

### Early Forms

The "box of power," which Lord Kel-

vin, then Sir William Thompson, was so enthusiastic about, when he received it from Paris, had a great many serious defects. It was the first of the lead accumulators, in which the oxides were pasted on the lead plates, instead of being formed on them by the electric current, in the expensive way that N. Plante had adopted. It was followed a very large number of other forms of pasted plates, all of which were subject to the same faults; the paste was liable to chip off, and the plates themselves tended to bend towards each other, thus short circuiting the cell and running it down. Then numerous forms of grids were adopted, all designed with pockets to contain the oxides, so as to prevent them chipping off. The trouble with these was the fact that the oxides change in volume, or tried to do so, very considerably, in the process of charge and discharge, because of small pieces of the oxides being forced out of the grids and hence short circuit followed sooner or later. The pure lead grids also were subject to the same trouble as the lead plates as they tended to buckle and bend towards each other, thus giving better chances for small chips of the oxide to lodge between them. The oxides which were pushed out of the grids also tended to build up a bridge at the bottom of the containing jars, thus short circuiting the plates, when the bridge was complete.

### Improved Types

Steady continuous work of 30 years has gradually eliminated the major of these troubles; the oxides do not as readily come out of their grids, and when they do they are prevented from short circuiting the cells by perforated separators, and by providing the plates with feet, causing them to stand well above the bottoms of the jars.

But after all trouble is only overcome by continual care, periodical testing, and continual charging. In the process of both charging and discharging the lead accumulator, sulphate of lead is formed. During charge, if the operation is properly carried out, the sulphate is all converted into oxides; but if not, some sulphate remains, interfering with the working of the cell as explained below. In the process of discharging, the formation of sulphate goes on more or less continuously. Sulphate of lead is, to all intents and purposes, an insulator in the position it occupies in the lead accumulator. It also tends to break the circuit, to break the connection between the electrolyte and the lead grid. If some lead sulphate is allowed to remain when charging is complete, it practically screens the portion of the lead plate upon which it is formed, from the action of the current, the resistance of the cell being higher in consequence, and its output less. If the discharge of the cell is allowed to continue indefinitely, a screen of sulphate is gradually built up all over the lead grid, which completely puts the cell out of action.

### Care of Cell

It is standard practice now to not discharge a cell below a pressure of 1.8 volts, and 1.85 volts is better; 2 volts being the initial pressure directly after charging is completed. The lower the pressure to which a cell is allowed to fall, the greater is the difficulty in restoring it to its normal working condition. As long as the discharge has not gone too far, and the pressure has not fallen too low, the cell can be restored by prolonged re-charging, sometimes with an occasional discharge. But the restoration is affected at the cost of the lead grids themselves.

The improvements in the lead accumulator have been very much quickened by the advent of a rival in the form of the alkali accumulator. Salts of nickel, and iron are employed, and the whole thing is constructed in a very much superior manner from mechanical point of view. The plates in the alkali accumulator are of steel plated with nickel; and the active materials are carried in perforated boxes made of the same material, the boxes being held in the steel plates in such a manner that there will be hardly any of the troubles that arose with the early forms of lead accumulator. The alkali accumulator furnishes a much lower pressure than the lead accumulator, 1.2 volts per cell, as against the two volts of the lead accumulator, but it is claimed that a smaller weight of cells is required to perform a given work.

## GAS FIRING AND REGENERATIVE SETTINGS

By T. J.

IN the earlier days of gas firing, as applied to retort settings, there were some rather vague ideas current as to the economy just effected. The saving of fuel consumption and the higher working temperatures attained in the retorts were often too hurriedly attributed to the recovery of waste heat. Waste heat is, of course, recovered, and returned to the setting in the preheated secondary air, but all the advantage does not lie merely with this recovery.

The advantages of gas firing as ordinarily practised are chiefly in three directions:—(1) The application of heat. High temperatures are generated in close proximity to the retort, and not as with direct firing at a considerable distance away, where much of the heat applied is in the form of much cooler and rapidly cooling convection currents of gaseous products. The study of flames may be applied with advantage to the question of gas firing of retorts, which is really a question of the application of flames. (2). The regulation of air. This can be accomplished to a very fine point so as to avoid the drop of available temperature due to the admixture of a large excess of air. (3). Regeneration or recuperation. Much heat is in waste products, i.e., gaseous products of combustion (mixed with air), which have passed the retorts and are on their way to the chimney. Any of the contained heat that can be transferred to the incoming air (usually the secondary air) is so much pure gain.

In Europe regeneration and recuperation of heat are used pretty much as interchangeable terms. In America recuperation is applied to the process by which (as in retort settings) the heat of the waste gases is transmitted through the walls of a flue and is given up to the air in an adjoining flue, while regeneration is there chiefly confined to the recovery of heat from heated chequer work over which the hot waste gases are first passed, and then by a change-over valve the incoming cold air is led over the same chequer work. Regeneration in this sense was tried on gas works, but its use was not long continued, though the same arrangement is successfully used on some coke-ovens, notably the Simon-Carves type.

### Recovering Waste Heat

It is often too rashly assumed that all the heat taken to the combustion chamber by the secondary air of an ordinary retort is this recovered waste heat. It is usefully applied heat, but not necessarily all waste heat. Some of it may be initial heat. In cases where the secondary air travels are placed between the waste gas flues and the furnace, some of the heat in that air will undoubtedly be derived from the furnace. As the air is ceaselessly passing through these flues, and thus tending to cool them, this constitutes a drain upon the heat resources around the flues, and thus will certainly withdraw some of the furnace heat. Whether this procedure may be right or wrong may be open to discussion.

It is all to the good to get the secondary air as hot as possible; but no mistake should be made by considering the heat it withdraws from the neighboring furnace as recovered waste heat. It is abstracted initial heat, and its loss tends either to increase the fuel consumption or to lower the temperature of the producer gas. It may seem unnecessary to labor or even to mention the point, but the heat that can be produced from a given weight of a given coke is fixed and unalterable, whether the coke is burning direct to the carbon dioxide, as in direct firing, or first to the monoxide and then to the dioxide, as in gas firing. Still the idea lurks around in some minds that gas firing actually produces more heat from the fuel.

What gas firing really does is to transfer much of the heat production from the generator to the actual setting some 70 per cent. of it. In the same way the use of water on the fire bars, which when vaporized and passed through the furnace generates some water gas, does not furnish any new source of heat. Whatever heat is given out by its combustion exactly balances the heat abstracted in its formation. All that is gained in a thermal sense is the transference of heat from the lower part of the fire, where a high temperature favors the formation of clinker, to a high zone where it is more useful and less likely to entail harmful secondary effects, such as fusing the ash into clinkers.

## FUEL SITUATION IN WAR TIME

[illegible]

Never in the history of the world has coal been of such vital importance, it is the life-blood of [illegible] world-wide war, and the success of the Allies is very largely dependent upon its increased production and careful conservation.

[illegible] to send the surplus coal produced in Eastern Canada to the New England States and from Western Canada to the Western States, Central Canada and that part west of the Great Lakes and as far as Brandon being supplied with American coal.

The total production of Canadian coal prior to the war was 15,000,000 tons per annum, and in the United States between 500,000,000 and 600,000,000; the latter being the production for 1916.

During the year 1917 Canada will produce nearly 2,000,000 tons less, and the United States approximately 50,000,000 tons more than in 1916. But as the increase in consumption is approximately 100,000,000 tons, there is a shortage of 50,000,000 tons to be made up by elimination of wastage.

Sending Eastern and Western Canadian coal to the United States and American coal to Central and part of Western Canada was with the object of sending coals by the most suitable rail traffic routes and waterways, and providing more even distribution.

If the Eastern Canadian coal was moved west it would be against the current of traffic to Fort William, and if Western Canadian coal was moved to Eastern Canada it would put onto railroads the burden of transporting the longest distance on the American continent.

### What Is Expected of Us

The United States Government has been very considerate towards Canada, and will continue to be so, the intention being to treat Canada on an equality with any state in the Union, but, while doing this, they expect and insist that we do the same as they doing, viz., inaugurate a campaign for the intensive conservation of fuel.

It is not the purpose of this paper to point out in what way our share of the deficiency is to be made up, it being principally a matter of good engineering and true fuel conservation in the boiler-[illegible].

Canadian railways have already reduced their annual passenger train mileage by 10,000,000 miles, and have further decreased the fuel consumption by lengthening out the times of other trains and by eliminating fast freights and instead running trains with full tonnage, and by equipping locomotives with superheaters, and the best known modern means of lessening fuel consumption.

The Canadian Pacific Railway has been [illegible] Railway [illegible] helping the cause by breaking up and using old ties for fuel—this even at considerable expense of labor, train service, etc., gathering and handling.

The United States have also made a start in reducing their passenger service and loading their trains to the tonnage limit, thereby affecting a saving of several million tons of coal per annum.

### Action Advocated

I think that we should go further, and I would submit to the consideration of this club the necessity of the mechanical members getting together and inaugurating an active educational campaign among the firemen, both locomotive and boiler-house men.

To my mind this should not be done by printed instructions but by actual illustration by competent firemen. While it is all very well to write a fireman and tell him what he should do, it is far more educational for a competent instructor to show how it should and could be done.

There is a lot of fuel wasted by automatic stokers not receiving intelligent attention from the fireman. The stoker itself when in proper working order will do all that is required of it, but there are, however, occasions when it will not do what it is supposed to, it is then that a properly instructed fireman will give necessary assistance with a consequent saving in fuel.

The majority of our passenger trains, particularly the sleeping cars, are overheated—it being largely left to the discretion of the colored porter as to what is considered a comfortable temperature, the result is that the temperature is kept up to a point that means comfort for the porter and discomfort for the passengers.

Our houses are being maintained at an unhealthy temperature. Pneumonia takes a little more than one man in eight, and therefore it grasps from tuberculosis the grim honor of killing the most human beings.

Man is a marine animal, seven-eighths water, he needs cool air and moisture around him, overheated dry air makes him susceptible to disease, and in a temperature of over 68 degrees it is difficult for men and women to exist healthfully.

If the people can be taught to live in this temperature, the number of pneumonia victims wil shortly decrease. Fresh, cool, moist air is the foe of pneumonia, and persons who keep their houses cool and breathe pure fresh air have no fear of it.

### Normal Temperatures

Celebrated doctors have decided that 65 degrees is ample for persons in robust health actively engaged, 70 is too much, with 68 we have a fair healthy average.

Many activities which involve large consumption of fuel, and many methods of using this fuel, which are practically legitimate in time of peace, will be found susceptible of changes which involve very slight sacrifices of material interests but afford opportunities for considerable saving of fuel.

We have in the past been an extravagant people in the use of fuel, and as the war continues it will be necessary to get down to bedrock in the matter of fuel economy.

Manufacturers of non-essentials should during these war times voluntarily forego the manufacturing of such articles before being compelled to do so by Government direction.

Wherever possible water power should be utilized. In wooded districts, of which there are several in Canada, wood should be utilized wherever possible. One cord of hard wood is equal to one ton of coal, and one ton of coal is released for use in war work for every cord of wood substituted. It will be found that there is a vast quantity of dead wood in many sections of the country. It will also be found that the supply of wood in many communities is sufficient for domestic purposes in these parts. This wood in many instances is destroyed as waste, and its conservation will not only serve the patriotic purpose of conserving coal needed to win the war, but will also prove a measure of economy to the user.

In certain districts prison labor might be used as a means of cutting and collecting wood, where, of course, the labor of the prisoners could be utilized without interference with free labor.

As a matter of fact the one practical and needful thing to-day is to save coal in order that our transportation lines and munition plants may have sufficient to carry on. It may be patriotic and a certain amount of pleasure may be derived from singing "Keep the Home Fires Burning," but the saving of one ton of coal is of more practical benefit towards assisting the boys in the trenches than the singing of one hundred songs.

## OIL PRODUCTION GETS BOUNTY IN AUSTRALIA

THE COMMONWEALTH Government of Australia has decided to offer a bounty on the production of crude oil in Australia. This decision is of great importance to the state of New South Wales, for the reason that the only oil refining works of any importance are in that state.

Oil bearing shale is found in large quantities at a number of localities in New South Wales and the first effort to distill oil was made in 1865. The shale is suitable for mixing with ordinary coal in the manufacture of gas and in normal times is exported largely to Great Britain, America and other countries, as well as to the neighboring states.

Since the war commenced, high freights and shortage of shipping have killed the busines for the present. The principal companies operating in oil production are the Commonwealth Oil Corporation which has extensive works at Newnes, 80 miles from Sydney, and the British Oil Corporation, at Murrurundi, 300 miles from Sydney.

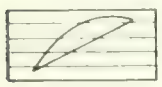
# The Aerial Propeller: Notes on its Design and Construction

By A. Proctor Burwash

*In common with the majority of aeroplane components the aerial propeller has been evolved step by step, the results due to practical experience being applied in successive steps until a degree of perfection is obtained far in advance of that which accompanied initial efforts. As a product of technical deduction and skilled workmanship, the aerial propeller is probably unequalled in its particular realm.*

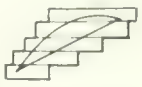
AN aerial propeller is composed of a number of laminations dressed to required thickness and glued together. Both the number and thickness of laminations vary with the size of the propellers and opinion of the designers. Thicknesses from 11/16 to ⅞ are commonly used, while five and six laminations are quite frequent.

In the earlier days of propeller building these laminations were boards of the same width forming a block when glued together, the cross section of which was a parallelogram. From this block the propeller was shaped out. As will be seen from Fig. 1, the finished blade requires only a comparatively small diagonal section of this block, the major portion being wasted. The shaping of the laminations (see Fig. 2) eliminates a portion of this waste and is now in general use.



Laminations Unshaped

FIG. 1



Laminations Cut to pattern

FIG. 2

### Principles of Design

The mechanical principle governing the action of the propeller is the same as that of the wings. The blade of the propeller must be considered as a number of sections attacking the air at different angles of incidence and at different velocities. For each of these sections the relationship of the various forces is the same as in the plane or wing—$Q = K\ S\ V^2\ i$, where:

Q is the pressure in kilogrammes on the plane approximately at right angles.

K is the lifting efficiency (determined experimentally).

S is the area of the plane in square meters.

V is the velocity or speed at which it meets the air in meters per second.

i is the angle of incidence expressed as a decimal fraction expressing the relative slope of one side to the other, in small angles the sine of the angle (see Fig. 3).

While variation in different propellers, either of the true screw or variable pitch type, is governed by actual performance, it will be readily seen from the above formula how great an effect any springing of the blade, due to torsional stress, would have. This tendency is overcome by some designers by having the centres of pressure in the various blade sections in a curved line sweeping slightly away from the leading edge as it proceeds from the hub to the tip. When the centres of gravity are in a similar curve the centrifugal force has a tendency to counteract the strain due to resistance. In still other propellers the centres of gravity of the various sections form a line at a slight angle forward to the axis. In this case the centrifugal force tends to offset the strain from the thrust of the propeller. By combining these arrangements the resistance, torsional and thrust stresses can be fairly well neutralized, tension alone remaining.

The outline of propellers varies greatly, some designers being influenced by the considerations given above and others ignoring one or other of them. Generally speaking, the blade is a narrow ellipse, or semi-ellipse; some with squared ends. The width at the widest point is approximately one-tenth of the diameter. The cross-section (Fig. 4) shows the forward side of stream-line shape, while the rear side is either flat or slightly convex. The thickest point in the cross-section and also the deepest point in the convex side are about one-third of the blade's width from the leading edge.

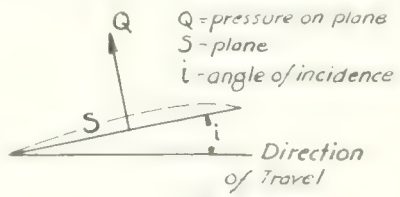



FIG. 3

### Selection of Material

The woods in general use in America to-day are black walnut, mahogany and white oak.

The question of a wood's suitability for successful gluing and its tendency to warp under changing climatic conditions must be considered, together with its strength under the various stresses, hardness, etc.

Only quarter sawn lumber should be used, which makes possible the placing of the grain in right relation to the face of the propeller.

The question of securing seasoned lumber is, and will be, a more difficult one as time goes on. The use of dry kilns has already been resorted to. Great care must be taken to guard against "case hardening" or the setting up of internal strains. The recent development in dry kilns with accurate control of humidity and heat are said to be producing very satisfactory results.

The greatest care has to be taken to eliminate all knots and other defects.

Selected hide glue is used, careful inspection being made by standard methods. A shearing strength test of 2,200 lbs. per square inch and viscosity test (comparing glue tested) with a standard sample of proven efficiency are two of the principal tests recommended in good practice, and should be made at frequent intervals.

The varnish used in the finishing pro-

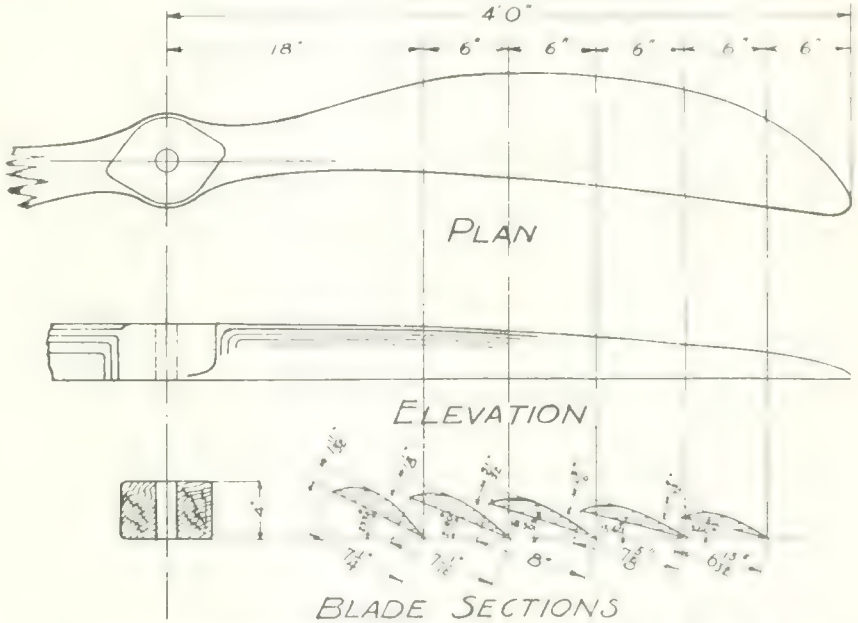



FIG. 4 PROPORTIONS OF TYPICAL PROPELLER AND BLADE

plane."

Machining Operations

boards which have been dressed and kiln

This is followed by the first centre boring, usually 1⅛ in. in diameter, and surfacing down to required thickness, which last operation should be done with great care. The surface is now roughened with a tooth plane to improve gluing conditions. Care should be taken, however, not to impair the dimensions.

the balancing equipment (see Fig. 5). Usually two carefully adjusted parallel rods, about 5 feet from the floor and 18 through the laminations is placed on these bars and the heavy end determined and marked. In the grouping of the laminations composing any one propeller not only should these heavy ends be alternated, but selection should be made to bring the grain at approximately right

The location of the glue room, in addition to convenience in the rotation of operations, should be such as to ensure heating and freedom from draughts. The equipment consists of glue cooker, oven for warming laminations, and clamps or presses. The groups of boards are warmed in the oven, the glue applied, and boards placed in their correct position on a stand with centre pin and clamped, or in the press and the bolts tightened to retain pressure. The gluing and clamping operation should be done in 15 minutes to ensure success. A period of some two weeks should be allowed for the thorough setting of the glue and drying of the block. The clamps are removed after 24 hours, and the rough shaping should also be done during this drying period.

There are already on the market several machines for this rough shaping. Their success is still an open question.

**Bench Work**

A special bench or stand is used with a bolt set in an upright position, as shown in Fig. 6. This bolt passes through the shaft boring in the propeller and clamps it firmly in position.

A surfacing table with a spindle similar to the bolt mentioned above and adjusted with great care, and with the radius marked in suitable stations, is used by the mechanic for testing the accuracy of the blade angles, tracking of the blades and diameter.

An especially adapted protractor and a surface gauge are used in this work (see Fig. 7). The thickness at the various stations and also the correctness of the stream-line side is gauged by a set of templates. A balancing arrangement similar to that mentioned above should also be located here, and the dynamic balance perfected in all positions. There has been a machine built in England which registers the lack of balance in half-ounce inches; this would have many advantages.

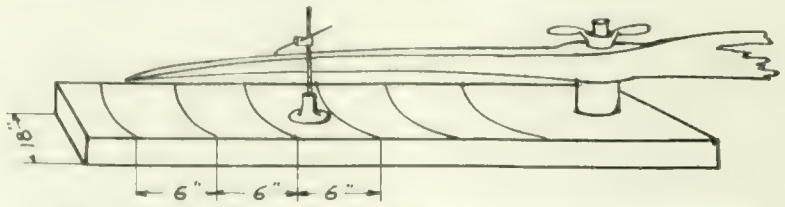



FIG. 6 SURFACE TABLE FOR CHECKING PROPELLER DIMENSIONS

The finishing methods vary in different factories. French finishing is used by some; fillers and varnish by others, also shellac and oil finishes. In all the above methods careful work in the smoothing with sandpaper and steel wool between the coats and in the final polish with pumice stone is required, as the fineness of the polish is an essential of success.

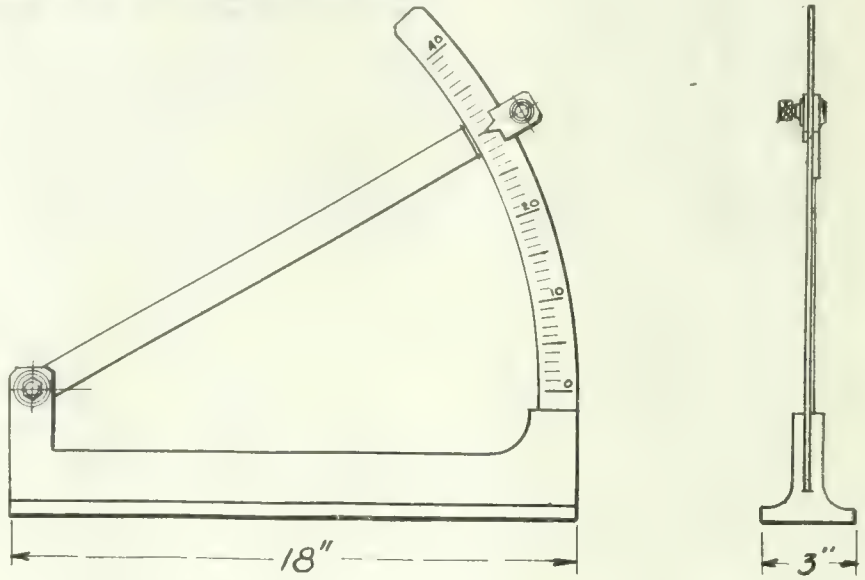



FIG. 7. PROTRACTOR DESIGNED FOR PROPELLER CHECKING

**Inspection**

The inspection should include selection of lumber, testing of glue, and careful examination of failures in glue joints. The checking of the angles, tracking, diameter, width and thickness of blades at various points is done on the surfacing table and the balance is checked, as described above. Any roughness or unevenness in the surface must be eliminated. The balance is watched at all stages of the operation, the final balance being adjusted with additional coats or part coats of shellac or varnish applied where necessary.

DISUSED cotton mills in England are being converted into aeroplane factories and the Cotton Control Board is arranging to supply labor in the various districts where the mills are located.

# Shell Inspection: What a Shell Inspector Should Know-II.

By Chief Examiner

*The prolongation of the war with the increasing importance attached to quantity and quality of ammunition make it more than ever essential that inspection, to fulfill its purpose, must be applied intelligently, however unremittingly. A little knowledge is sometimes dangerous if misapplied, and the author of this article endeavors to make clear the object of inspection, rational methods of carrying it out in practice, and incidentally the disastrous results attending ignorance or carelessness in performing the duties attached thereto.*

THE machining of high explosive shells has been thoroughly dealt with in the technical press and the writer does not propose to more than touch on that subject. It is desired, however, to deal with inspection in detail, and while the remarks apply, to a certain extent, to what is done, or should be done, in the government room, they apply more directly to those engaged in shop inspection.

There are several conditions essential to good inspection—good light; no noxious fumes; good eyesight; no great rush, or excitement; clean benches; also the shells themselves should be clean inside and out. To begin with the inspection of high explosive shell, we will take the preliminary examination first. This of course, varies in the order of operations according to the size of shell, but the main idea is the same. Each dimension has its " High" and "Low" gauge limits. "High" is the term used for the greatest dimension, and "Low" for the least.

### Care of Gauges

There is a way of using a gauge so as not to cause undue wear. Never try to make a gauge fit the shell, but have the shell made to fit the gauge. In other words, don't force the gauges. They are costly things and must be renewed when worn. As they are made to .001"—a thousandth of an inch, and in some cases, such as the screw-gauge to a tenth of a thousandth—it only needs a little carelessness to render them useless. If the shop gauges are carelessly used, you cannot expect to be able to gauge correctly before submission to the government room. Manufacturers always prize a man who takes care of his gauges. Here is another hint. Keep the gauges on a board or in a box when not actually in use; keep them clean; give them a coating of grease once a week; and don't leave them lying about the bench for shells to roll over.

The first operation should be the "visual internal." See that the "bore" is clean, smooth and free from tool cuts, scores and scratches. Look carefully to see that there are no "pits" or "tits" in the bottom. It is very important that the bottom of the bore be free from these defects, because the explosive tends to hug there when the shell is fired. Also see that there are no traces of "piping," "sand holes" or other flaws in the interior. The bottom should be perfectly flat.

As "bores" are a bore and bone of contention in most factories, a shop inspector on the bench should give this question his first attention. It is no use sending faulty ones into the government room only to be sent out again. Rectifications are not only a waste of good time, but are a terrible hindrance to production. Find out what the chief examiner wants, and give it to him. It is just as easy and a good deal easier than taking chances. Don't let the foreman hustle the shells into the government room anyhow just for the sake of saying that so many have passed over your bench in the day. That is often done and is bad policy because it is not production and is the road to nowhere.

### Details of Handling

Now try your "body rings" over each shell. Use them together. The high should drop by its own weight to the full length of the shell and the "low" should rest on the shoulder.

Some firms do not machine the undercut above the container seat, until after "government preliminary," but in any case the threads should be looked at to see that they are of the proper shape, thickness and form, and are not crossed.

Now go over each shell with the wall calipers in three places. In the shop, this is generally done before the preliminary bench but it should be done there as well. Now turn every shell base upwards; try the base recess for depth, flatness and diameter. This is for 18 pdr., 4.5 in. and 6 in. without adapters. In the case of the larger shells adapters are used instead of base plates.

Examine the condition of the thread which receives the adapter. If it is deeper on one side than the other the shell is eccentric. This is a bad fault and will weaken the fit of the adapter. Examine carefully the seating on which the adapter will rest, when screwed home. This must be in good shape, and have no ridges or roughness on the face. The depth of recess in this size of shell and the depth of the flange on the adapter must correspond.

### Visual Examination

After you are satisfied that the base end is OK, lay the shells on their sides and commence the "external visual" examination. See that they are clean. Look carefully on the base and body for flaws—seams, sand holes, hair lines, ghost lines, etc.—and make sure that the tool traverse is not too coarse. A mirror finish is not necessary but a rough shell tends to damage the bore of the gun. Not only that, but the shells, travelling through the air at high speed—2,600 feet per second— would be more liable to "windage" if rough.

The next thing to gauge is the driving band recess, "H" and "L"; after that comes the width of D. B. recess, H and L; then the "form" and "throw" of the waved ribs. These must have a continuous "wave," and, according to the size of shell, must have a certain amount of it shown in the blue-print. If they are not good, the driving band is liable to slip when gripped by the rifling of the gun. This would be very dangerous and would cause the shell to wobble in its flight.

Now try the distance of base from D. B. recess. It is only necessary to put the low gauge over at this stage. Don't forget the base thickness. Base calipers are generally used for this test, or what is termed the pillar gauge. When looking over the body visually, see that the figures of the heat number are stamped plainly and legibly and when stamping the series letter, let it be perfectly distinct. The letter E looks very much like F, and O very like Q. A good government man will not accept a shell with indistinct markings.

### Friendly Advice

The preliminary examination is now over and the shells only require to be washed, if this has not already been done, and they are ready for submission to the government room. Of course, certain chances may be taken by the shop inspector, because although the chief government examiner may not pass certain things, the Assistant Inspector for the District may be able to do so. But the shop should not play upon this fact, as it sometimes looks as if undue advantage was being attempted.

Never, at any time, or under any circumstances, try to put anything over the government examiners. This at once destroys any confidence the chief may have had in the shop inspectors, and always leads to trouble. If the shop inspector is not sure of anything, he should at once enquire at the government room. Then everyone is happy and confidence is created and maintained.

Now comes the fitting of base plates in the smaller shells, and adapters in the larger.

Base plates, when forged, carry the government "acceptance" stamp only, although they are forged in "heats." Adapters carry the code letter, heat number

Base Plate Requirements

.006 in. feeler to enter when the plate is shell. At the same time, it should not be loose when faced. Base plates must be carefully examined for flaws, cracks and sand holes, and should have the corner or sharp edge removed.

A base plate which is screwed in, should have its threads milled properly and should fit corresponding threads in the shell base without any slackness. They have a left hand thread and when screwed home the nipple should be broken off with the force of sending the plate home.

To inspect the adapter, examine the threads for form, depth and general condition. They must be cut away from the face and flange.. The flange must fit the seating in the shell and the corner on the flange must be rounded. Measure the length of thread in the shell and on the adapter. There must be a sufficient number on the one to take all on the other.

### Adapter Hints

When fitting the adapter to the shell, chalk the face of the flange, screw in half way then shake it with the hand to feel the fit. This must be what is termed a snug, mechanical fit. Screw right home. Now put a chisel cut half on the adapter and half on the shell. The adapter must seat to not less than 70 per cent. Now unscrew and note the seating. Then coat the pilot with shellac putty and screw in one thread. Now coat the remaining threads with Pettman cement and screw home till the chisel cuts meet. On a good, tight adapter, the chisel cut will have just passed the chisel cut on the shell. A government inspector always superintends this operation.

Now we come to the "final" inspection of the shell, which varies in operations according to the size and weight of the various "marks" or "patterns." It is interesting to note these. These are the 18 pounder high explosive and the 18 pounder shrapnel; 4.5 in. H.E. marks V, VII and IX; 60 pdr. marks V and VII; 6 in. H.E., marks III, VI, IX and XVI; also 6 in. mark VII; 8 in., H. E., marks III and V; and 9.2 in., H.E., marks II and IX, and after each mark comes the symbol L denoting that the shell is "land service." These are the shells made in Canada at present. There are, of course, many more types, but they do not concern us in this article.

## WEIGHING APPARATUS IN THE FOUNDRY

By C. T.

THE correct and systematic weighing of foundry materials is of the utmost importance if the best results are to be produced with economy and despatch. In the modern foundry the bulk material, both iron and coke, is carefully analysed before purchasing, and also periodically analysed at the factory to ensure that the quality is being maintained. The laboratory apparatus is generally of the best quality, and it is just as important that the various grades of metal should be correctly weighed before being put into the cupola, otherwise the castings will not give the desired analysis.

### Shop Conditions

The conditions which obtain vary considerably in different foundries, depending on the layout of the plant and the nature of the castings to be produced. In most cases it is the practice to have a small stock of material comprising the charges on the cupola platform, although sometimes these stocks are kept on the ground level, the charges being automatically elevated and discharged into the cupola mouth. Probably the most important machine in the whole foundry is that which weighs the various materials comprising the charge. It is, therefore, of the utmost importance that the weighing apparatus at this point should be the best of its kind and the most suitable for the work. The type of machine used is generally of the dormant pattern, of heavy construction, the platform being of sufficient size to accommodate the wheelbarrows or bogies, and the indicating arm of the no-loose-weight type. To enable continuous records to be kept a tape or ticket-recording device may be fitted.

### Special Type

A special machine has been produced for weighing and recording charges which has been widely adopted for blast furnace work. It is not so generally used in ordinary foundry practice, although it is eminently suitable for the work. The apparatus consists of a series of say, six steelyards, three or four steelyards being used for the various grades of pig, one for scrap, one for coke and sometimes one for lime. The steelyards are totally enclosed in a lock-up, the various weights not necessarily being known by the barrowman. The charge hand or other administrative person sets the poises to the various weights of each grade, etc., required. A small trigger outside the case enables the operator to put into use the steelyard corresponding to the nature of the material which is on the weighing platform. The triggers are either numbered or otherwise suitably inscribed to denote the material, the correct weight of which has been set by the poise on the steelyard.

Individual or cumulative weights may be put on the platform—that is to say, the total constituents comprising the charge may be weighed collectively or individually; of course, each constituent must be on the platform separately. To increase the speed of operation and ensure accuracy a pointer, which has a plus and minus range, is sometimes fitted. This enables the operator to see when the correct load is being approached. Also a recording device may be fitted which records the exact weight of each charge, whether correct or in excess or deficiency. This machine is a distinct advance in the weighing of furnace charges, and if properly used and maintained helps to insure reliable castings.

It is not generally desired to weigh the molten metal in the ladles, but machines have been supplied of the suspended pattern, having clock-face dial indicating automatically the weight of the metal as it is poured into the ladle. On these machines special guards have to be fitted to protect the mechanism from the heat of the metal.

### Weighing Finished Product

The weighing of the finished castings may be done on either a truck weighbridge or portable or dormant platform machine, the type of machine used depending entirely on the class of work turned out; the truck machine being used for heavier castings, the dormant machine for castings of medium weight, and the portable machine for light castings. These machines should be fitted with no-loose-weight steelyard, or preferably with tape or ticket recording system steelyards, so that accurate record may be kept of output. A platform or dormant machine should also be provided for weighing the gates, spills and bad castings. This should be placed near the cupola.

The sand is generally weighed in bulk, but it is sometimes desired to apportion the day's requirements. In this case a dormant machine fitted with rails to suit the bogies may be installed.

All the weighing apparatus in use in foundries should be of the heavy type; the bearings, knife edges, etc., protected as far as possible from sand and dirt and dust. The weighing apparatus which is often used in foundries is generally unsatisfactory, the type of machine being unsuitable for the work. They are generally kept in a dirty condition, the parts being clogged with sand particles, so that the resultant weighings are inaccurate, the management thereby not being able to obtain a reliable output and melt loss figures.

Before installing any kind of weighing apparatus in the foundry individual manufacturers should be consulted, for they will bring their expert knowledge to bear on the subject and supply the most suitable apparatus for the purpose. The weighing machines in the foundry, especially, should be maintained in condition by the manufacturer, who usually sends his own skilled men frequently to the machines, this avoiding disputes and unsatisfactory foundry cost figures.

THERE are, at the present time, 32 Heroult electric furnaces in Canada and 22 of other types—in all 54 furnaces using the electric process. These furnaces have a capacity of 173,000 tons of iron and steel, 50,000 tons of ferrosilicon and 8,000 tons of other ferroalloys per annum. The British Forgings plant at Toronto has 10 electric furnaces of the Heroult type and a total capacity of about 72,000 tons per annum, making it the largest electric process steel plant in the world.

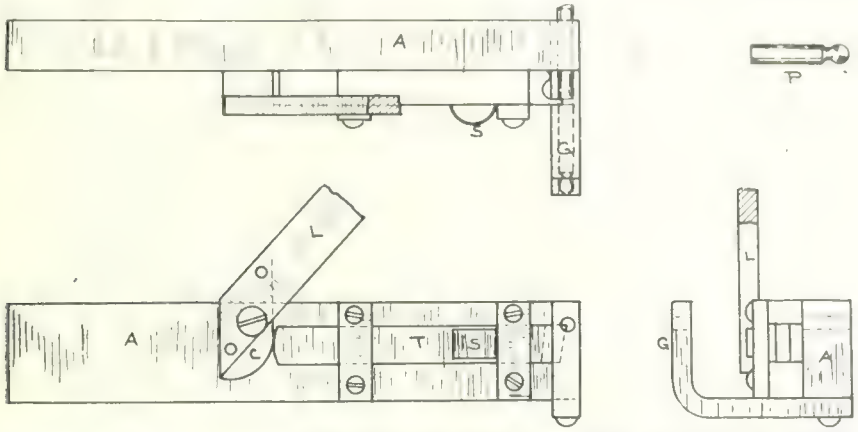
# PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

## PIN FORMING TOOL

A. L. Loy

IN the assembly of a machine a number of pins were used such as shown at P. These were driven into casting and used for holding certain springs, the end of the spring being looped over the head of the pin. The assemblers had been in the habit of making their own pins either holding the pieces in a drill chuck or universal chuck on the lathe and then filing for the head and sawing off. The material was ¼ in. cold drawn. One of the assemblers was of a somewhat inventive turn of mind and during his odd time built the tool shown and after that had to supply all the others with pins.




DEVICE FOR FORMING AND CUTTING OFF PINS. ADAPTED FOR USE IN ORDINARY TOOL REST OF ENGINE LATHE

The body A was arranged to be held in the tool post of the lathe and the tool T slid between guides, the end being formed to the proper shape for cutting off and rounding the head of the pins. A flat spring S held the tool back against the cam C which was riveted to the handle. The piece G was used as a gauge and also as a guide when cutting off. The pins were just long enough to extend through the piece C. Needless to say, the shop was not supplied with a screw machine, but in all probability the time was even less when using this tool than it would have been had they been produced in the regular way. A long length was run out of the chuck and started into the tool and as the pins were cut off the carriage was moved up each time.

## ERRORS IN INTERCHANGEABLE PARTS

INTERCHANGEABILITY of manufactured articles is secured by making all details to within known limits of size, and these limits are set with sufficient closeness to ensure a satisfactory fit permissible size of the part to which it fits.

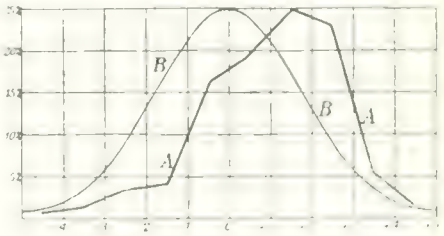
In considering the results obtained by working to limits in the machine-shop, one is apt to assume that the average size of accepted work will be half-way between the allowable limits, and further, that the distribution, between those limits, of the errors in the dimensions will be in accordance with the "law of normal error." These assumptions are natural, and it is usual, therefore, to set even should the largest permissible size of one part coincide with the smallest the permissible limits of size equally above and below the nominal size of the article. Since, however, all machining operations are effected by the removal of metal which there is no means of replacing, it appeared likely that the natural caution of the operator might have a tendency to cause the work to be generally finished a little on the "high side" so as to be further from the danger of being under size.

The point is interesting, because if such a tendency existed, the limits might be set so as to cause the bulk of the work to conform as nearly as possible with the nominal size, and thus to ensure a better general average of fit with the same overall limits of machining.

In order to determine this point investigations were recently carried out in an English factory and the results published in "Engineering" from which the accompanying chart is reproduced.

A supply of 74 finished crank-pins were taken from stock, and their diameters were measured by means of a Prestwich fluid gauge. The instrument was set so that the first pin tested caused the gauge to read zero on the scale, and check measurements were taken several times with the same pin, in order to see that no error due to temperature or other cause was affecting the readings during the course of the experiment. The gauge was graduated in ten-thousandths of an inch, but it could be read by eye to the nearest forty-thousandth of an inch, and the readings were actually recorded to this accuracy. Possible slight errors of parallax, and in estimating the quarters of a division, of course render these readings doubtful, so far as the final figure is concerned, and in collating the data, the readings were grouped into batches, each with a range of one ten-thousandth of an inch.

After all the pins had been measured, they were shuffled and a second set of measurements taken. These were found to agree remarkably well with the first set, especially considering the extreme fineness of the readings. The curve A in the accompanying diagram shows the mean of the two sets of readings, the ordinate representing the percentage of the pins whose dimensions fell within the limits shown on the base of the diagram. Curve B is the curve corresponding to the "law of normal error" and is given for comparison. It will be seen that all the pins came within a range of + or — 0.0005 in., of the nominal size, which is represented by zero on the diagram. The "mode" or most fashionable size was from one to two ten-thousandths of an inch above the nominal size, and 25




CURVES ILLUSTRATING THE LAW OF NORMAL ERROR IN INTERCHANGEABLE PARTS.

per cent. of the pins fell within this range. The "median" or the size above and below which an equal number of pins were found is about one ten-thousandth of an inch above the nominal size. The experiment appears to show that in order to obtain the greatest number of pins of the nominal size, with the same accuracy of workmanship and the same range of limits it would be better to fix the latter at + 0.00035 in. and — 0.00065 in. instead of setting the + or — 0.005 in. above and below the nominal size.

## SETTING MACHINE TOOLS

By D. S. Mann.

WHERE machine tools are placed on concrete floors, as they are in the greater number of cases, it is quite a job to put in the foundation bolts for holding same. Of course, for the larger and more weighty machine no fastening is necessary, and especially so if motor-driven.

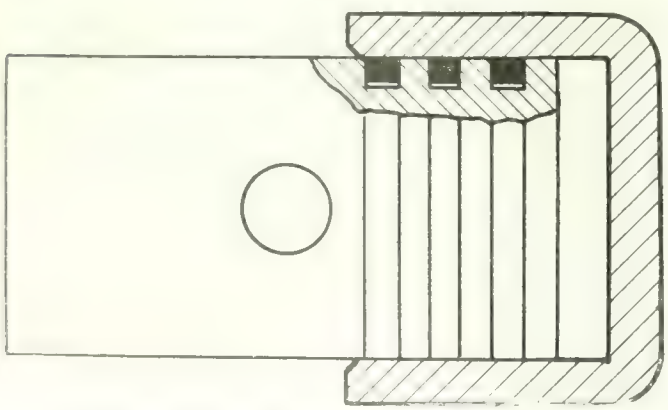
However, the average machine tool will finally work its way out of position either from the belt pull or by being struck with trucks or heavy castings. Several years ago the writer installed [illegible] in a manufacturing shop and, not being quite certain as to their ultimate positions, adopted the following [illegible] were levelled up by means of iron wedges and raised about three-quarters of an inch off the floor. A [illegible] mixture of sand and cement was mixed up with a generous supply of fine iron chips. This was worked well under the edge of the machine so as to have a good wide bearing and was extended out about one inch, giving a bevelled edge entirely around the machine. When this hardened it seemed impossible for the machine to move and, to the writer's recollection, none ever did move. Adding the iron chips formed a very hard cement, and even where castings were rolled against this edge it seemed almost impossible to crack it. If it were desired to move the machine it could, of course, be very easily raised and the cement band then broken up.

## SECURING GAS-TIGHT PISTON RINGS

By A. L. Loy.

TROUBLE is often experienced with the leakage of compression past the piston rings in gasoline engines. This is more often true with the cheaper makes of farm engines, on many of which the standard of workmanship is low. This leakage of compression quite naturally cuts down the power which the engine will develop as well as resulting in an increased fuel consumption. Needless to say it is extremely annoying at all times.

When the piston is being pushed back into the cylinder on the compression stroke the friction between the rings and the cylinder will naturally retard their movement, and they will rest against the side of the groove toward the shaft, leaving a slight clearance on the opposite



ILLUSTRATING METHOD OF SECURING GAS-TIGHT PISTON RINGS.

Now, if the side of the groove and ring as well is rough or uneven the metals will not come in contact completely around, allowing a small space through which the gases will pass. In manufacturing care is always taken to see that one side of the ring is well finished and the same is true in the piston. If these two surfaces are in contact a fairly tight joint may be obtained.

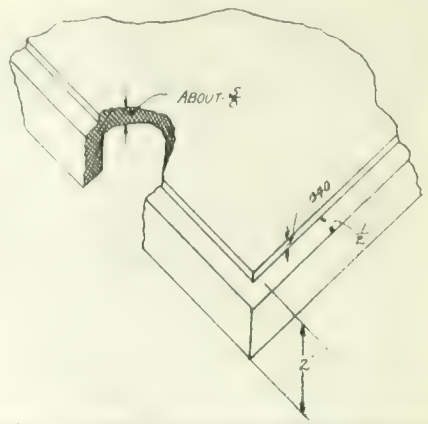
The method here described was seen by the writer in a small gas engine shop which had had trouble in securing perfect results along these lines, and it is well adapted for use in the repair shop also. A casting is bored out to just slip over the rings and piston, bevelled at the edge so the rings will enter easily. A thin mixture of emery flour and oil is poured into the ring grooves and the casting slipped over, and, as it is pushed forward, it will carry all the rings in the same direction so they will rest against the sides of the grooves, when they may be ground to a seat the same as a valve, using a rotational movement. This method has worked out admirably, and has resulted in cutting down the rejections due to leaky rings and pistons.

## PLANING SURFACE PLATES

By D. A. Hampson.

EVERYONE who has gone through a printing office has noticed what are seemingly marble-topped tables with heavy wooden legs standing in the centre of open spaces, with workmen making up "forms" on them. These men are called "stone men," from the material of which these tops are composed, for they are really slabs of marble, which have been used for this purpose almost from the beginning of the art. It is even whispered in some offices that if these stones were turned over the words, "In Memory Of" would be found on the reverse side. The hammering that these stones receive and the laying down of tools results in an abrasive action that wears the surface, so they have to be refaced if used on the best work; then the corners chip off, and it is not to be wondered at that cast iron is taking the place of marble and the iron imposing surface has become the standard modern equipment.

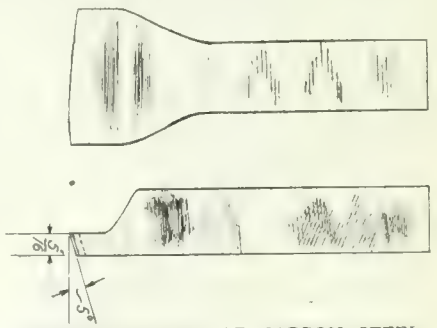
These imposing surfaces are nothing more than large surface plates, but much lighter than a standard shop surface plate of the same size. Take for an example a surface 40 in. x 60 in., which is a good average size; a good surface plate would weight at least a ton if as large as this, but the printer's surface weighs only 500 lbs. in the rough, with most of this in the top itself, the ribs being widely spaced and not over 1¼ in. deep. The finished casting must present a smooth surface, perfectly true, and for shop reasons, if for no other, the thickness should micrometer the same at all four corners and this thickness for printers' reasons must not be over 2 in. Solid blocks about 4 in. square are cast in the four corners for the legs to rest on or fasten to, and small pads are formed at the intersection of some of the centre ribs for additional facing spots on the under side.




PART OF CAST IRON IMPOSING SURFACE

As the castings come in from the foundry they are put on the planer, with the top or final working side uppermost, and after an approximate levelling up are roughed off. The wider ones are roughed with a tool in each of the two cross rail heads. Then a flat tool is substituted for the roughing tool and the surface gone over with a wide feed to even up the two cuts and give a general bearing when turned over. The cutting on the bottom does not have to be particularly smooth, but must be accurately done, therefore the casting is carefully papered up and clamped.

Then when the casting is again placed right side up the unevenness which was the excuse for papering before is taken off with a flat tool. The clamps are loosened, and if there is any spring over any of the clamping points or bearing surfaces, a cigarette paper or two will fix it up. The finishing tool, which is a sort of semi-spring tool, is run over the top. This cut should be a very light one; often the casting does not clean up with just one cut and another must be taken. To test the accuracy of the surface the clamps are taken off and the casting laid



FINISHING TOOL OF CARBON STEEL

on a clean portion of the planer table. Then a standard straight-edge is tried at right angles and diagonally, and must hold two cigarette papers at any point in any direction.

Some will ask why a spring tool of the

gooseneck type is not used. The answer is that the tool shown is better. It is not so springy as the gooseneck, hence it is quicker, and its cutting edge is sufficiently far back to overcome any pulling-in from the bending of the tool itself. So far as the distance that a tool sets ahead of the planer uprights is concerned that argument is purely theoretical when finishing cuts are being considered. The normal working fit of the slides is present, whether the tool cuts a foot ahead or a foot behind the uprights. Printers' machinery has many thin, light castings that must be true, and the tool under discussion has been found to give most satisfactory results. As compared with the gooseneck tool, the cost of forging is but a fraction. Finishing feeds from ¾ in. to 1¼ in. are used. The tool is set by trying cigarette papers under the sides. A broad oilstone is used to produce a cutting edge smoother and truer than the grinder leaves it.

For printers' uses a flat called a rabbet is cut all around the edge of the iron imposing surfaces. This is 0.040 in. deep by about ½ in. wide. The cuts on the long sides are made after the last finishing cut before the casting is taken off. The shops that have an open side planer turn the surfaces for the end cuts. Those that do not generally use an extension and turn the castings, making a setting for each end. Again, there may be a wide planer in the shop, but as the surfaces run up to seven and eight feet in length, these wide planers are few and far between. In the writer's shop this work is done in an altogether way—an old-fashioned way—by hand. The same tool used on the sides is turned and the hand cross feed used to carry the tool across and back. With a crank at each end of the screw and a husky laborer to help, it is a short job—in fact, is done quicker than any other way. The cut on the two ends of a 40-in. surface is done in a half hour. No extra settings are required.

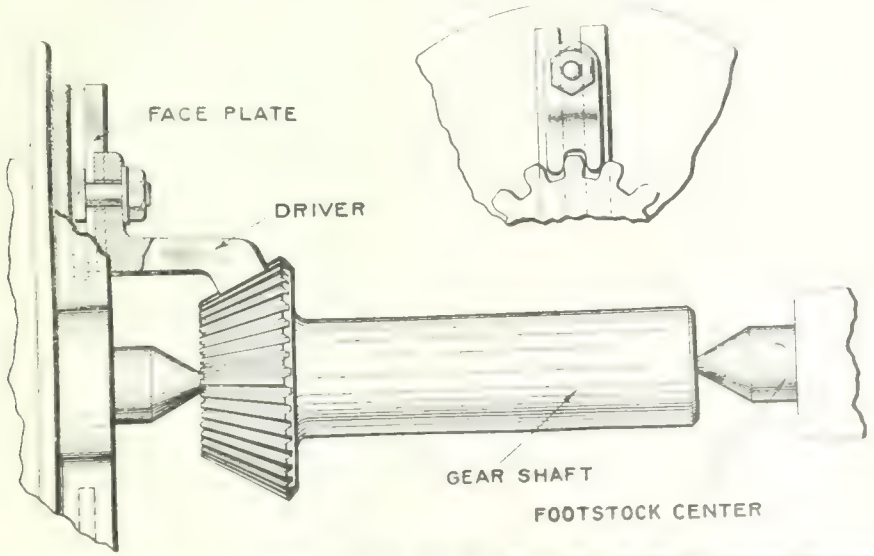
## SIMPLE METHOD OF DRIVING BEVEL GEAR SHAFT

By Howard W. [illegible]

THE accompanying illustration shows a simple driving arrangement for a bevel gear or spur gear shaft, so that when the shaft is put on to the centers of the machine the little driver automatically engages the teeth in the gear and furnishes the means for revolving the shaft while grinding. The illustration pictures a bevel gear in place, but it is equally effective on a spur gear, if the engaging end is made of the right form and shape to fit the spur gear.

As the center wears back it is evident that the driver can be moved in the slot of the face plate to allow for the proper adjustment and play for engaging the tooth of the gear. The driver itself is made from a strip of rectangular steel and fits in the slot of the face plate of the machine having a notch in the end which straddles one of the teeth in the gear. The end engaging the gear should be hardened and tempered.

Such an arrangement offers a simple, inexpensive driver and one which is very effective and convenient for taking the work in and out of the machine.—Grits and Grinds.




SIMPLE DRIVING ARRANGEMENT FOR BEVEL GEAR SHAFT WHILE BEING GROUND

## THE EKENBERG PEAT PROCESS

EXPERIMENTS on the treatment of peat by a modified Ekenberg process are being conducted at Chateauneuf, in the Departement Ille-et-Vilaine, Bretagne, France. According to a paper, published in the "Comptes Rendux" of September 3, and Octover 1 (errata), 1917, by C. Galaine, C. Lenorm and C. Houlbert, the peat is first compressed in presses of the Mabille or Aurep types to reduce the water in the peat from about 90 per cent. to 60 per cent.; the peat is then treated with superheated steam at 160 deg. C. for 25 minutes, and then either compressed again or at once dried, which is best done in special chambers, though air-drying may be applied. The product, which is called tourbon, still contains from 20 per cent. to 25 per cent. of moisture, but does not absorb moisture, as it would do if the cellulose in the peat had not been destroyed by the steam heat. The calorific value is stated to be raised by 10 per cent. over that of dried peat: the tourbon yields 61 per cent. of volatile matter, 36 per cent. of fixed carbon, and 3 per cent. of ashes. With suitable arrangement of the batteries of autoclaves and utilisation of exhaust steam, a heat efficiency of from 85 per cent. to 91 per cent. is claimed to be realised in this process, which can be worked throughout the year. The tourbon is fired directly, or sent to the gas works (with ammonia recovery), or converted into power gas for internal-combustion engines; the last-mentioned utilisation has so far proved most satisfactory elsewhere, we believe.

## AMERICAN FOUNDRYMEN'S ASSOCIATION ACTIVITIES

THE War Service Committee of the American Foundrymen's Association has appointed C. E. Hoyt, of Chicago, secretary, and has established offices in the National Union Building, 918 First St., N.W., Washington. From these headquarters will be directed all of the committee's activities in connection with co-operation with the government. Sub-committees on malleable and gray iron castings already have been named and a sub-committee on non-ferrous castings is being selected. A questionnaire has been prepared and will be mailed out to all of the foundrymen of the United States, and from the data thus obtained, a survey of the foundry trade of that country will be made. Information is being sought on the melting equipment, capacity, fuel capacity, etc., of all castings plants, and when compiled this information will be available to all of the purchasing agents of the different government buying departments.

R. A. Bull, Duquesne Steel Foundry Co., Pittsburg, chairman of the American Foundrymen's War Service Committee and a Major in the Officer's Reserve Corps, has resigned, having been called for active duty. He has been succeeded by H. D. Miles, vice-chairman Buffalo Foundry & Machine Co., Buffalo.

The malleable and gray iron sub-committees already appointed are constituted as follows:

**Malleable Iron.**

[illegible]

H. F. Pope, National Malleable Castings Co., Cleveland.

F. L. Sivyer, Northwestern Malleable Iron Co., Milwaukee.

[illegible]

John C. Haswell, Dayton Malleable Iron Co., [illegible] member of the General Committee representing the malleable cast iron industry.

**Gray Iron.**

Henry A. Carpenter, General Fire Extinguisher [illegible] R.I.

W. D. Tynes, Hardie-Tynes Mfg. Co., Birmingham, Ala.

F. B. Whitlock, Interstate Foundry Co., Cleveland.

[illegible]

# EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

### ORDERLY METHODS

By R. Hamilton

THIS is one [illegible] this is primarily intended for human associations, it is nevertheless equally applicable to the workman in the factory and the immediate environment in which he finds himself, and for which he is more or less responsible. Orderly kept work benches and machines are seldom the "ear-marks" of an inefficient mechanic. While neatness and cleanliness are not always associated with expert workmanship, it will invariably be found that a man's immediate surroundings reflect the skill and efficiency with which his duties are performed. If a man is directly accountable for the condition of his machine or bench, the general appearance of such is a fair indication of his all-round ability. Particularly is this true in respect to that period when a workman is preparing for a new job. Many men pay little heed to the cleaning of their machines or benches between the finish of one job and the starting of another. Under some circumstances this is not always possible or advisable, but in no instance should complete indifference be allowed to prevail in connection with this feature of shop environment. Not only should men as individuals educate themselves to the uplifting influences of better shop conditions, but an energetic superintendent or department foreman should insist upon a strict rule respecting orderly methods.

### PLACING THE RESPONSIBILITY

By R. M. Q.

THE factor of spoiled work and its relation to machine shop efficiency is a question of considerable importance in the operation and maintenance of the average factory. Referring particularly to that class of work requiring a certain degree of skill for its achievement, it is often true that the article, both in its preparation and production, must pass through a number of hands before it is finally completed. To eliminate the possibility of error or mistake during the process of manufacture is one of the essential factors of efficiency, and if it were not for the variable qualities of the human element, necessary for accomplishment, the attainment of the purpose would be entirely satisfactory. However, no automaton has yet been discovered with infallible characteristics, and, recognizing this, the executives of a factory, who are themselves subject to the [illegible] though perhaps in a lesser degree—must exercise every precaution to avoid the possibility of error while the work is in [illegible] with the same definite meaning as the one who imparts it is a necessary acquirement for effective work. A failing that is only too prevalent in connection with the administration policy of many shops is the hasty manner in which instructions are issued by the foreman to the workmen, particularly when such orders are of a verbal character. In many instances the foreman, before passing out a job to a mechanic, has thoroughly studied the details of production, so that when he is giving the job to the man who is to do the actual work the instructions are based on the study that he has previously given to the question. Unless the workman is of the same way of thinking (mechanically) as the foreman, or that the instructions have been very fully explained, the probability is that the work will be performed in a different way than that intended.

Should cause for argument arise, or through a misunderstanding or misinterpretation of the initial order, the work be inaccurately done, who must shoulder the blame for the spoiled or defective work? Having nothing to verify the verbal instructions previously given, there arises the doubt as to which should accept the responsibility for any errors that have been made. Whenever possible written instructions and, if necessary, sketches or drawings should accompany any orders for work, particularly if the same requires a fair degree of accuracy, and would entail loss of time and material if the work is not properly performed.

#### An Instance

The writer recollects an instance where a toolmaker was given a certain die to make, the foreman giving him a sample of the piece to be made and a brief description of the manner in which the tools were to be designed. As the job was desired in a hurry, it was thought best to have some of the preliminary work started so as to avoid any great loss of time. The instructions were not definite and the workman was allowed to use his own judgment as to the design of the tools. He, therefore, studied the sample and decided on a particular method of die construction, receiving the hurried approval of the foreman. To facilitate the machining of the various pieces they were cut from the bars for shaping and turning. After considerable time had been put in machining the different pieces the foreman—who had subsequently been consulting with the superintendent regarding this particular job—came to the mechanic and advised him that a change would be made in the tool design to conform to certain alterations suggested in the sample. When told that everything had been cut off and partly machined for the piece as it was first intended the foreman was considerably annoyed, saying that too much headway should not have been made until the problem had been more fully discussed. The change necessitated the discarding of considerable tool steel, part of which had been machined.

Such instances as these go to show that in the constructing of dies or fixtures or other tools of accuracy haste is a factor that should be avoided, and in all cases is it advisable to study the problem in hand while preparing drawings and written instructions to which a workman can refer, or leave it entirely to the toolmaker to suggest the design of construction.

### SELLING AND BURNING FUEL

By J. H. R.

FEW problems at the present time are more pressing or more difficult of solution than that of the economic utilization of fuel for industrial and domestic purposes. That the question is of vital significance has been amply demonstrated during the past few weeks by the drastic measures taken by the government fuel controllers, for the utmost conservation of coal in every line of manufacture. In an effort to comply with current regulations and assist in relieving a situation that was rapidly developing into the famine stage, users of fuel were both anxious and willing to co-operate to the fullest extent for a reasonable solution. The essential need of maintaining production was however a feature that invariably prevented a plant from curtailing on the consumption of fuel, for operating the equipment at maximum capacity.

An interesting experience in connection with coal conservation was related to the writer a short time ago, where an institution with a large power plant was induced by the o+cial salesman of a gas concern to use coke forfiring the boilers. The engineer of the plant was not consulted regarding the new developments, as the agreement to "give the coke a trial" was made in the office. The salesman for the gas company interviewed the manager respecting the adoption of coke for the aforementioned purpose. Owing to the poor quality of the coal they had been getting and the convincing persuation of the salesman, respecting the high efficiency of coke as a heat producing medium, the manager finally decided to give the coke a trial, and placed an order for several tons for immediate delivery.

When the engineer was advised that a quantity of coke would be delivered the following day, the jig was up. The manager was informed right off the bat that it was utterly impossible to burn coke on the particular style of mechanical

grate travelling in the boilers. Nothing would do however but that the engineer should make ready to receive and store the supply of coming coke. He nevertheless refused to have anything to do with the "test" and suggested that the gas people supply the fireman for the demonstration, as he would be very willing to learn anything new regarding the firing of a boiler on any class of fuel. So it happened that the next day saw a number of carts discharge their load into the waiting bunkers, and with the arrival of the "demonstrator" the test was commenced. Previous to becoming an interesting onlooker, the engineer went the rounds of the different departments and advised them to be prepared for an early shut down. The manager and salesman stood quietly by as the coke specialists loaded the hopper with the recent arrival, no particular attention being paid to the size of the lumps that were thrown in. The travelling grates continued their regular course, automatically carrying the three inch layer of slack coal from the hopper to the fire chamber. The time soon arrived however, when the last of the slack coal reached the bottom of the hopper and in a very brief space of time the pressure gauge, which had been registering 100 lbs. per sq. in., gradually began to fall, so that in a few minutes the hand was pointing to 50, with the foremen of the machine departments inquiring as to the failure of the power.

As invariably happens, the practical man was at once approached for advice, when it was discovered that the coke had failed to find its way through the three inch opening, and the back half of the grate was bare of fuel, the cold air rushing through and cooling off the boiler shell. The coke was emptied from the hopper and spread on the concrete floor—all over the boiler room—and hammers were brought into play to reduce the lumps to a size that would pass through the openings of the mechanical stoker. In the meantime the bed of the fire was put in order and a fresh supply of slack placed in the hopper. When all was again ready, the coke demonstrator—still optimistic—took the leading role, and his assistants filled up the hopper with a supply of small coke. However, the result was little better than the preceding one; for while the coke passed through the opening and followed the bituminous and hard coal slack along the grates, it failed to ignite when reaching the fire chamber, and as soon as the air struck the thin open layer of coke, the rush of cold air prevented the back creeping of the fire that is necessary in the successful operation of this particular type of mechanical stoker. It was a very disappointed but wiser salesman that ordered the coke back to the bunkers and its subsequent removal next day.

## A PISTON DOES STOP AT REVERSAL

By W. Fletcher Shepherd

IN his revival of this time-honored controversy in the December 6th issue Mr. R. Hamilton attempts by an ingenious argument based on Euclid's definition of a line to prove that a piston—theoretically—does not stop at reversal. Euclid's definition of a line as having length but neither breadth nor thickness is now, however, regarded as insufficient for modern analytical mathematics. According to the modern mathematical conception a line is the trace or path of a point moving in space or in a plane and its breadth and thickness are infinitely small as compared with its length.

That this conception is based on sound reasoning a moment's consideration will show. A point on a body moving along any path or line must pass through a multitude of points so that the line itself is composed of an infinite succession of points. If then a point has no dimensions at all no progress could be made along the line since if nothing be added to nothing the sum is nothing no matter how often the process be repeated.

Now it appears to the writer that the piston problem can be very simply settled by a close observation of the pin joining the connecting rod to the crank. The path of the crank pin center is a circle and in a well balanced engine the crank pin moves around its entire circular path with practically no lost motion. Its reciprocating motion, however, in the direction parallel to the piston axis varies in acceleration and speed from a maximum at the middle of the piston stroke to zero at each end of the piston stroke. We also observe that at each end of the piston stroke the crank pin centre crosses the piston axis at right angles and can therefore at that instant have absolutely no movement in either direction along that axis. The breadth of that axis may be infinitely small and the time consumed in crossing it infinitely short but the essential fact remains that there is an instant when the crank pin has absolutely no movement in either direction along that axis and this is true irrespective of the speed of the engine.

Now since the crank pin is linked to the piston the latter also at that instant can have absolutely no movement in either direction along its axis and since these are the only directions in which it can move the piston must therefore for that instant be at rest.

## HIGH-SPEED RAILWAYS AFTER THE WAR

THE subject of rapid transportation and its possible developments in the near future were the subject of an address by Chalmers Kearney before the Society of Engineers last month, in the course of which he pointed out that rapid transit for passengers and goods was of paramount importance in the economic life of a nation.

The essentials of a successful high-speed railway were enumerated by the speaker as follow:—

It must eliminate oscillation;

It must allow of the use of simple points and crossings;

It must be reasonably cheap to construct;

It should be capable of being built coincident with existing lines, and through existing tunnels;

It should be capable of being used as a surface, elevated, or tube railway;

It should not depend for the stability of its cars on moving mechanisms (such as gyroscopes);

It should not concentrate the stresses due to centrifugal force and side wind pressure on one rail.

The existing lines as well as various systems proposed by inventors from time to time do not fufil all these requirements, and it was to solve the problem presented and meet these points that the Kearney high-speed railway was designed. Details of track construction were given and the ample margin for safety illustrated. For practical purposes Kearney high-speed trains will be secure from derailment under all conditions. Pictures of the first full size passenger carrying car were exhibited. The car is "streamlined" to reduce air resistance at high-speeds and ball bearings of an improved type are used. As is well known the Kearney system employs a single rail to carry the weight of the trains and a second overhead guide rail to maintain equilibrium. The mechanical advantages of this method were fully described by the author. Simplicity in design has been achieved and the cost of the overhead structure is actually less than in the case of that for the electric transmission wires on the Brighton Elevated Electric. Future Kearney lines would cost much less to build on account of the steeper gradients which may be employed which will permit of large reductions in embankments, cuttings and tunnels. Bridges would also cost much less owing to the concentration of the load on to one deep plate girder.

### Speed Possibilities

As regards working, Mr. Kearney considered that speeds of 100 to 150 miles an hour would be economically sound with this system and showed how operating costs would be reduced. The abodition of oscillation and consequent concussion would greatly reduce the cost of upkeep of the tracks. In short, high-speed railways would not merely prove to be an economic advantage but a commercial necessity in the era after the war.

Speaking of underground railways, Mr. Kearney said that present methods left much to be desired. The four points for consideration in the construction of future underground lines were:—

To secure more convenient stations;

To reduce capital expenditure;

To obtain higher speeds;

To reduce operating costs.

The London Tubes were phenomenally slow owing to the lifts. They were also extremely expensive to build and to work. The Kearney system removed these disadvantages and secured all requirements. A recent improvement in the Kearney system is the design of a

"stepless" street level station. An in- [illegible] pavement on to the platform and into [illegible] hour would be reached in 23 seconds from the start. The train would then [illegible] the next station when it would run up a similar gradient which would bring it to a standstill without the destructive use of brakes. Such lines besides being vastly more convenient for passengers [illegible] great as on the present tubes. This means a corresponding reduction in the number of trains employed, reduced staff, lower working costs, higher wages and lower fares. The ventilation of such [illegible] perfect.

## MECHANICAL DENTISTRY COURSE FOR DISABLED SOLDIERS

Dental mechanics is one of the little known trades in which returned men are manifesting an interest when they return to Canada incapacitated for their former occupations. The vocational training of the Military Hospitals Commission has been called upon to make provision for it in their re-education courses.

The work requires mechanical skill and a fine eye for detail and holds, through its demands for fine work and ingenuity, an unusual interest for the able man who [illegible] incapacitated for heavier work.

In France a school of dental mechanics has been established for disabled soldiers by Dr. Quintero of Lyons, and a large class of veterans is under instruction, but the Military Hospitals Commission has made arrangements for Canadian men to take the work in established schools here. The work pays well and a skilful man can become an efficient workman in eight months.

The course has been granted to several soldiers, one a Montreal man who before he enlisted was a very successful salesman, drawing a good salary. He suffers now from an injured hip and cannot walk without pain. He must have work at which he can sit.

Enquiry into his past showed that his father had been an inventor and that he too inherited a certain ingenuity with mechanical things. He had demonstrated this in helping the dental officer on active service, and so an eight months' course was granted him by the government. His progress in the first month gives promise of great success.

## COMMERCIAL ARTS OPEN TO VETERANS

SOLDIERS in the Toronto Technical School come from all parts of the Dom- [illegible] of new vo- [illegible] tions, but none is more interesting than [illegible] in the

Men with talent whom fortune granted only a meagre means of expression before the war are being given opportunity to further their ambitions and many of them will go back into the industrial world better off, one might say, for their injuries. This is true of three men now under instruction who are making remarkable progress at their new occupations.

Pte. M. J. Claire was a stone carver before he enlisted. He went overseas, and was so wounded that such work was out of the question. To make the most of his natural talent, a new work allied in some way to his previous experience must be found. He turned to industrial clay modelling. Here his artistic ability will enable him to become competent to command a splendid salary.

### Paralysed Designer

A veteran by the name of J. R. Champion whose pre-war occupation was house painting is now engaged in stencil designing. Graduated from out door painting he is now being qualified to do the more detailed and better paid work of interior decoration. He is making good and turning out fine work in spite of the fact that he is paralyzed partially in both hands.

The Military Hospitals Commission, in arranging these courses for soldiers, attribute a large degree of the success with which men so disabled as to require occupational re-education are being placed again in condition to earn a good livelihood to the care with which the courses are adapted to their previous experience.

## TORONTO FIRM BUILDS MOTOR LIFE-BOATS

SEVERAL large motor-powered lifeboats are now under construction at the Canadian Beaver Company at the foot of York Street. They are to be used on the Norwegian Government ships, which are being built at the Polson Iron Works.

The life-boats are 24 feet over all, with a beam of seven feet. They are being fitted with a 12 horse-power Foreman gasoline motor, and have a seating capacity of 30, and when loaded are expected to attain a speed of seven miles an hour. Fitted with two belts of cork 12 inches in diameter amidships and tapering off to nothing at bow and stern, they are absolutely unsinkable. The boats are also fitted for towing, and have the luxury of a canvas hood to enclose the whole cockpit. The frames are made of the finest white oak and are planked with cypress. Four pairs of oars are provided. The oak water-casks are aft, and the provision locker in the bows The fuel tank is amidships, and has a capacity for 50 gallons.

The Canadian Beaver Company is also constructing a number of life-rafts for the same ships, the tanks of which are made of regulation government copper, the frames of white oak, and will, in case of emergency, be taken in tow by the life-boats. The rafts are 8 feet by 10 feet, and have a capacity of 25 persons. The rafts are always carried loose on the decks, except in very rough weather, when they are lashed.

## EYE HAZARDS IN INDUSTRIAL OCCUPATIONS

A NEW book written by Gordon L. Berry, Field Secretary, National Committee for the Prevention of Blindness, with the co-operation of Lieut. Thomas P. Bradshaw, U.S. Army, formerly Technical Assistant to the Director of the American Museum of Safety, octavo, 150 pages, fully illustrated. Published by the National Committee for the Prevention of Blindness, 130 East 22nd Street, New York. Price, 50 cents.

In this volume the author reviews the chief industrial hazards to eyesight in the industries of the United States. Case reports illustrate each section, the special dangers are described and recommendations made for such changes of working conditions, or installations of protective devices, as have been found suitable for protecting workers. The book is most completely illustrated.

The following section headings indicate the scope of the book: Statistics of eye accidents, chipping operations, machine operations, abrasive wheels, sand-blasting, "mushroomed" tools, riveting, radiations from intense light and heat sources, ultraviolet rays in illuminants, radiant energy in arc welding and in molten metal, metallurgic operations, glassblowers' cataract, infections, gauge glasses, acids and chemicals, treatment of acid burns, industrial poisons, removal of dangerous fumes, vapors and gases, spray process hazards, methyl alcohol, bottling accidents, mining and quarrying, agricultural hazards, goggles, garment trade hazards, industrial lighting, the safety movement.

These subjects have been treated not so much in the way of a technical manual for safety engineers, but rather in a general informative way for the information of the average manufacturer or layman who is seeking information of this nature. Descriptions of many of these hazards have been included heretofore in publications covering the complete field of industrial accident prevention, and where discussion of preventive measures would be repetition, the author has referred his reader to the chief of those sources where such detailed information might be secured, if desired.

The book is the most complete compilation of material relating solely to the prevention of eye accidents that has been published in this country. Inasmuch as there occur annually in the United States alone nearly 200,000 eye accidents, from which many cases of total blindness result, it would seem that there is need for further attention to this important subject.

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## TECHNICAL WRITING AN AID TO ADVANCEMENT

THE majority of mechanics, when urged to express in writing their ideas, views and specific knowledge of things mechanical, postpone the fateful day with a variety of excuses. Inability to express themselves clearly, lack of time, lack of subjects to write about—these three reasons are put forward without hesitation when a few minutes' consideration would show that in fully 90 per cent. of the cases there is no foundation for even one of them.

It is not overstating the mark to say that one out of every eight or ten machinists and probably one out of every five toolmakers has sufficient knowledge, i.e., experience and education, to enable them to contribute real, live articles on questions of vital interest to many of our readers.

If dictaphone records could be taken of the various conversations and anecdotes which take place in the average tool room in connection with troublesome jobs and how they were overcome, the amount of latent knowledge gathered in a few days would surprise not only the parties themselves, but their employers also.

At the present time there are numbers of mechanics in the making—men who have started in munitions shops either through stress of circumstances or lure of high wages.

Despite recent and future changes in the machinist trade, the fascination which machine work has for many men has taken complete hold of them and brought to the surface an amount of mechanical ability which has lain dormant until awakened by opportunity.

Such men, although bred and trained to other trades, have had a natural liking for wheels, etc., and when circumstances compelled them to hire out as simple operators they at once got down to a working bearing at a speed far beyond that of the most ambitious apprentice.

Now, after extended experience and a fair knowledge of what a machinist can accomplish, they feel that their duty to themselves and their employers is to equip themselves mentally and materially to the best of their ability.

In helping others we help ourselves! The truth of this statement can be vouched for by any mechanic who can recall occasions on which he has helped a fellow worker out of a hole. Perhaps a certain tooling arrangement would not operate satisfactorily, too much chatter—if tightened up to suit, some other objection would arise—a case of gradual elimination of trouble until success is obtained. Such a procedure is of weekly if not daily occurrence in hundreds of shops, each case a problem in itself, and the solution buried in the depths of the tool room foreman's memory until jerked out again by some similar circumstance.

The idea itself represents no intrinsic value in dollars and cents to either the foreman or his employers, it is all part of the day's work, but just inasmuch as hundreds of these incidents are forgotten, so is the trade deprived of general knowledge and many individuals of information which they may ultimately have to dig up for themselves by arduous effort.

Handicraft, mechanical ability, skill in machine operation—call it what you will—such faculty is frequently born and most times developed, but the knowledge of how to utilize such accomplishment to the best possible ends can only be gained by experience and he who gives his experience to others gets it back one hundredfold.

The old bogey of trade secrets has been almost completely dispelled by modern science. Individual research along all lines of machine shop practice has evolved certain principles which are world-wide knowledge, results given freely to all who may look and listen. The successful application of such principles to daily problems is the business of the progressive machinist, and just as research continues to open up increasing fields for itself, so does the machinist's work suggest new angles of attack.

In recording, describing and incidentally criticizing his own work the present-day machinist, be he lathe hand or toolmaker, will find his knowledge of his own ability greatly increased, his confidence in himself increased, with, as many notable cases have shown, his responsibility increased, and last, but not least, the knowledge that in doing so he has helped others less favored than himself by opportunity or natural gift.

## BUYING COAL ON A HEAT BASIS

THE purchase of coal on a basis of contained heat units appeals to the engineer who is accustomed to judging the majority of materials on an efficiency basis. As a standard of value it is the only correct method of classifying fuels apart from types such as hard, soft, etc., each of which has individual characteristics rendering it more or less suited for specific purposes.

It is stated that since 1906 the $8,000,000 worth of fuel purchased annually by the United States Government has been bought on B.t.u. and chemical bases, and it is suggested that our own government might well adopt such a plan in buying over $1,000,000 worth of coal yearly. Where large amounts such as these are dealt with, the system is equitable as the producer must have a production large enough to allow inequalities of cost, etc., to balance up.

As the better grades get exhausted, they cost more to mine, and relatively may give the producer a smaller profit per ton than a lower grade easily mined coal which can be sold on the open market at ruling prices irrespective of its efficiency as a heat producer.

The root of ultimate trouble is the fact that coal is not a manufactured product and must be accepted as Nature made it. Perhaps when national fuel control is an accomplished fact, the manipulation of coal for by-products will enable a standard fuel to be made available which will possess a nearly uniform heat content and avoid many inconsistencies which would arise if the heat basis were adopted on a wide scale at present.

# Weather Aids Country in Its Fight Against Fuel Shortage

*Order Accepted in Good Spirit—Milder Weather Aids Movement*
*Steel Situation Continues Acute With Reduced Output*
*Metal Markets Quiet—Machine Tool Business Steady*

**The closing down of practically all industrial establishments over the week-end naturally disorganized business, but it was taken in good spirit in spite of the loss entailed. The necessity of the Fuel Controller's order was recognized and it is to be hoped that the saving in fuel justifies the drastic measures resorted to. Fortunately milder weather intervened which helped considerably in the saving of fuel as well as in moving cars from the border. The strictest economy in the use of coal is imperative in order to conserve available supplies and prevent, if possible, another period of "heatless days," and the loss which results from the decline in production of the factories. There have been no developments of importance in the iron and steel trade this week. Conditions have not shown any improvement although the milder weather will relieve the situation to some extent by permitting a heavier movement of coke and more favorable operating conditions at the furnaces and mills. No pronounced improvement, however, is looked for until next month when the output should show a big increase. The situation in the iron and steel trade in the United States continues acute on account of the traffic congestion and the output of mills and furnaces is still a long way below capacity. The scrap market is dull and prices unchanged. Business in scrap metals is quiet and is being adversely affected by the freight congestion. In the non-ferrous metal markets business has been quieter this week on account of the holidays. There is no improvement in the tin market and the scarcity of this metal is affecting a number of manufacturing plants. Lead is firm but antimony and aluminum have both declined. Copper is firm and unchanged. Machine shop supplies are in good demand at firm prices. Castor oil is practically off the market as it cannot now be obtained from England. The machine tool market is steady and fairly active. Deliveries in equipment from the United States are very slow on account of the heavy demand there.**

MONTREAL, Que., Feb. 9, 1918.—Conservation of fuel is the dominating feature of this week's industrial "activity." In common with the United States the Canadian Fuel Controller has found it imperative to adopt similar methods for the saving of fuel during this period of prolonged cold and unfavorable weather. In addition to the three days' closing that has been deemed necessary in many branches of industrial and commercial life, additional curtailment will be made in railway passenger service during the next three months to effect a further saving of fuel. To facilitate the result of the heatless days and increase the available supply of necessary coal nothing but food and fuel will be loaded as freight during the period of industrial suspension. This action, it is expected, will materially assist in the attainment of the desired purpose, as shunting requirements at other than main terminals will be practically eliminated.

### Steel

While the industrial situation at the present time shows a slight improvement over that of a week ago, the betterment so far has not been pronounced owing to the prevailing conditions restricting production. Following the action of the American Government respecting the measures adopted for the conservation of fuel, the authorities here have taken similar steps to relieve a condition rapidly becoming acute. The moderating of the weather previous to the enforcement of the order promised well for the better movement of coal on the severely taxed railroads, but expectations in this connection were not fully realized owing to the return of the stormy weather of Saturday adding to the difficulties of the transportation problem. The inability of plants to obtain delivery of sufficient raw materials for capacity production has materially affected the output, which at the present time is considerably less than that under normal conditions. Even with the forced curtailment resulting from the Monday closing of many plants in the States it is practically impossible for sufficient fuel and other commodities to be shipped in such quantities for the total relief of present conditions. Not only are the mills unable to obtain fuel and materials for production, but the movement of cars is so uncertain and stocks are piling up to such an extent that a return to normal will necessarily take some considerable time even when the freer movement of freight is possible. Until a prolonged spell of favorable weather is experienced the industrial activities of the country must remain more or less demoralized. Owing to the congested condition of all American railroads Canadian dealers and consumers have found it almost impossible to get reasonable delivery on material coming from the States. Ship plate requirements for Canadian-built vessels are still hard to obtain. Many of the local steel plants and other industries working on essential production have secured special permission from Ottawa to continue operations through the period of restricted activity. Steel for the manufacture of the American shells is very slow in coming, and those plants that have received contracts for these shells are greatly inconvenienced in this connection.

### Metals

General conditions throughout the metal trade remain unchanged, production being ample to meet the requirements for all essential purposes, although domestic interests are still suffering from insufficient supply. The feature of the week is the acute condition in tin that has developed a more serious tone from the recent action of the British Government and the sharp advance on the London market. Copper is more settled and trading steady. Spelter is quiet and firm. Lead is unchanged, but with an easier undertone. Antimony is steady, while aluminum has weakened.

**Copper.**—The trade has become reconciled to the fact that no change will become effective regarding further price regulation until after the 1st of June at the earliest. This has had the tendency to remove much of the uncertainty prevailing last month, and in consequence the situation has become more settled and activity has returned to normal. While some dissatisfaction has been expressed because a higher price was not established, the general opinion appears to be that the present price is one very acceptable to the majority of producers and consumers. The American situation is still governed by the fixed price of 23½c. The local market is easier on a quieter demand, and quotations show a decline of 1c over that of last week, the price asked being 32c for lake and electro and 31c for castings.

**Tin.**—The seriousness of the present tin situation has been additionally emphasized by the further restrictions and regulations recently imposed by the British Government. Just what effect this will have on the securing of permits to ship tin to the States is not yet certain, but it is anticipated that increased difficulties will be experienced in this respect. It is possible that the recent action of the Imperial authorities has been taken to relieve the situation in America, but nothing definite has so far been announced. Information regarding shipments is often delayed for obvious reasons, thus making the situation more uncertain and unsettled. The advance on the London market during the past week has been approximately £8 per ton. New York has taken on additional

strength, and nominal quotations have shown a higher tendency, with trading practically suspended. Local dealers report a fair demand, with stocks declining and prices moving to higher levels, this week's quotation of 79c being an advance of 2c per lb.

**Spelter.**—Considerable annoyance has been felt throughout the spelter trade through the indifference of the American Government in regard to the fixing of a set price to regulate the sale of the metal. In the face of what has taken place in iron and steel and other metals the spelter interests feel that the War Industries Board have been negligent in this connection. It is the opinion of many, however, that definite action will not be taken, and the trade will continue to operate under the supply and demand created by an open market. The local situation is apparently showing strength, but dealers continue to quote the unchanged price of 10½c per lb.

**Lead.**—Apart from the Government activity, the situation in the States has not been marked by any particular features, and general conditions are of a quiet character. The trust price of 6¾c continues to be about ⅜c below that quoted on the open market. Lead is quiet on the local market, and the lighter demand has given the situation an easier tone. Dealers, however, continue to quote 9¾c per lb.

**Antimony.**—While a fair volume of business is being done, the market cannot be said to be active. A weaker tendency has developed in the States and New York quotations show a decline of ¼c per lb., the price quoted being 14c for Chinese and Japanese. The market here is steady, with dealers reporting unchanged prices, these being 18c per lb.

**Aluminum.**—While the general demand continues the increase in available supply has produced an easier market, some local quotations being as low as 55c per lb. A fair average quotation here is 56c per lb.

### Machine Tools and Supplies

Another week of comparative quiet has been experienced in the machine tool industry. Inquiries have been light and sales have been few, business reported being of a general character, with no marked demand for any particular class of equipment. The difficulty of obtaining delivery from points in the United States is still very pronounced owing to the abnormal requirements for industrial purposes across the line and the congested condition of American railroads. Conditions that have prevailed throughout the past several weeks, necessitating the restriction of production, has also affected the supply market, reflected in the marked falling off in the demand for general machine shop accessories. Despite this, however, the total requirements for present activities continue to be of an encouraging volume.

### Scrap

Unsettled conditions are the dominating feature of the old metal market, due to the uncertainty that prevails regarding the contemplated action of the American Government respecting the regulation of this business. During recent weeks the trade has been operating under considerable difficulty in the handling of scrap to and from the plants and furnaces owing to the shortage of cars and the inability of the railroads to take care of the enormous volume of freight that has accumulated during the severe weather. Under these conditions consumers have often been forced to curtail production for want of scrap materials. Owing to the fact that railroads will confine themselves to the loading of food and fuel dealers in scrap expect to have a very quiet week-end. Local quotations are unchanged, dealers preferring to hold firm at prevailing prices.

## Toronto

TORONTO, Ont., Feb. 12.—The industrial situation continues to be affected by the unfavorable transportation conditions although some relief is looked for as a result of the three days' suspension of industrial activity and also if the mild weather continues. With favorable traffic conditions much can be done during this week in relieving the freight congestion but no decided improvement is possible until the spring. The strictest economy in the use of coal is urgently enjoined by the Fuel Controller for by this means a great saving can be effected and probably further drastic measures obviated.

**CANADIAN GOVERNMENT PURCHASING COMMISSION**

**The following gentlemen constitute the War Purchasing Commission appointed by the Canadian Government: Hormidas Laporte, Montreal, chairman; George F. Galt, Winnipeg; William P. Gundy, Toronto. Thomas Hillier is secretary, and the Commission headquarters are at Ottawa.**

### Iron and Steel

There is no appreciable change in the situation in the iron and steel trade but the outlook has improved now that the severe weather has disappeared. If the mild weather continues there will be a heavier movement of fuel to the furnaces and steel plants, while operating conditions will be more favorable. Some weeks must elapse, however, before there is any decided improvement in conditions or material increase in output as stocks of fuel have become so low and transportation facilities so disorganized that it will be some time before conditions are even approaching normal. As a result of the falling off in production unfilled tonnage has consequently increased: The Algoma Steel Corporation reports that the situation is improving and that the company has plenty of business booked. Practically sold, the unfilled orders on hand at Dec. 31 representing 437,951 tons. Adequate supplies of raw materials are reported to be on hand, and enough coal has been secured to carry through until navigation opens. Blast furnace operations were interfered with during December operations.

The recent reports of the contemplated merger between the Dominion Steel Corporation and the Nova Scotia Steel & Coal Co. has brought to notice some interesting facts in connection with the progress of these two concerns, also the Steel Company of Canada, during the war period. The liquid position of the companies is the most striking part of the new conditions, and they show a remarkable reversal of form when contrasted with the situation as recently as five years ago. No doubt the steel boom is inflated, but the fact remains the companies have worked to such advantage, owing to capacity production, that their coffers are full to overflowing. Apart from cash surpluses, there has been a drastic writing off for depreciation which has probably left plant account at bedrock figures. All these factors serve as a guarantee for the future. Companies with complete plant units and an abundance of cash and ore reserves will have little cause to fear foreign competition when steel prices decline in peace times. And, furthermore, it is certain Canadian railways alone will have enough business to place to keep all the steel works running at profitable speed some time after peace is declared and when war orders cease.

The pig iron market continues more or less unsettled on account of the coke situation, although some relief is looked for concurrent with the improvement in the weather. The respite will probably be only of short duration so no permanent relief can be expected for some weeks. Canadian concerns have been in the market recently for pig iron in the United States but conditions across the line are anything but satisfactory. Steel mills and blast furnaces are making small headway in recovering the lost ground due to compulsory cutting down of production in the last few weeks through the breakdown of the transportation system and unfavorable weather. As a result of these conditions, Government plans for rushing production of ordnance and other war munitions have been badly interfered with. The situation is reflected in the unfilled tonnage report of the U.S. Steel Corporation for January. The unfilled orders of the Corporation on January 31 were 9,477,853 tons, acording to the monthly statement issued [illegible] Tons, an increase of 96,135 tons compared with the orders on hand Dec. 31st.

### Scrap Metals

The market continues dull with very little business passing. Traffic conditions are affecting the market, as it is almost impossible to ship any scrap. Supplies of scrap are accumulating and

when the freight congestion is relieved it is possible that prices will be easier due to increase in supply. Heavy melting steel and cast iron scrap are firm but copper and brass are easier but unchanged.

### Machine Tools

Little has been done in developments of importance in the machine tool market, this week. Business has been fairly active, with munitions equipment predominating. Machine tool builders in the States have been seriously affected by the fuel situation and maximum production is almost impossible. As the Government demand for machinery is getting heavier, private consumers are finding it a difficult matter to get tools. The output of the builders is sold up for several months in the case of some types and to more than a year in others. There is a good demand for second hand equipment.

### Supplies

A good steady business is reported by dealers in machine shop supplies. Prices generally are very firm with a higher tendency for a number of lines. On account of the great demand for leather prices of belting are very firm. English castor oil is practically off the market here as it is now impossible to get shipment of this commodity from England owing to the heavy demand for war purposes. An advance of 25c a barrel in the price of Pennsylvania crude oil to a new quotation of $4 was announced recently by the South Penn. Oil Co. Other grades were increased five cents. Local prices are holding very firm but are unchanged in the meantime.

### Non-Ferrous Metals

The closing down of so many industrial establishments has affected the market and business has been rather slow. The tin market continues nominal, otherwise prices have a weaker tendency, lead being the only metal to show any degree of strength. There is no change in the copper situation and none is expected as the market is regulated. Lead is a shade higher on account of the scarcity of this metal. The spelter market is dull and prices unchanged but both antimony and aluminum are weaker and have declined.

**Copper.**—The market has been quiet, but conditions are very strong from the point of view of the selling and producing interests as the need of metal is insistent and available supplies are very small. It is generally believed that copper can and will be produced at the mines in sufficient quantity to meet all requirements but there is some fear that the freight congestion may interfere with shipments of ore from the mines to the refineries. Local prices are unchanged, lake and electrolytic copper being quoted at 29c and castings at 28c per pound.

**Tin.**—Practically all arrivals of tin in the United States are being commandeered by the Emergency Fleet Corporation and Chinese tin is understood to be controlled by Japanese interests. There is no spot metal available and the shortage is becoming a serious matter to many consumers who are badly in need of tin. Tin quotations are entirely nominal at 80c per pound.

**Spelter.**—The market is quiet and very little interest is being shown in spelter. Stocks are ample for requirements and consumers do not appear to be anxious to do business.

**Lead.**—The scarcity of lead in the East due to traffic congestion continues. There is a fair demand for lead and but for the shortage, business would be more active. Locally lead has advanced ½c and is now quoted at 9c per pound.

**Antimony.**—The market has a weaker tendency and quotations are lower at 17c per pound.

**Aluminum.**—The demand for aluminum is light but there is little spot metal offering.. Aluminum has declined 8c and is now quoted at 52c per pound.

## Washington

WASHINGTON, Feb. 9.—The labor agreement entered into between the United States and Canada is regarded here as one of the most effective measures taken since the beginning of the war to make the industries of both the United States and Canada most effective. Under the plan worked out it is the opinion of officials of the Department of Labor that the labor resources of the United States and Canada will be virtually pooled and all labor competition will be wiped out.

### Labor Agreement

Under the terms of agreement there can be no shifting of labor from the United States to Canada or vice versa, without the permission of the two governments interested. This measure will protect Canadian manufacturers from the inroads made on their labor supply by the higher wages offered by some manufacturers in the United States. On the other hand it is deemed a measure that will be equally favorable to the United States. For some time, according to officials of the Department of Labor here, there has been a general shifting of labor between the United States and Canada and this has resulted in disruption of the industries of both countries. Under the present agreement there must be mutual agreement by both governments before there can be any labor shifting so that there will be a virtual pooling of surplus labor. All fears expressed by industrial leaders that the plan might work to the disadvantage of the United States have been set at rest by the Department of Labor. Senator G. D. Robertson of Canada has been appointed as the representative of Canada to act as a member of the Federal Employment Board of the United States and protect the interests of Canadian labor and industry at all times.

### Shipping Board Activities

The United States Shipping Board is scheduled for another reorganization. Chairman Edward N. Hurley of the Shipping Board has not made public his plans of reorganization yet, but he has told the Senate Commerce committee which is investigating the shipping problem that he has plans for changes in personnel that will speed up the work of constructing an American merchant marine.

At the present time a concentrated drive for labor is going on in the United States with a view of securing adequate labor forces to carry on the work of the Shipping Board. George Piez of the Shipping Board is directing this great drive for shipbuilders and it is hoped that 250,000 ship constructers will be enlisted within a months' time. There are at present, Mr. Piez states, 713 ship ways in the United States and it will be necessary to carry on work in these ship ways twenty-four hours a day. In order to do this sufficient men are to be recruited to maintain three eight hour shifts in every shipyard in the country. In this connection it is declared that the recent labor agreement with Canada will work to the benefit of the United States. It has been suggested that some Canadian labor may be borrowed from Canadian shipyards and put at work in yards in the United States. Negotiations to this end have already been started. Whether or not the surplus labor among the Canadian shipbuilders is sufficient to allow them to give any large number of workers to the shipbuilders in the United States, it is hoped that some experienced Canadian shipbuilders can be secured in order that they may be made "leaders" for raw labor, which has been recently recruited.

### More Trade Prohibitions

Strict prohibition on imports and exports of the United States will be the next drastic step taken by the United States Government. It is generally understood that within a few days President Wilson will issue a proclamation in which he will set forth drastic regulations of the imports and exports of the United States. The step is taken in order that every possible bit of shipping space may be reserved for the transportation of war supplies. It is understood that all non-essentials will be prohibited, both as imports and exports. Detailed instructions will be given as to what are considered essentials and what are non-essentials. It is generally believed here that some agreement will be made with the Canadian Government whereby the full terms of the proclamation will not be extended to trade between the United States and Canada. Inasmuch as much of the trade between these two countries does not involve the use of any shipping which might be used for trans-oceanic cargoes the effect of the prohibition would be to put a damper on trade which has no interference with the problem of shipping war supplies across the Atlantic.

The fuel situation in the United States has become somewhat relieved during the past week. It has reached a state

where the order issued by Fuel Administrator Garfield, closing down factories on Mondays, has been revoked in as far as it applies to the Southern states. Railroad congestion is gradually clearing and there is a hope that the closing order may be gradually revoked until all the industries of the United States will be unrestricted before April 1, when the order finally ceases to operate.

The question of shipping space still remains the most important question confronting officials of the United States. An agreement reached with the Allies for the pooling of all shipping space and placing the control of all bottoms in the hands of a central committee is looked upon as one measure which can be counted upon to bring maximum efficiency to shipping.

### Executive Reorganization Due

President Wilson has asked Congress for power to reorganize the executive departments of the government. This measure will probably fail to pass Congress, but it is generally taken in Washington as an indication that a general reorganization is about to come, which will place the industries of the nation more fully in the power of the government. President Wilson has steadfastly refused to countenance proposals for the establishment of a Director of Munitions, but it is generally conceded that steps will be taken shortly which will place the war industries of the nation under a more central head. It is regarded as a possibility that the present War Industries Board which has only the power of advice now may be given some real authority by legislation.

Ninety-two commercial trucks valued at $111,038 were exported to Canada during December, 1917. The number exported during the calendar year 1917 was 882, valued at $1,075,750. The number of pleasure automobiles exported in December last was 1,852, valued at $1,318,786. The number exported during the calendar year 1917 was 16,438, valued at $12,401,705.

## New York

NEW YORK, Feb. 9.—Large orders for machine tools are being placed by the Government for arsenals, private ordnance plants and other factories producing war munitions. The buying this week follows as a result of the vigorous campaign waged by the machine tool section of the War Industries Board, the chief signal officer of the Army and the Navy Department. Unfortunately, the army and navy still appear as competitors in purchasing war material. Apparently there is race between Army and Navy Department officials to locate machinery needed as a step toward commandeering, if necessary. The War Industries Board has demanded a list of the purchasers of certain types of tools in the last twenty years. The machine tool builders are furnishing the information. Dealers in second hand machinery also are instructed to furnish lists of tools which they may own or which may be located for Government inspection. The chief signal officer of the army has made requests for price lists and discount sheets covering tools catalogued by various manufacturers, while the Navy Department is demanding a list of all the machine tools held in storage in New York. It will be recalled that only a few weeks ago the Government put out a hurry call for 1,000 machine tools and it is understood that while most of these are wanted for ordnance plants in this country, other heavy purchases of tools will be made for export to France.

### Aviation Activities

One interesting development, is the cancellation of the contract for 500 Liberty motors, given to the Duesenberg Motors Corp. of Newark, but, as a substitute, a contract for 2,000 Bugatti aviation motors has been given to the same manufacturers; as a result of these orders the Newark plant will be doubled in capacity, requiring the purchase of more machine tools. In this connection it is also of interest to know that the Canadian plant of the Willys-Overland Co. will soon make substantial deliveries of the "Sunbeam" aeroplane engines which heretofore have been manufactured almost entirely in Great Britain. So great is the demand for various types of aeroplane engines that additional large contracts are expected to be placed in this country as well as in Canada.

Aviation work is absorbing the attention of all of the Allied Governments to an unusual degree at the present time. The United States Government is preparing to place contracts for 65,000 tons of structural steel for hangars in France and the British and French Governments are seeking to place orders for 1,000 hangars requiring 35,000 tons of steel. All of this material will be purchased in the United States. Five fabricating shops are ready to fabricate the steel shapes but four or five of the largest structural mills have refused to bid upon the contracts for plain material for shipment in the time required by the Government. The chief officer of the signal corps of the army called for the fabricated steel required for 2,000 hangars in sixty days. Allowing sufficient time for transportation and fabrication would mean that the shapes would have to be rolled by the mills in two or three weeks. Under present conditions of reduced operations and demoralized traffic, as well as the relatively small number of mills prepared to roll light sizes at once, the material cannot be furnished in the time specified by the Government. The structural mills are already rolling large tonnages of shapes for the Government. In time, however, all the needs for aviation work can be met.

### Steel Output

Numerous manufacturers of guns, gun mounts, projectiles and engines in the Eastern territory are buying small lots of shop equipment to take care of additional orders placed by the Government in the last ten days.

To-day the U.S. Steel Corporation reported unfilled orders on hand Jan. 31, 9,477,353 tons which is an increase of 96,135 tons over unfilled orders carried at the end of 1917. The deplorable condition of transportation and the unfavorable weather made it impossible for the corporation to operate more than 45 to 50 per cent. of total capacity last month. Upon this basis, the output of ingots was approximately 900,000 tons, indicating production of 675,000 tons of rolled steel products. Shipments are estimated to have been 600,000 tons and orders taken therefore would be a little less than 700,000 tons.

## Pittsburgh

PITTSBURGH, Pa., Feb. 9.—This is the fourth day of mild weather, 40° to 50°, after 10° below zero was touched Tuesday. Barring the possibility of another cold snap, transportation conditions should improve rapidly, and with that improvement there must be a sharp increase in the production and consumption of steel. Thus far there has been no noteworthy improvement in traffic movement, though the experience of some shippers has been less unsatisfactory in the past day or two.

### Effect of Railroad Block

How greatly the railroads have been blockaded is being emphasized by concrete data now being received. Iron ore shipments from Lake Erie docks in January were only 199,091 tons, against 686,227 tons the preceding January, and leaving 10,069,592 tons on dock, whereas by the opening of navigation in April there should be only a very few million tons on docks.

Pig iron production in the United States in January was at the rate of only 28,750,000 tons a year, when the capacity is between 42,000,000 and 43,000,000 tons. In 1916 production was 39,400,000 tons, and many new blast furnaces have since been completed. Production since the 1st of February has been at the rate of less than 25,000,000 tons, probably considerably less.

Shipments of Connellsville coke in the week ended Feb. 2 were 228,539 tons, against an average of 420,000 tons in 1916. On account of completion of many by-product plants not as much Connellsville coke as formerly is needed; but it would require close to 375,000 tons a week to supply the furnaces still depending on Connellsville coke. The production of pig iron is below its normal proportion to the coke supply, as irregular working of furnaces increases the coke consumption per ton of pig iron produced, this frequently mounting to 3,000 pounds, against a normal of about 2,200 pounds.

Estimates are that during January the shipments of steel mills in the Pittsburgh, Youngstown and lake front districts averaged between 50 and 60 per cent. of capacity, while since the first of this month the average has probably been not over 50 per cent.

There are railroad embargoes against nearly all important steel consuming points, and permits are required, these

some classes of war material. Cars are secured first there may be demurrage while the permit is awaited. If one must wait for cars the permit sometimes expires. Of the shipments made since the first of the year fully two-thirds have been of war material, the remainder being ordinary commercial steel. Shipments for export are very light, as there is already much material at seaboard awaiting shipment.

### Steel Corporation Business

At noon to-day the United States Steel Corporation reported its unfilled obligations at the close of January at 9,477,853 tons, indicating an increase during January of 96,135 tons. This [illegible] of 484,612 tons in December, a decrease of 112,569 tons in November, and decreases averaging 575,000 tons a month during the five months preceding. The December increase was due almost wholly to the booking of contracts for sheets and tin plates for the first half of this year. Excluding altogether the item of sheets and tin plates, the corporation's bookings exceeded the shipments by about 75,000 tons more in January than they did in December, but the shipments decreased about 250,000 tons, as it is estimated the corporation's shipments were about 80 per cent. of capacity in December and 60 per cent. in January. The bookings in each month were chiefly of war material.

### Record Exports

In December, the eleventh month of ruthless destruction of merchant shipping by German submarines, the iron and steel exports of the United States made a new record at 656,044 gross tons, breaking the previous record of 643,767 tons made in September, 1916. The calendar year total for 1917 is over 6,200,000 tons, a gain of 100,000 tons over 1916. The largest item in the December exports was 204,555 tons of ingots, blooms, billets, etc., this being chiefly shell steel exported to the Allies abroad. Next came 78,571 tons of steel bars, doubtless also steel for making the smaller shells. Pig iron exports were unusually large in December, amounting to 64,727 tons, against 24,140 tons in November.

### Market Prospects

There is not what can really be called a market at present, nor has there been one for several weeks past. Everything is against there being any buying or selling, except, of course, as war business arises. The average buyer or seller is quite indisposed to enter into new engagements in present circumstances. The great majority of buyers have large tonnages due them, on which deliveries are well behind-hand, while at the same time the consuming operations of buyers have been interfered with as much by traffic conditions as have the operations of producers. The buyer does not know how much material he is going to be able to consume, and the seller does not know how much material he is going to be able to produce. A rough estimate would be that since the first of the year shipments of steel from mills have represented at the outside 60 per cent. of capacity—40 per cent. war steel and 20 per cent. commercial. A month hence the mills may be producing at 80 per cent., 100 per cent., or still at only 60 per cent. The consumer, who has been receiving steel at only 20 per cent. of productive capacity, may be offered 40 per cent. and not need it, or he may require 60 per cent. and not be able to get it.

All sales, except export sales not of war material, must carry a proviso that the price is to be readjusted to any new Government price that may be made as to any shipments made after March 31. What Washington is disposed to do as to revision of the set prices against that date no one has any definite inkling, and very likely there are no well-defined ideas in Washington on this subject. Conditions may be altogether changed by that time. Only a very few weeks of mild weather should put the railroads in shape again, and then a whole new market situation would be built up, with greatly increased production and increased consumption, perhaps as much increase in the latter as in the former, but more probably not as much. The railroads have not permanently broken down. While the traffic movement in the past two or three months has been extremely poor, the returns of freight movement for October, just compiled, indicate movement in that month at the rate of about 422,000,000,000 ton-miles a year. In the fiscal year ended June 30, 1916, the record fiscal year, the movement was 343,000,000 ton-miles. If the October rate of movement were restored and the iron and steel industry were given simply its former share of the total railroad service it would have ample facilities, so far as the movement of raw and finished is concerned, to operate at its full capacity. Thus the traffic movement will furnish the key to the iron and steel market when one is developed again.

## WAR INCREASES DEBT OF CANADA

RETURNS compiled by the Finance Department, at Ottawa, show that Canada's total gross debt on Jan. 31 was $1,994,563,746,32, as compared with a total gross debt of $1,226,185,543.53 on Jan. 31, 1917. Total assets amounted, on Jan. 31, to $997,034,539.05, leaving on that date a total net debt of $997,529,207.28. Between Dec. 31, 1917, and Jan. 31, 1918, the net debt increased by $21,100,703.10.

War expenditure during January amounted to $16,606,176, or a total during the ten months' period of $188,355,015. War expenditures during January, 1917, amounted to $24,074,932. War expenditures during the corresponding ten months' period of the previous fiscal year totalled $194,304,681.

Revenue during January showed a decline as compared with the figures for the same month last year. In January, 1918, it was $17,881,384; in January, 1917, it was $21,047,216. For the ten months' period, however, it shows an increase. Up to Jan. 31, 1918, revenue was $208,540,755; up to Jan. 31, 1917, it was $187,903,565.

## GOVERNMENT PLACE ORDERS FOR SHIPS

FABRICATION and assembling of materials for the first of the fleet of merchantmen to be built by the Dominion Government has been commenced, and a similar work for two other vessels will shortly be undertaken. The first ship, which will be a steel steamer of 4,350 tons burden will be laid down at the Canadian Vickers yard at Montreal. A second of 8,200 tons will follow at the same establishment, and, it is expected, a contract for a third ship of 3,800 tons will soon be made with the Collingwood Shipbuilding Co., which has a vacant berth in its yard. It is hoped that the ships to be built at the Vickers yard will be in commission by September next.

The Government's shipbuilding programme contemplates the laying down of the keels of some forty ships to June, 1919. Of the number, four of 5,000 tons and six of 8,200 tons are to be built on the Pacific Coast. All the vessels, however, are intended to relieve the shortage on the Atlantic and to ply there while the war continues.

Arrangements have been made whereby the Government is assured of a supply of ship plates and steel materials for its shipbuilding programme to June, 1919. Orders for steel for the Canadian Government will, it is understood, be placed by the United States' Purchasing Commission with various steel companies in that country. The Canadian Government, which, by the arrangement will be assured of securing material at as favorable prices as possible, will then make contracts with reference to deliveries and other features of the purchase agreements.

## WAR PURCHASING COMMISSION

AN order-in-Council, passed on Feb. 7, extends the functions of the War Purchasing Commission to purchase for all departments of the Government, whether connected with the prosecution of the war or otherwise. The only limitations are with respect to supplies of small value which may from time to time be urgently required at points distant from Ottawa, purchase of supplies for the Government system of railways, and in the case of purchases where the provisions of the new order cannot be enforced, "without detriment to the public interest."

"As far as practicable," it is provided further, "tenders shall be called for in respect of all contracts and purchases to be made by or under the authority of the commission, and the purchase shall be made from and the contracts given to the lowest tenderer."

The commission is to keep a systematic record of all business transacted and to make an annual report to the Governor-in-Council containing a statement of all contracts and purchases mde.

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

### PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago. | 37 50 |
| Standard low phos., Philadelphia. | ..... |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 33 00 |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | ..... | ..... |
| Victoria | 50 00 | |

### FINISHED IRON AND STEEL

Per lb. to Large Buyers. Cents

| | |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 5 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 5 75 |
| Chequered floor plate, 3-16 in. | 13 20 |
| Chequered floor plate, ¼ in. | 13 00 |
| Staybolt iron | 8 50 |
| Bessemer rails, heavy, at mill | ..... |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | *3 50 |

F.O.B., Toronto Warehouse

| | |
|---|---|
| Steel bars | 5 50 |
| Small shapes | 5 75 |

F.O.B. Chicago Warehouse

| | |
|---|---|
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

### FREIGHT RATES

Pittsburgh to Following Points

| | Per 100 lbs. C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 35.1 | 45.5 |
| Halifax | 35.1 | 45.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

### METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $32 00 | $29 00 |
| Electro copper | 32 00 | 29 00 |
| Castings, copper | 31 00 | 28 00 |
| Tin | 79 00 | 80 00 |
| Spelter | 10 50 | 9 50 |
| Lead | 9 75 | 9 00 |
| Antimony | 18 00 | 17 00 |
| Aluminum | 56 00 | 52 00 |

Prices per 100 lbs.

### PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¼ to ½ | $10 00 | $10 00 |
| Heads | 10 30 | 10 30 |
| Tank plates, 3-16 in. | 10 10 | 10 10 |

### WROUGHT PIPE

Effective Jan. 7, 1918.

| | Black | Galvanized |
|---|---|---|
| Standard Buttweld. | Per 100 feet | |
| ⅛ in. | $ 6 00 | $ 8 00 |
| ¼ in. | 5 10 | 7 23 |
| ⅜ in. | 5 10 | 7 23 |
| ½ in. | 6 46 | 8 03 |
| ¾ in. | 8 17 | 10 29 |
| 1 in. | 12 07 | 15 22 |
| 1¼ in. | 16 28 | 20 59 |
| 1½ in. | 19 38 | 24 61 |
| 2 in. | 26 27 | 33 44 |
| 2½ in. | 42 12 | 53 34 |
| 3 in. | 55 08 | 69 23 |
| 3½ in. | 69 92 | 86 94 |
| 4 in. | 82 84 | 103 00 |
| Standard Lapweld. | | |
| 2 in. | 29 43 | 37 71 |
| 2½ in. | 43 88 | 54 11 |
| 3 in. | 57 38 | 70 76 |
| 3½ in. | 71 76 | 89 70 |
| 4 in. | 85 02 | 106 28 |
| 4½ in. | 96 52 | 121 29 |
| 5 in. | 112 50 | 141 34 |
| 6 in. | 145 90 | 183 36 |
| 7 in. | 190 40 | 238 00 |
| 8 L in. | 200 00 | 250 00 |
| 8 in. | 230 40 | 288 00 |
| 9 in. | 276 00 | 345 00 |
| 10 L in. | 256 00 | 320 00 |
| 10 in. | 329 60 | 412 00 |

Prices—Ontario, Quebec and Maritime Provinces

### WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%
4½" and larger, 15%.

### OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 22 50 |
| Copper, heavy | 22 50 | 22 50 |
| Copper wire | 22 50 | 22 50 |
| No. 1 machine composition | 21 00 | 20 50 |
| New brass cuttings | 16 00 | 14 00 |
| No. 1 brass turnings | 14 00 | 15 75 |
| Light brass | 10 00 | 10 00 |
| Medium brass | 14 00 | 12 00 |
| Heavy brass | 15 00 | 14 00 |
| Heavy melting steel | 21 00 | 21 00 |
| Steel turnings | 12 00 | 12 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 23 00 | 18 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 23 00 |
| No. 1 machine cast iron | 27 00 | 25 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 17 00 | 13 00 |
| Car wheels, iron | 26 00 | 25 00 |
| Steel axles | 38 00 | 30 00 |
| Mach. shop turn'gs | 9 00 | 8 50 |
| Cast borings | 12 00 | 12 00 |
| Stove plate | 17 00 | 19 00 |
| Scrap zinc | 5 50 | 6 50 |
| Heavy lead | 5 50 | 7 00 |
| Tea lead | 5 00 | 5 75 |
| Aluminum | 25 00 | 20 00 |

### BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, ⅜" and less | 10 |
| Carriage bolts, 7-16 and up | net |
| Coach and lag screws | 25 |
| Stove bolts | 55 |
| Plate washers | List plus 20 |
| Elevator bolts | 5 |
| Machine bolts, 7-16 and over | net |
| Machine bolts, ⅜ and less | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | 10 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | add 25 |
| Nuts, square blank | add $1 00 |
| Nuts, square, tapped | add 1 75 |
| Nuts, hex., blank | add 1 75 |
| Nuts, hex., tapped | add 2 00 |
| Copper rivets and burrs, list plus | 30 |
| Burrs only, list plus | 50 |
| Iron rivets and burrs | 10 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 50 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 37½ |
| Wood screws, O. & R., brass | 32½ |
| Wood screws, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

### MILLED PRODUCTS

| | Per Cent. |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil. Head Cap Screws | net |
| Flat ⅞ But. Hd. Cap Screws plus | net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. & Semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2 in. | plus 10 |
| Studs | net |
| Taper pins | 10 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | list plus 20 |
| Collar screws | list plus 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | 65 |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $1 50 |
| Cold pressed nuts over 1½ in. | add 7 00 |

### BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $47 50 |
| Open-hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.

F.O.B. Pittsburgh.

### NAILS AND SPIKES

| | | |
|---|---|---|
| Wire nails | $5 25 | $5 20 |
| Cut nails | 5 70 | 5 65 |
| Miscellaneous wire nails | | 60 |
| Spikes, ¾ in. and larger | | $7 50 |
| Spikes, ¼ and 5-16 in. | | 8 00 |

### ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 31 |
| Plumbers' oakum, per lb. | 0 09 |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila rope | 0 33 |
| New Zealand hemp | 0 33 |
| Transmission rope, Manila | 0 45 |
| Cotton rope, ¼-in. and up | 0 47 |

### POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | net |

MISCELLANEOUS

| | |
|---|---|
| [illegible] | 0 [illegible] |
| [illegible] | 0 [illegible] |
| [illegible] | 18 to 70 |
| [illegible] | 0 [illegible] |
| [illegible] | 0 16 |
| [illegible] | 4 75 |
| White lead, pure, cwt. | 16 05 |
| [illegible] cwt. | 15 50 |
| Glue, English | 0 35 |
| Tarred slater's paper, roll | 0 95 |
| [illegible] | 0 31½ |
| Benzine, per gal., bulk | 0 30½ |
| Pure turpentine, single bbls., gal. | 0 73 |
| Linseed oil, raw, single bbls. | 1 50 |
| Linseed oil, boiled, single bbls. | 1 53 |
| [illegible] | 2 50 |
| [illegible] list plus 20 |
| Emery cloth list plus 20 |
| [illegible] | 0 03½ |
| Sulphur, rolls | 0 05 |
| [illegible] | 0 04½ |
| Rosin "D," per lb. | 0 03 |
| Rosin "G," per lb. | 0 03½ |
| Borax crystal and granular | 0 12 |
| Wood alcohol, per gallon | 1 80 |
| [illegible] in, per 100 lbs. | 2 20 |

DRILLS AND REAMERS

| | Per Cent. |
|---|---|
| S.S. drills, wire sizes up to 52 | 30 |
| S.S. drills, wire sizes, No. 53 to 80 | net |
| Standard drills to 1½ in. | 30 |
| Standard drills, over 1½ in. | 30 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 20 |
| Bit stock | 25 |
| Ratchet drills | 15 |
| S.S. drills for wood | 30 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 40 |
| Sleeves | 40 |
| Taper pin reamers | net |
| Drills and countersinks...list plus | 30 |
| Bridge reamers | 52½ |
| Centre reamers | 10 |
| Chucking reamers | net |
| Hand reamers | 10 |

COLD ROLLED SHAFTING

| | |
|---|---|
| At mill | list plus 40 |
| At warehouse | list plus 50% |

**Discounts off new list. Warehouse price at Montreal and Toronto**

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 25% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 9 50 | $ 8 50 |
| Sheets, black, No. 10 | 12 00 | 12 00 |
| Canada plates, dull, 52 sheets | 9 00 | 9 00 |
| Canada plates, all bright | 10 50 | 10 50 |
| [illegible] galvanized | | |
| Queen's Head, 28 B.W.G. | | |
| [illegible] 28 B.W.G. | | |
| Gorbal's Best, No. 28 | | |
| [illegible] No. 28 | | |
| Premier, No. 28 U.S. | 9 45 | 9 45 |
| [illegible] | | |
| Zinc sheets | 20 00 | 20 00 |

PROOF COIL CHAIN

B

[illegible] in., $12.35; 5-16 in., $11.85; ⅜ in., $11.50; 7-16 in., $10.90; ½ in., $11.20; 9-16 in., $11.20; ⅝ in., $11.10; ¾ in., [illegible]

Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $15.50; 3-16 in., $11.70; ¼ in., $8.40; 5-16 in., $7.40; ⅜ in., $6.35; 7-16 in., $6.35; ½ in., $6.35; ⅝ in., $6.35; ¾ in., $6.35.

**Prices per 100 lbs.**

FILES AND RASPS.

| | Per cent |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 40 |
| Black Diamond | 40 |
| J. Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 37½ |
| Disston | 50 |
| Whitman & Barnes | 50 |

COAL AND COKE

| | |
|---|---|
| Solvay Foundry Coke | |
| Connelsville Foundry Coke | |
| Steam Lump Coal | |
| Best Slack | |

**Net f.o.b. Toronto.**

BOILER TUBES.

| Size | Seamless | Lap welded |
|---|---|---|
| 1 in. | $36 00 | $ |
| 1¼ in. | 40 00 | |
| 1½ in. | 43 00 | 36 00 |
| 1¾ in. | 43 00 | 36 00 |
| 2 in. | 50 00 | 36 00 |
| 2¼ in. | 53 00 | 38 00 |
| 2½ in. | 55 00 | 42 00 |
| 3 in. | 64 00 | 50 00 |
| 3¼ in. | | 58 00 |
| 3½ in. | 77 00 | 60 00 |
| 4 in. | 90 00 | 75 00 |

Prices per 100 ft., Montreal and Toronto.

OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | 52 |
| Royalite, per gal., bulk | 17 |
| Palacine | 20 |
| Machine oil, per gal. | 26½ |
| Black oil, per gal. | 15 |
| Cylinder oil, Capital | 45½ |
| Cylinder oil, Acme | 36½ |
| Standard cutting compound, per lb. | 0 06 |
| Lard oil, per gal. | $2 50 |
| Union thread cutting oil antiseptic | 88 |
| Acme cutting oil, antiseptic | 37½ |
| Imperial quenching oil | 39½ |
| Petroleum fuel oil | 13½ |

BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30-5% |
| Standard | 40% |
| Cut leather lacing, No. 1 | 1 95 |
| Leather in sides | 1 75 |

TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 06 |
| Emery glue | 15 to 20 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 35 |

**Prices Per Lb.**

BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 38 |
| Brass sheets, 24 gauge and heavier, base | 0 43 |
| Brass tubing, seamless | 0 46 |
| Copper tubing, seamless | 0 48 |

WASTE.

| White. | Cts. per lb. | | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 18½ |
| Peerless | 21 | X Empire | 17¼ |
| Grand | 19¾ | Ideal | 17¼ |
| Superior | 19¾ | X press | 16 |
| X L C R | 18½ | | |

Colored.

| | | | |
|---|---|---|---|
| Lion | 15 | Popular | 12 |
| Standard | 13½ | Keen | 10½ |
| No. 1 | 13½ | | |

Wool Packing.

| | | | |
|---|---|---|---|
| Arrow | 25 | Anvil | 15 |
| Axle | 20 | Anchor | 11 |

Washed Wipers.

| | | | |
|---|---|---|---|
| Select White | 11 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

RUBBER BELTING.

Standard ... 10% Best grades .. 15%

ANODES.

| | |
|---|---|
| Nickel | .50 to .54 |
| Cobalt | 1.75 to 2.00 |
| Copper | .44 to .46 |
| Tin | .49 to .56 |
| Zinc | .23 to .25 |

**Prices Per Lb.**

COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | 42 50 | 43 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 46 00 | 44 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 48 00 | 48 00 |
| Copper sheet, planished, 16 oz. base | 57 00 | 45 00 |
| Braziers,' in sheets, 6x4 base | 45 00 | 44 00 |

LEAD SHEETS.

| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $13 25 | $13 25 |
| Sheets, 3½ lbs. sq. ft. | 13 25 | 13 25 |
| Sheets, 4 to 6 lbs. sq. ft. | 12 50 | 12 50 |

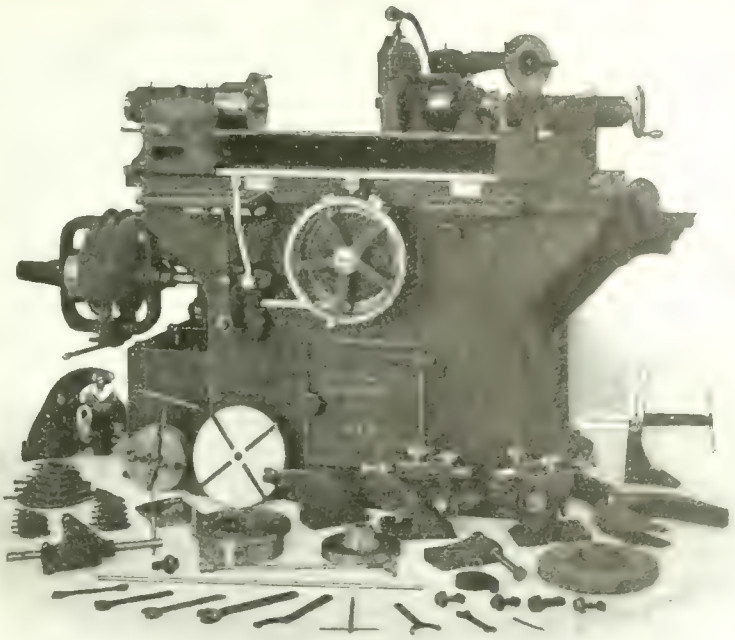
Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

| | |
|---|---|
| Acid, boracic | $ .15 |
| Acid, hydrochloric | .05 |
| Acid, hydrofluoric | .14½ |
| Acid, nitric | .10 |
| Acid, sulphuric | .05 |
| Ammonia, aqua | .08 |
| Ammonium carbonate | .15 |
| Ammonium, chloride | .11 |
| Ammonium hydrosulphuret | .40 |
| Ammonium sulphate | .07 |
| Arsenic, white | .12 |
| Copper, carbonate, anhy | .35 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .70 |
| Iron perchloride | .20 |
| Lead acetate | .16 |
| Nickel ammonium sulphate | .12 |
| Nickel carbonate | .35 |
| Nickel sulphate | .15 |
| Potassium carbonate | .75 |
| Potassium sulphide (substitute) | .20 |
| Silver chloride (per oz.) | .65 |
| Silver nitrate (per oz.) | .55 |
| Sodium bisulphite | .10 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .41 |
| Sodium hydrate | .04 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | .14 |
| Tin chloride | .60 |
| Zinc, chloride | .60 |
| Zinc sulphate | .09 |

**Prices per lb. unless otherwise stated.**

# Landis Grinders for Production



## *Deliveries*

| | | |
|---|---|---|
| 12 x 52 | Plain | - Stock |
| 10 x 96 | " | - Feb. |
| 10 x 72 | " | - Feb. |
| 6 x 18 | " | - March |

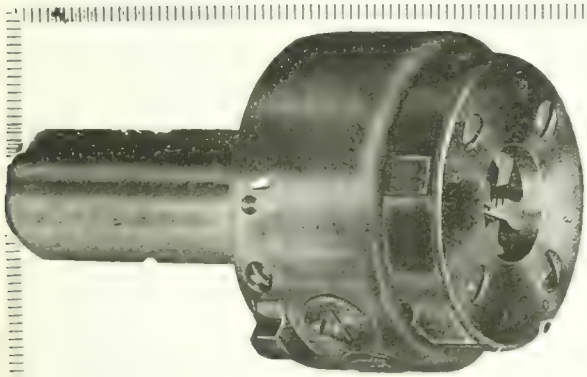
4A Universal - Feb.
(Capacity 16 x 66)

***Also the following used machines in stock:***

14 x 50 Norton Plain
14 x 96 Brown & Sharpe
18 x 96 Norton Plain

**THE A. R. WILLIAMS MACHINERY CO., Ltd.,** 64 FRONT ST. WEST TORONTO

ST. JOHN, N.B. WINNIPEG VANCOUVER



# Thread Accuracy

Are you satisfied with your threads? Are they all you desire? Do you wish to get better results?

That last question interests us vitally. Our Self-Opening Automatic Die Head will chase your troubles. Its quick release feature not only insures the cutting of the thread to a given point every time, but permits cutting right to the shoulder where required.

Our booklet will tell you about other features.

## Eastern Machine Screw Corp.

**New Haven, Conn., U.S.A.**

## Second-Hand Machinery

# FOR SALE

We offer the following list of machinery at extremely low prices:

1 Air Compressor, Rand Duplex, class B1, steam driven, cylinders 8" x 12". Cost, new, $1,700.00.

1 Center Crank Steam Engine, Cylinder, 8 x 12

1 Side Crank Steam Engine, Cylinder 6½ x 8, self-contained Frame

The above are all in good condition, but were laid aside by us when we changed from steam to electric power.

*Write for prices and full description*

***Or call and see them.***

## Marsh & Henthorn Ltd.

**Belleville, Ontario**

*If any advertisement interests you, tear it out now and place with letters to be answered.*

# INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

## ENGINEERING

Three Rivers, P.Q.—The St. Maurice Foundry Co. are erecting a brick extension to their factory.

Vancouver, B.C.—White Brothers, of Bay City, Mich., propose erecting a pulp mill at Beaver Cove on North Vancouver Island.

**Brantford, Ont.**—Immediate Hydro power for Brantford Township has been promised the council of the municipality by Engineer Gaby, of the Ontario Hydro Commission.

**Toronto, Ont.**—The Ontario Wind Engine & Pump Co. has taken out a permit for the erection on the corner of Atlantic and Liberty Avenues of a steel and iron silo factory to cost $4,000.

**Montreal, Que.**—The Gillette Safety Razor Co. will enlarge its plant to five times the present capacity. The addition will cost about $750,000, and $180,000 worth of new machinery will be installed. The plant will have a capacity of 800 razors and 10,000 dozen blades a day.

**Toronto, Ont.**—Plans and specifications were ordered to be prepared at a private meeting of the transportation commission for a modern car factory to be used by the city when the street railway is taken over. It was also decided to prepare for the purchase of 250 new cars for delivery in September, 1921.

**Owen Sound, Ont.**—J. H. Cole, of this town, has organized a company under the name of the Great Lakes Steel Corporation to manufacture machine screw products and nuts. A site has not yet been purchased but the company has been incorporated with a capital of $1,000,000. J. H. Cole, 20 King street east, Toronto, is interested.

**Nanaimo, B.C.**—The Nanaimo Gas Co. has taken over the Nanaimo gas works, with W. W. Lewis in charge. Plans are already in hand for the improvement of the gas works on an extensive scale, which will place the works in a first-class condition. The plant that will be installed will be up-to-date in every respect and will be able to fill the wants of the city.

## GENERAL

**Toronto, Ont.**—The city architect has issued a building permit to R. Thompson to erect a brick factory, east side of Dundas street west, near Glenlake avenue, to cost $5,000.

Vancouver, B.C.—A new and important [illegible] of the Dominion Canners, Ltd., of Hamilton, Ont., are consummated. Three sites here are now under consideration of the directors of the company, who are personally looking over the ground with a view of establishing their second plant in British Columbia.

**Toronto, Ont.**—Two whole townships, estimated to contain millions of tons of peat, have been set aside by the Ontario Government with a view to having them developed as a source of fuel for the province. The two townships are Hanna and St. John, lying on either side of the T. and N. O. railway, immediately south of Cochrane. In these townships, unsuitable for cultivation, examination has shown that the deposits of peat range in depth from six to forty or fifty feet in some places.

## MUNICIPAL

**Mitchell, Ont.**—The Town Council are contemplating installing a gasoline engine and pump.

**Kelowna, B.C.**—The city council will purchase a motor-driven chemical engine for the fire department.

**Brandon, Man.**—The City Council contemplate installing a new pumping plant at the municipal waterwarks.

**Port Colborne, Ont.**—The Town Council contemplates the installation of a waterworks pumping plant and equipment.

**Hamilton, Ont.**—The city will reopen negotiations with the United Gas & Fuel Company in an endeavor to have a company build a coke oven here. The controllers unanimously agreed to take above action.

**Kingston, Ont.**—The City Council contemplate purchasing a motor driven pump and hose truck, estimated to cost $14 600 and a motor driven ladder truck to cost $7.000. A by-law will be prepared authorizing the purchase of this equipment.

**St. Thomas, Ont.**—The City Council propose to make considerable improvements to the local gas works including a new unloading and coal passing system, a more modern system of retorts, a new gas exhauster, an ammonia pump, etc. A new manager will be appointed.

**Brockville, Ont.**—There are extensive peat fields adjacent to Brockville, which, if developed, would supply a want in the fuel shortage. Local interests have expended much in drainage and experimenting with drying processes without any material results. The Town Council is now petitioning the Ontario Government to take over the project.

**Winnipeg, Man.**—At the meeting of the Greater Winnipeg Water District last Thursday afternoon, on learning that C. G. Anderson, owing to the alleged delay in granting the contract for the gate house and intake at Waugh, refused to do the work, Controller Wallace, seconded by Controller Cockburn, moved that the contract be granted to the next lowest tenderer, whose price was $97.000, while Anderson had tendered for $90,000.

## BUILDING

**Ottawa, Ont.**—It is understood that plans are now being prepared for a new nine-storey government office building to be erected at the south-west corner of Queen and O'Connor streets, on the site now occupied by the old fisheries exhibit building. It was announced a few days ago that the erection of such a building was under consideration, but it was not stated what site had been chosen.

## PERSONAL

**James S. N. Dougall**, president of the Dougall Varnish Co., Montreal, died on Feb. 2, at his residence, 102 Fort street, aged 64.

**M. J. Beatty**, of Beatty Bros., Fergus, Ont., has been elected a director of the company. He succeeds the late G. P. Scholfield.

**Alexander R. Milne**, marine engineer, known all over the Great Lakes, died at Kingston, Ont., on Feb. 6, after two days' illness. He was about 75 years of age.

**W. H. A. Fraser**, of Fraser & Co., and director of the Hull Power Co., died at his home in Ottawa on Feb. 4. Mr. Fraser was born at Westmeath, Ont., in 1863.

**E. J. Babbit** has been appointed chief clerk of the Montreal Locomotive Works, in place of W. C. Stagg, who has resigned to accept a position in the United States. Mr. Babbit was previously assistant to Mr. Stagg in the same office.

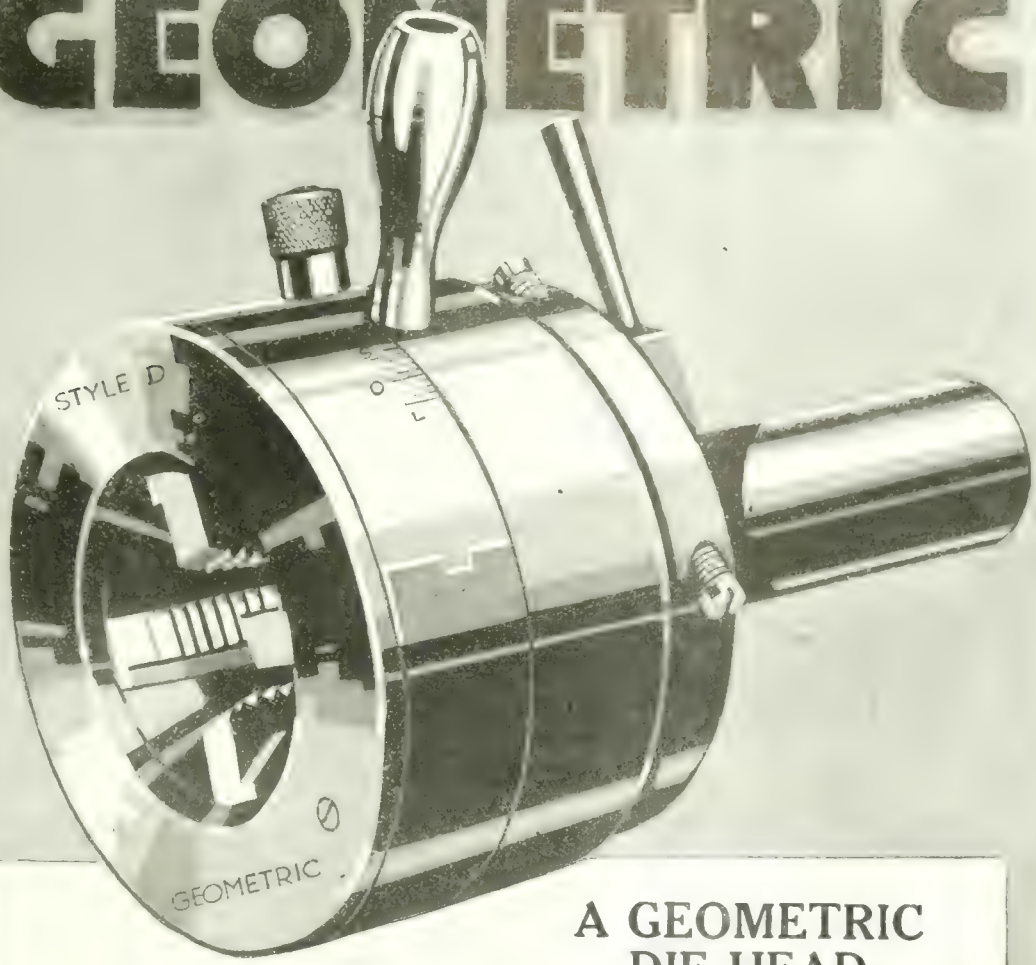
**Lloyd Harris**, president of the Russell Motor Co., who has been associated with the British War Mission in Washington for several months, has been appointed chairman of the Canadian War Mission in that city.

**Lieut.-Col. George A. Walker, R.E.**, formerly of Kingston, Ont., has been placed in charge of all British railway construction works in Palestine. He is a graduate of McGill, and spent some years as a railway engineer in British Columbia.

**J. H. Bertram**, collector of Customs for the Port of Toronto, who has been acting collector for the Port of Montreal during the past year, since the retirement of R. S. White, was given a cabinet of cutlery last Friday by the officials and employees of the Montreal Customs House. Mr. Bertram is leaving to resume his duties in Toronto, having been relieved by the appointment of Ald. W. S. Weldon as collector here.

**C. C. Curtiss**, successor to E. L. Milliken as manager of the Cape Breton Electric Co., has arrived in Sydney, N.S., and will immediately take up his new duties. Mr. Milliken leaves early next week for Houghton, Mich., where he will manage another branch of the company's

# GEOMETRIC




## A GEOMETRIC DIE HEAD

### THE MONARCH OF THE SCREW-CUTTING INDUSTRY

For nearly a quarter of a century Geometric Die Heads have been steadily increasing production for the user and increasing business for themselves. Every Geometric Die Head sells another

Inquire of the established users of Screw Machines and Turret Lathes, and get their opinion of the Geometric Die Heads.

Whatever your threading problem, there is a Geometric Die Head to solve it—in the most economical way.

Why should you not take advantage of the Geometric method of Screw Cutting? Whenever you are ready to take up your threading proposition with us, you will find us ready to advise with you.

## THE GEOMETRIC TOOL COMPANY
NEW HAVEN CONNECTICUT

Canadian Agents: Williams & Wilson, Ltd., Montreal; The A. R. Williams Machinery Co., Ltd., Toronto, St. John, N.B.

# TRADE GOSSIP

The Sorel Shipbuilding & Coal Co., of Sorel, Que., has changed its name to that of Sorel Shipbuilders, Ltd.

**Contract Let for Concrete Ships.**—A contract for ten 3,500-ton concrete ships has been let by the U. S. Shipbuilding Board to the Ferrar Concrete Shipbuilding Corporation, of Redondo Beach, Cal., the first to be delivered within six months and the balance in a year.

**U. S. Steel Corporation Unfilled Orders.**—Unfilled orders of the U. S. Steel Corporation on Jan. 31 were 9,477,853 tons, according to the corporation's monthly statement issued a few days ago. This is an increase of 96,135 tons, compared with the orders on Dec. 31.

**The Canadian General Electric Co.** has secured the contract for the entire electrical equipment of the Bennett-Martin Asbestos and Chrome Mines at Coleraine, Que. The Canadian Wire & Cable Co. of Toronto, will supply the wire for the transmission system.

**The Canadian Car & Foundry Co., of** Montreal announce that they have opened an Ontario office at 303 Royal Bank Building, Toronto, under the direction of G. F. Richmond Junr. By this means the company will be in a position to look after the requirements of their Ontario customers by resident representation in the province.

**More Articles Not to be Exported From U. S.**—Additions made last Sunday by the War Trade Board, Washington, to its conservation list of materials which may not be exported to any country except under license include the following commodities: "Plate rolling mills, open-hearth blast furnaces, steel furnaces, rubber and all commodities containing rubber."

**Ford Plant Builds Submarine Chasers.**—The keel of the first of the super-submarine chasers being constructed at the Ford motor plant at Detroit was laid last Friday, Secretary of the Navy Daniels announced. It is expected that one of the vessels will be finished every day as soon as operations are in full swing. Several scores of the boats have been contracted for by the navy.

**Fire Losses in January in Canada.**—The "Monetary Times'" estimate of Canada's fire losses during January, 1918, is $2,688,556, compared with the December, 1917, loss of $5,144,100 and $1,918,660 for January, 1917. The total number of fatalities as the result of fires in January, 1918, was 28, which is the greatest number of fire fatalities in January for ten years.

**Must Load Cars to Full Capacity.**—[illegible] by any Canadian railway of freight for overseas export unless the cars are loaded to full cubic or weight-carrying capacity was issued last Friday by the Canadian [illegible]

of the Grand Trunk and chairman of the board, said that appeals to the public spirit of shippers had brought good results in combatting the car shortage.

**Kingston, Ont.**—Lieut. J. Werdon Edwards, son of Dr. J. W. Edwards, M.P. for Frontenac, who is serving with the Royal Flying Corps at the front, has invented an appliance for keeping aviators warm. His invention consists in equipping the aviator's clothing with wires through which he introduces an electric current generated from a motor driven by the airplane engine. The invention is being rapidly applied to all the machines in the Flying Corps.

**License Required for Export of Scrap From U. S.**—The United States War Trade Board calls attention to the fact that the exportation of scrap iron or steel requires an export license, and that any shipper who exports under any different classification (such as second-hand rails, car wheels, etc.) any articles manufactured of iron or steel which are exported for the purpose of being scrapped at destination is guilty of false declaration and is subject to such penalties therefor as the law provides.

**Steel From Sudbury Ores.**—A report has been prepared describing some tests carried out at the plant of the Canada Cement Co. of Montreal on a process for making steel direct from Sudbury ores. A high-grade alloy steel is being made from ores containing iron, nickel, and copper. The report claims certain advantages for the steel, one being that it is practically entirely made from Canadian materials. It has passed certain British Government tests, and is also being used commercially to a limited degree.

**Joint Commission to Prepare Report.**—The International Joint Commission created by Canada and United States in 1911 to consider the developing of water-power and securing adequate sanitation in rivers and streams jointly controlled by the two Governments met in New York on Feb. 4 to prepare its final report which will be submitted to the Dominion Parliament and to Congress. The text of the report, it was announced, will not be made public until it has been approved by both governments.

**Lake Superior Corporation Affairs.**—In a letter to Lake Superior Corporation stockholders, Secretary Taylor says: "Practically the entire steel output for 1918 is now sold, the unfilled orders on hand at December 31 representing 437,951 tons. Adequate supplies of raw materials are now on hand, and enough coal has been secured to carry through until navigation opens. Blast furnace operations were interfered with during December operations. We believe, however, that in respect of these conditions we fared better than did many other similar plants, and we are pleased to report the situation is now improving."

**To Remit Duties on Farm Tractors.**—One of the features of the Government programme for encouraging increased agricultural production for the benefit of Britain and her allies in the present war will be the remission of Customs duties on farm tractors imported for use on Canadian farms. Up to the present farm tractors coming from the United States have been subject to a duty of 17½ per cent., plus 7½ per cent. ad valorem under the War Tariff Act of 1915. Upon farm tractor engines up to the value of $1,400 these duties will be remitted as a war measure. These machines have proved of great use in drawing plows to break up the land.

**Big Production at Trail Refinery.**—The great metallurgical operation out at Trail, B.C., is again getting into its stride. The Consolidated Mining & Smelting Co., with fairly adequate labor, in the month of January produced metals in excess of a million dollars in value. The production included over 1,000 tons of high-grade zinc, over 500 tons of refined copper, over 1,600 tons of lead bullion, over 3,500 ounces of fine gold, and almost 100,000 ounces of silver. In addition, the usual quantities of sulphuric acid, hydrofluosilicic acid and copper sulphate were turned out. Over 38,000 tons of ore were treated.

**Railway Earnings Show a Decrease.**—The gross earnings of Canadian railways for the month of January, 1918, owing to the cold and stormy weather and the consequent hindering of traffic, showed a decrease from those for the corresponding month last year. Earnings of the three principal Canadian railways aggregated $17.368.662 this past January, a decrease of $82,326, or 5 per cent. The C.P.R.'s earnings last month were $10,570,000, an increase of $629,000; Grand Trunk's, $4.083,362, a decrease of $594,026; C.N.R.'s $2,715,300, a decrease of $117,300.

**Wish to Control Own Resources.**—Provincial control of the natural resources in Manitoba, Saskatchewan, Alberta and the railway belt in British Columbia will be one of the subjects discussed at the conference with provincial premiers at Ottawa next week. The old government was committed to this policy, and the new western ministers have been advocates of provincial control for some years. At present the three prairie provinces receive a cash subsidy in lieu of the public domain. As they wish to retain this subsidy as well as securing control of the lands, the other provinces are concerned.

**The Canadian Crocker-Wheeler Co.** of St. Catharines, Ont., whose fiscal year ended Dec. 31 last, reports a favorable condition of affairs in 1917 in comparison with the 1916 period. A new machine shop and power house were completed during the year and R. A. Stinson, the vice-president of the company, announces that the outlook for business in 1918 is most encouraging. They have recently completed the equipment and re-tooling of their ordnance department for the manufacture of 75 mm. French shells for the American Government. The contract for these shells will keep this department busy at least eight months.

**To Develop Canadian Fuel Resources.**—The Advisory Council for Scientific

and Industrial Research has forwarded a memorandum to the government, urging that immediate action be taken to make available the varied fuel resources within the Dominion for use in the coming year. At the request of the Institute of Civil Engineers of Great Britain, the council will also bring before the government and certain manufacturers the importance of Canada associating itself with the movement recently organized in Great Britain, the United States and France for combined action in connection with the standardization of various engineering products used and exported from these countries.

**War Mission to Act for Canada in U.S.** Canada has established a war mission at Washington. Lloyd Harris, who has been associated with the British War Mission there for several months, will act as chairman. The Canadian War Mission, it is announced, "will act in the closest conjunction with the British War Mission at Washington as well as with the British Embassy. "It will act on behalf of the various dpartments of the Canadian Government in respect of negotiations of purely Canadian affairs and will exercise general supervision and direction over all officers of the Government of Canada stationed in the United States in respect of matters connected with or incident to the prosecution of the war."

**Canada Copper Corporation.**—The Canada Copper Corporation is making rapid progress in its preparation to extract ore at a minimum cost. A main transportation tunnel, to be 2,900 feet long, was started in September, and is now two-thirds completed. Recent rate of progress exceeds 600 feet a month. On finishing the tunnel the company will immediately drive a large "raise" to connect with the upper tunnel and works, where preparations have been practically completed for mining the overlying ore body. The power line, which transmits a current generated at Bennington Falls, 100 miles distant, is ready for operation, and the C. P. R. has completed the preliminary work on the branch line to connect the mines with Princeton, B.C., where the mill is located. It is believed that these facilities will effect the highest degree of operating economy.

**Freighter Launched at Polson Iron Works.**—The cargo steamer "Asp" was launched at Polson Iron Works, Toronto, Monday afternoon. The "Asp" is a sister ship to the "Tento," which was launched last fall. Both vessels were built for Norwegian interests, but will be taken over by the British Government. Fears that the launching could not be carried out because of the thickness of the ice proved unfounded. Gangs of men cut away the ice barrier and at 3.20 the vessel slipped easily into the water without any mishap. Mrs. Winstrup, the wife of the captain who is superintending the construction of the vessel, performed the christening. The "Asp," like the "Tento," is 261 feet long, has a beam of 43 feet 6 inches, and depth of 23 feet. It will be fitted with triple expansion marine en-


MacKinnon, Holmes & Co., Ltd.

MacKinnon Steel Co. Limited
Sherbrooke, Quebec

*Builders of*

Coal Bunkers, Oil Tanks, Water Tanks and Receivers

We specialize in Bridges, Buildings, Towers, Tanks, Penstocks, Roof Trusses, Columns, Smoke Flues and Stacks, Coal Bins, Ore Bins, Buckets, Refuse Burners, Stills, Air Receivers, etc.

*Write for Prices*

'Barnes-Made' Springs

are unusual in service and wear.

They are the result of sixty years' experience, unsurpassed equipment and highly skilled workmanship.

A trial will convince you that "Barnes-Made" Springs are the best buy.

Established 1857
THE WALLACE BARNES COMPANY
218 South St., Bristol, Ct., U. S. A.
Manfrs of "Barnes-made" Products
Springs Screw Machine Products Cold Rolled Strip Steel

YOU

should read the classified advertising pages.

There s something there which is meant for you.

*Don't Overlook It!*

CANADIAN MACHINERY
*Classified Advertising Section*
143-153 University Avenue
TORONTO, ONTARIO, CANADA

"HAWK" D CHROME VANADIUM STEEL

Will Give You Exceptional

Shell Forging Production

WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat-treated and ready for use.

It does not stick to the work.

There are many cases where each punch has turned out over 2,000 shells.

It means more shells per machine per day.

STEEL OF EVERY DESCRIPTION.

Hawkridge Brothers Company
303 Congress St., BOSTON, MASS. U. S. A.

THE IRON WORKS LIMITED

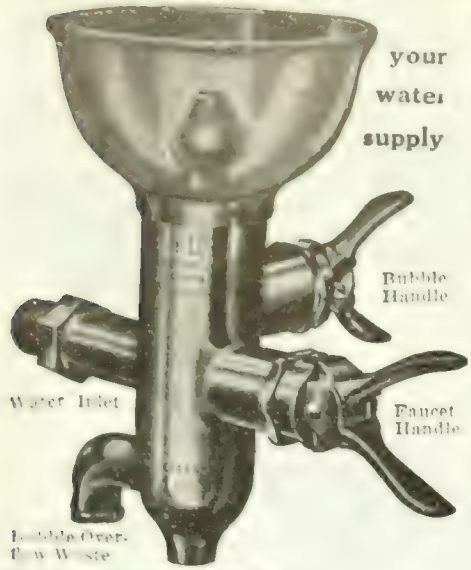
Successors to
Owen Sound Iron Works
Owen Sound, Ont.

Engineers
Boiler-makers
Founders
Machinists

Tank Work
Smoke Stacks,
Grey Iron and
Brass Castings,
Special
Machinery
Made to
Order

"PURO - FY"

(MADE IN CANADA)




THE American Museum of Safety conferred a Gold Medal Award upon the Puro Sanitary Drinking Fountain at the First International Exposition of Safety and Sanitation.

The Puro Sanitary Drinking Fountain won because it deserved to win. Puro had merits that made it stand head and shoulders above any other drinking apparatus.

**Safe Simple**
**SANITARY Economical**
**Quickly Attached**

These are the qualities that forced the leading safety and sanitary engineers to pick Puro in preference to all others.

No device can be as efficient that does not contain all these qualifications and Puro was not used for first place, Puro was first.

Don't be satisfied with half way goodness, or makeshift drinking arrangements for your employees.

If the men in your factory must drink, give them a clean drink.

Puro is [illegible] rust or corrode.

Puro is economical. It allows just the proper amount of [illegible] water to come through the bubbler. No spurting, no overflow, no loss. Puro regulates itself. You can [illegible] in five minutes.

Tell us how many men in your factory and your water pressure in pounds.

We'll tell you just what it will cost to "PURO-FY" YOUR WATER SUPPLY.

**PURO SANITARY DRINKING FOUNTAIN**

TRADE MARK

147 University Ave. TORONTO, ONT

**Prompt Deliveries**

on Gauges, Tools, Dies, Jigs and Fixtures.

**Special Machinery**

CUT GEARS

Contracting and Repairing Machinists

[illegible] cheerfully submitted.

**Normac Machine Co.**

55 Vine Street, St. Catharines, Ont.

[illegible] and two boilers 14 by 12 feet. It is of 3,500 tons burden.

**The Canadian Car and Foundry Co., Montreal,** has recently received a contract from the French Government, through the New York office, for the construction of twelve mine sweepers. These vessels are to have an overall length of 143 feet and a beam of 22 feet 6 inches, and the approximate value of the construction order will be $2,500,000. The company has decided to erect a plant at Fort William, Ont., adjoining their present car works, where the conditions are very suitable for a shipbuilding plant of this description. The present depth of water at the existing dock and water front is about thirty-five feet, being amply sufficient to accomodate this particular type of vessel. Covered sheds together with the necessary crane runways and all other facilities will be constructed at once so that no delay will be experienced in meeting the terms of the contract. It is not thought that much additional machinery will be required, owing to the available equipment at the present car factory, which it is expected will be utilized for the mechanical operations in connection with the building of the vessels. The company will be relieved of the duty of obtaining the necessary steel for this work, as arrangements have been made whereby the U.S. Steel Co. will furnish the required material in ample time for the filling of the contract. It is anticipated that the twelve vessels will be completed before the closing of navigation in the fall of 1918 so that they can be brought down the Great Lakes to he ocean terminal under their own steam.

## TENDERS

**Hamilton, Ont.**—Tenders will be received by the Board of Control, up to Monday, March 4, 1918, for supplying the city with the following materials: Castings (ordinary and special), iron pipe, hydrants, valves, extension boxes, hardware, lead pipe, pig lead, road oil, lubricating oil, flux, fuel oil, lumber, gasoline, brass work, including ordinary and special brass castings for the Water Department. Specifications and form of tender for all of the above can be obtained at the office of the City Engineer, Hamilton, Ont.

**Melbourne, Australia.**—Tenders for the following may be addressed to the Director of Navy Contracts, Navy Office, Melbourne: Supply, delivery and erection at Garden Island, of one (1) 200 horsepower prime mover set of either semi-Diesel type or other heavy oil engine direct coupled to 2-65 K.W. 240 volt D.C. electric generating set. All accessories, tank and fittings to be supplied by tenders as per specification. Date of closing June 7, 1918. Tender forms are open for inspection at the Department of Trade and Commerce, Ottawa. File No. 20117.

**Ottawa, Ont.**—Tenders will be received until Friday, Feb. 22, for the purchase of the car ferry steamer Leonard, formerly engaged in transferring cars between Levis and Quebec. The Leonard was built in 1914, and designed to fulfill the requirements of the highest class in Lloyd's for a vessel of this type. Her principal dimensions are: Length over all, 313 feet; breadth, 65 feet; depth, 23 feet; draught, 16 feet. The Leonard is now lying at Levis, Que., below the dry-dock, where she can be examined. Information as to the steamer's engines, boilers, steam pressure, speed, bulkheads, tracks, gangways, ice breaking, etc., etc., etc., and further information can be obtained at the Department of Railways and Canals, Ottawa.

**Ottawa, Ont.**—Tenders will be received until March 18, 1918, for heating and ventilating equipment required in the reconstruction of the Parliament Buildings. All tenders to be based on the execution, erection and completion; together with the furnishing of all materials, tools, appliances, scaffolding, apparatus and labor required for the installation of the heating and ventilating equipment as called for in the plans and specifications. All information can be obtained at the office of the general contractors, P. Lyall & Sons Construction Co., Ottawa. A set of plans and specifications may be had by depositing an accepted bank cheque for twenty-five ($25.00) dollars made payable to the Honorable the Minister of Public Works, which will be returned if the intending bidder submits a regular bid.

**Ottawa, Ont.**—Tenders will be received until March 18, 1918, for rolled steel casements and bronze covered frames and sash for the Parliament Buildings. All tenders to be based on the execution, erection and completion; together with the furnishing of all material, tools, appliances, labor, etc., as required and described by the plans and specifications for (a) rolled steel casement; (b) bronze covered frames and sash. Separate tenders to be submitted for "a" and "b." The work included under this contract shall be commenced immediately on the signing of the same, or at such time as may be directed, and be carried out in such a manner as to insure the completion thereof by Sept. 30, 1918. Plans and specifications, and any other information required can be obtained at the office of the general contractors; P. Lyall & Sons Construction Co., Ottawa.

## CONTRACTS

**Toronto, Ont.**—The Jackson Lewis Co. have the general contract for two dry kilns, costing $10,000, for the Canadian Aeroplane Co.

**Winnipeg, Man.**—Thos. Kelly & Sons, Lindsay Bldg., have the general contract for reinforced concrete pipe line, etc., costing $482.626, for the Greater Winnipeg Water District, 501 Tribune Bldg.

**Montreal, Que.**—The Chilean Government has placed an order for twenty engines with the Montreal Locomotive Works, a subsidiary of the American Locomotive Works. The local company is now completing an order of twenty engines for the Union of South Africa.

# MARINE

**Victoria, B.C.**—The Wallace Shipyards have secured a contract for four steel steamers from the Dominion Government. The vessels will be 5,100 tons deadweight capacity.

**Vancouver, B.C.**—The Union steamer Cassiar has left for the North after her spring overhaul and refit, taking the place of the Cheakamus, which is in turn going on the ways.

**Vancouver, B.C.**—The Taylor Engineering Co. is designing and will start construction within 30 days of a full-powered wooden oil tanker for the International Petroleum Co. This new tanker, when completed, will serve the British Columbia coast trade.

**Port Arthur, Ont.**—J. F. Paige, general manager of the Port Arthur Shipbuilding Co., has officially announced that the company had received contracts for the construction of five canal size freighters and eight other boats. Mr. Paige stated that the freighters would be numbered 19, 20, 21, 29 and 30.

**Winnipeg, Man.**—It is reported that F. Hutchings, president of the Great West Saddlery Co. of this city, and one of the best-known financiers in Manitoba, is head of a syndicate that has secured a tentative contract to build twelve ships on the Pacific Coast. It is understood that the company is now negotiating with the federal authorities.

**Department of Marine and Fisheries.**—Public notice is given that the Minister of Marine and Fisheries, under the provisions of section 27 of the Canada Shipping Act, has granted permission to change the name of the tug "Dorthy Symons" of Vancouver, Official Number 126,542, owned by the Department of Public Works, to that of "Nakusp."

**Montreal, Que.**—A Canadian shipping syndicate has purchased control of the Ogdensburg Coal & Towing Co. Two corporations will be formed, one capitalized at $200,000 to continue the business here, and the other at $1,000,000 to operate at Montreal. W. L. McDougall, of Montreal, will be president and general manager of each. The company has arranged to supply fuel to the vessels of the Canada Steamship Lines plying on the St. Lawrence route.

**Victoria, B.C.**—It is announced at the offices of the Imperial Munitions Board that the War Yukon is in the hands of the engineers at the new assembling plant. The contractors, the Cameron Genoa Mills Shipbuilders, have, with the exception of stepping the masts and other deck work, which will be done by the utilization of more adequate hoisting facilities at the Ogden Point works, practically completed their part of the contract as far as the War Yukon is concerned. The main engines for the vessel have been lying at the assembly plant for several weeks past and immediately the new hull is safely moored alongside the government pier a start will be made in assembling her machinery.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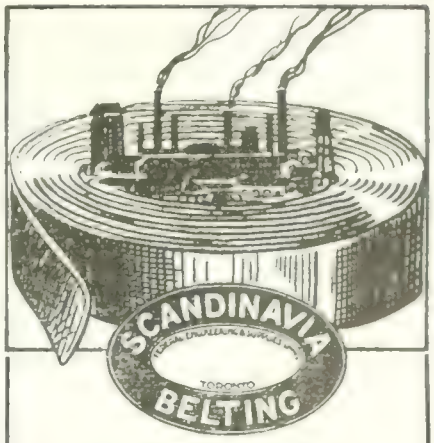


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# CANADIAN MACHINERY

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*A weekly newspaper devoted to the machinery and manufacturing interests.*

Vol. XIX. TORONTO, FEBRUARY 21, 1918 No. 8


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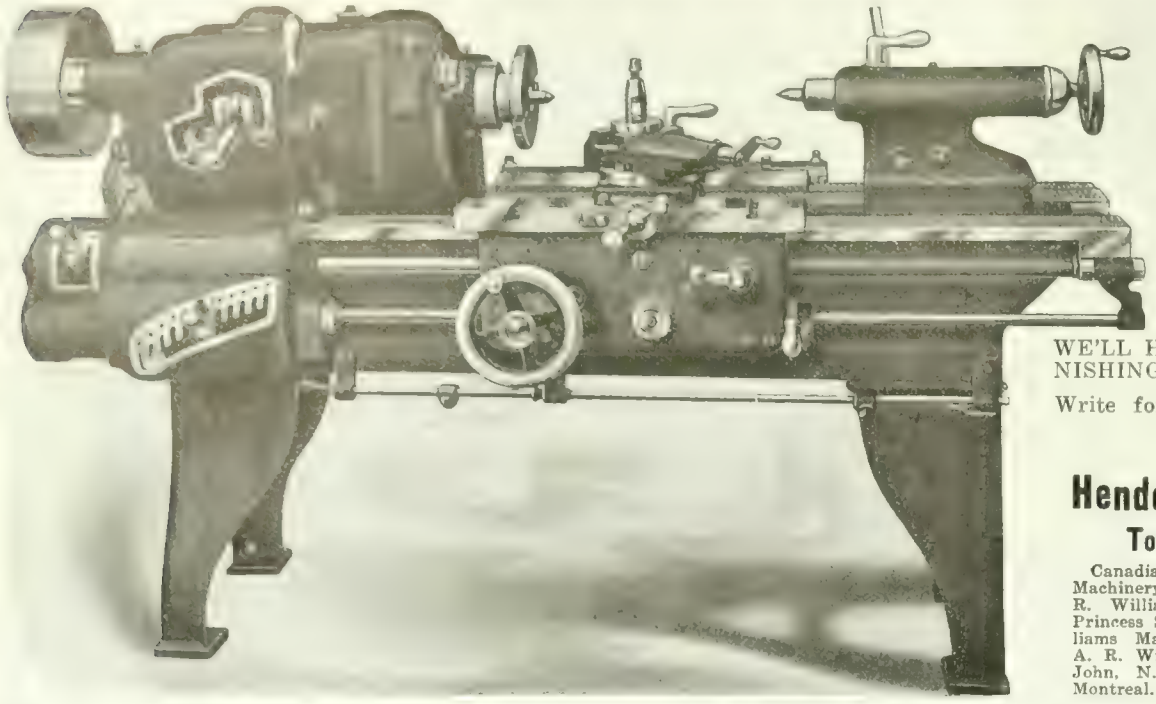

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# Recent Advances in Canadian Metallurgy*

By Alfred Stansfield, D.Sc., F.R.S.C. **

*The mineral resources of Canada have been [illegible] to the [illegible] being of vital importance. The developments [illegible] convincingly the variety and extent of the [illegible] facilities for production so brought about [illegible] present position of world-wide importance.*

IN writing of "recent" advances, it becomes necessary to decide on some definite period of time on which to report, and this surprising war has given such an impetus to Canadian metallurgy that it will be appropriate to regard the commencement of the war as the epoch from which to measure these advances.

### Metal Markets in War Time

The first effect of the war was to restrict the regular operation of metallurgical plants and to stop al lnew developments. This followed naturally from uncertainty in the financial situation and an immediate lack of money. Looking back at the situation it seems strange that markets should fall, and metal production decrease, when it must have been certain that nearly all the metals would be needed in increasing quantities for warlike operations. After about six months this demand became apparent, the prices of metals began to rise, and their production was consequently stimulated. An early development was caused by the shell committee's need of brass for cartridge cases. Copper for this purpose could be obtained without great difficulty, but zinc, of a suitable degree of purity, was very difficult to obtain even at a greatly enhanced price. Zinc ores had been mined in British Columbia for a number of years, but it had not been found practicable to smelt them in this country, and zinc ores, or concentrates, were shipped to smelters in the American zinc districts. After the outbreak of the war, the American smelters refused to accept ore shipments from Canada; a refusal which was considered by many as being caused by German control or interest in the smelters. Whatever was the cause the situation was clear: the shell committee needed zinc, and the British Columbia miners had the ore, while the American smelters were unwilling or unable to convert the one into the other.

### Zinc Production

Zinc differs from many metals in the fact that the smelting process yields a metal which is marketable without the need of any refining. The purity of the "spelter" depends mostly upon the character of the ore from which it is produced, thus "high-grade" spelter, from specially pure ores will contain less than 0.1 per cent. of total impurity, while "Prime Western" spelter, obtained from leady ores, may contain as much as 1.5 per cent. of lead. This difference in the purity of different brands of spelter is not objectionable, since the uses to which they are put vary greatly in requirements; prime Western spelter is amply good enough for galvanizing, while high-grade spelter is none too good for making brass for cartridge cases. The British Columbia zinc ores are in general mixed with ores of lead, and it would be impossible by the usual smelting process to obtain a spelter that would meet the requirements of the shell committee.

A process was under investigation, at that time, for obtaining zinc from these complex ores by roasting, extracting the zinc as sulphate by means of sulphuric acid and water, and separating metallic zinc from this solution by electrolysis, using insoluble anodes. This process was not new, but it had failed hitherto owing to technical difficulties in the leaching of the ore, the purification of the solution and the production by electrolysis of compact zinc that could be remelted. The cost, moreover, was too high to make it profitable in view of the low price of zinc before the war. A commission was appointed by the Minister of Militia to investigate the situation with respect to the supplies of copper and zinc. This commission concluded that the electrolytic process offered the greatest probability of filling the need, and made arrangements with the Consolidated Mining and Smelting Company, which led to the establishment at Trail of a plant for producing electrolytic zinc from the British Columbia ores. At the present time this plant has a capacity of about 300 tons of zinc per week.

Before the war the writer carried out an elaborate investigation for the Department of Mines on the electric smelting of zinc ores, but practical success was not reached. During the war this research has been taken up again for a mining company with more success, both in the laboratory and in a small plant at Shawinigan Falls. Commercial success has not yet been obtained, but it is expected that the work will be resumed during the present year. The writer has also been interested in the production of zinc oxide for paint by the Wetherill process; he helped to design and operate an experimental plant in Montreal, and following on from this, a full-sized plant has been erected at Notre Dame des Anges.

The metallurgy of zinc, as well as that of lead, copper and silver, has been materially improved during recent years by the application of the flotation process by means of which the zinc minerals can be separated more perfectly from the gangue, and in some cases from other metallic minerals.

### Copper Situation

The copper situation, investigated by the commission, was entirely different; copper ores are mined and smelted in British Columbia on an enormous scale for the production of copper matte, and in some cases the matte is bessemerized for the production of metallic copper. Crude copper, however, is of no use until it has been refined, and all the copper derived from British Columbia was sent to the United States as ore, matte, or blister copper, in order to be refined in the American refineries.

The problem before the commission was the establishment in Canada of an electrolytic refinery, so that Canadian copper could be made available for Canadian needs of that metal. The problem was complicated by American interests in the Canadian copper smelters, by contracts with American smelters and refiners, by heavy freight charges between British Columbia and the points at which the copper would be used, and by the lack in Canada of rolling mills and other works for turning the refined copper into sheets, rods, wires and other forms required by the Canadian market. Although the price of copper rose to a very high figure, the shell committee was able to obtain supplies of pure copper from the States, and there was not sufficient urgency to justify the Government in establishing a copper refinery in British Columbia in face of the natural obstacles already mentioned.

In the meantime the Consolidated Mining and Smelting Company established at Trail a small refinery, which is now in operation, and has an output of about 10 tons per day, and the copper and zinc from Trail have both been used in the Dominion Copper Products' plant in Montreal for making brass for the manufacture of cartridge cases. It must not be supposed that the erection of this small refinery solves the general problem outlined above, although it may serve by way of example to help in settling it at some later date. The copper furnaces at Trail smelt ores of gold and silver as well as ores of copper, and the resulting crude copper is so rich in the precious metals that the company finds it more satisfactory to refine the metal at Trail, thus securing the gold and silver contents, instead of shipping the crude metal to distant refineries which would entail very serious difficulties in

*Read before the Canadian Society of Civil Engineers at Montreal, Feb. 14, 1918.

**Birks Professor of Metallurgy, McGill University.

British Columbia amounted in 1913 to about 23,000 tons, or about 60 tons per day, so that a practically unanimous co-operation of all the producing companies would be needed to support a single re- [illegible] of time, a large refinery will be operated in British Columbia for the treatment of Western ores, but this will depend on the erection in that province of mills for working up the refined copper, and of the growth of a market in Western Canada that will absorb a large part [illegible]

The production of copper in British Columbia has increased steadily during [illegible] years as the following figures show, this increase being largely due to the development of the Granby Company's smelter at Anyox. Recently the copper smelter at Ladysmith has changed hands and has again been put into operation. This increase of copper production will tend towards the establishment of a large refinery on the coast. The introduction of the flotation process has modified copper metallurgy in recent years. Low grade ores, which were at one time smelted in blast furnaces, or even treated by wet (chemical) methods, are now crushed and ground to a fine powder and concentrated by flotation. The flotation concentrate, on account of its powdery condition, can be treated most easily by roasting in mechanical furnaces and smelting in reverberatory furnaces.

PRODUCTION OF COPPER IN BRITISH COLUMBIA IN TONS

| [illegible] | 1914 | 1915 | 1916 |
|---|---|---|---|
| [illegible] | [illegible] | 28,000 | 32,000 |

Outside of British Columbia, the largest production of Canadian copper is from the Sudbury district, where it occurs in association with nickel. The production in Ontario, nearly all being from the Sudbury district, is about half the production in British Columbia, but its separation and refining is dependent on the separation of the nickel and copper, and can only be considered as a by-product from the extraction of nickel.

### Nickel Production and Refining

At the beginning of the war, two companies,—the International Nickel Company and the Mond Nickel Company,—were operating in the Sudbury district. These companies smelted the ore to a matte containing from 20 per cent. to 30 per cent. of nickel and copper, and [illegible] of about 80 per cent. of nickel and copper, containing little else than sul- [illegible] in proportions depending on the relation between these metals in the original ore. The Mond Company shipped their matte to England for treatment by the Mond [illegible] South Wales, while the International Company treated their matte by the "salt cake" process at their refinery at Constable Hook in New Jersey.

It has for a long time been regarded as an economic injustice to Canada that the copper-nickel matte should be sent to the States for refining, but it was maintained by the company officials that the cost of refining it in Canada would be very much higher than in New Jersey. After the outbreak of the war, attention was repeatedly called to the situation, because it was feared that the nickel passed into German hands, and as a result of this outcry the International Company agreed to erect in Canada a refinery sufficiently large for the British requirements of nickel. This refinery is now being built at Port Colborne, in Ontario, and should be in operation early in the present year; it will have an initial output of 7,500 tons of nickel per annum. In the meantime a new company has entered the field.

The British America Nickel Corporation, a strong British-Canadian company, which is controlled by the Imperial Government, has acquired about 17,000 acres of mineral land in the Sudbury district, and early in 1917 began the construction of a large smelting and refining works at the Murray mine. This company will smelt the ore to matte, and bessemerize the matte on substantially the same lines as the older companies; but the production of refined nickel and copper from the matte will be carried out by the Hybinette electrolytic process, which is now in operation in Norway. The new plant is expected to be in operation in 1919, and will have an output of 6,000 tons of refined nickel per annum. In 1913, the last whole year before the war, nickel matte, containing 25,000 tons of nickel was sent abroad to be refined; during 1917 the output was about 42,000 tons, and by 1919 we may expect a production of some 13,000 tons of nickel in Canada in addition to perhaps three times this amount in matte refined abroad.

During the year 1914 one million tons of nickel-copper ore was mined and smelted in the Sudbury district, and the resulting matte contained 22,700 tons of nickel and 14,000 tons of copper. Some 400,000 tons of iron, equal to half the Canadian production of pig iron, was slagged in the furnaces and thrown over the dumps, and 300,000 tons of sulphur was discharged into the atmosphere. This sulphur would produce one million tons of sulphuric acid, which is equal to one-fourth of the consumption of the United States, but it is not considered worth while to save this at the present time on account of the cost of transportation of the acid to points at which it could be used. Projects have been considered, however, for saving the sulphur in the elemental state so that it could be shipped easily, or for collecting the $SO_2$ gas in the liquid state and using it for the manufacture of wood pulp. With regard to the waste of iron, it may be remembered that more than half the nickel produced is used in the manufacture of nickel steel, and with respect to this part of the output, there is therefore no need to separate from the nickel the iron which was originally associated with it.

Attempts to make a nickel pig-iron which could be converted directly into nickel steel were met in the past by the difficulty that the copper, which is almost always present in the ore, was supposed to be harmful in the steel. During recent years, however, it has been found that if the copper is present in moderate amounts, not more than one third of the nickel contents, a nickel-copper steel is entirely satisfactory and may be expected to replace the usual nickel steel for many purposes. Many tons of this steel have recently been made from the Sudbury ore, by the process devised by Mr. Colvocoresses; and its mechanical properties and suitability for many purposes will soon be ascertained. It should be possible to employ this process on a large scale, although, of course, it is limited to ores with a small content of copper. Care will be taken, by suitable admixture of the ores and otherwise, to maintain a uniform product, and it may be added that the small amount of precious metals contained in the ore cannot be saved if this process is used.

In connection with the advances in the nickel industry, mention must be made of the investigation of the Ontario Nickel Commission, which was appointed in 1915 and brought out its report in 1917. This commission has investigated the ores, smelting processes, refining methods, properties and uses of nickel, not only in Canada, but in all parts of the world where nickel ores are mined. They have considered the subject from many points of view, and have produced a very valuable report. Geo. T. Holloway, the metallurgist of the commission, died soon after the completion of his work.

The production of iron and steel in Canada fell off considerably at the beginning of the war, but revived later, and at the present time, owing to the large demands for the manufacture of munitions, is larger than ever. This will be seen from the following table:—

PRODUCTION OF IRON AND STEEL IN SHORT TONS*

| | 1912 | 1913 | 1914 | 1915 | 1916 | 1917 |
|---|---|---|---|---|---|---|
| Canadian iron ore | 216,000 | 307,000 | 245,000 | 398,000 | 340,000 | 190,000 |
| Pig iron | 1,011,000 | 1,129,000 | 783,000 | 914,000 | 1,169,000 | 1,187,000 |
| Steel ingots and castings | 957,000 | 1,169,000 | 828,000 | 1,020,000 | 1,454,000 | 1,735,000 |
| Electric furnace steel | | | 61 | 5,600 | 13,000 | 50,000 |

### Electric Iron Smelting

The production of steel has advanced faster than the production of pig-iron, the latter being restricted by the need of importing the ore, and in some cases

*The figures for production in this paper have been taken from the reports by John McLeish, who kindly furnished the writer with approximate data for 1917. The amounts, in most cases, have been stated in even thousands, as in this form they are far more easily read and compared.

even the fuel, for smelting in Canadian furnaces. The amount of ore mined in Canada is but a small proportion of the amount smelted, but if we include Newfoundland ore, as we reasonably may, we would find that rather more than half the iron is derived from Canadian ore.

Just before the war the writer visited Sweden in order to study the electric iron smelting industry in that country, and made a report to the Mines Branch in the fall of 1914. At that time it did not appear that electric iron smelting could be undertaken profitably in this country, but in the year 1916 he made a fresh study of the situation in connection with a report by Mr. John Dresser on "Part of the District of Lake St. John, Quebec," and came to the conclusion that there is hope for electric pig-iron in Canada. In considering the possibility of smelting electrically the titaniferous magnetites of that district, it appeared that although pig-iron produced in that way could never compete, as regards price, with the product of the blast-furnace using coke as fuel, still it should be possible to make a limited production of high class white pig-iron which would command a high price and thus sell at a profit. Besides producing a very desirable quality of pig-iron, and incidentally helping the steel makers, this would have the advantage of utilizing ores which are at present worthless, and of employing water-power which now runs to waste.

### Electric Furnace Steel

Although electric smelting of iron ores is still in the future, the electric furnace has been employed very largely for making steel, as is shown in the table. The electric furnace has not been used in this country to any extent for making new steel, but mostly for remelting steel scrap into shell billets. For this purpose several furnaces are in operation in Montreal and district, and at Toronto a large plant, containing ten 6-ton furnaces has been built by the Munitions Board for remelting shell turnings and other scrap. During the period under consideration the Armstrong Whitworth Company have built up an electric melting plant for the production of all kinds of tool steel in their works at Longueuil. The electric steel plant at Belleville has made a quantity of very good steel from titaniferous iron ore, but at that time it was found cheaper to employ steel scrap than to smelt ore. The plant has recently been fully occupied with the production of ferro molybdenum for the British Government.

### Ferro Alloys

There has been, for a number of years, a moderate production of ferro-alloys in Canada amounting in 1913 to 8,000 tons, in 1914 to 7,500 tons, and in 1915 to 10,800 tons. This production consisted mostly of ferro-silicon made in electric furnaces at Welland by the Electro-Metals Limited, and in 1915 a little ferro-phosphorus made at Buckingham, P.Q., by the Electric Reduction Company. In 1916 the production had risen to 28,600 tons, valued at $1,777,000, and included, besides ferro-silicon and ferro-phosphorus, a considerable production of the valuable product, ferro-molybdenum, which is now made in electric furnaces at Belleville and Orillia. Ferro-silicon is now made at Shawinigan as well as at Welland. For the manufacture of steel there is a considerable demand for ferro-manganese and spiegel-eisen, and experiments are now in progress for making these alloys from Canadian manganese ores. The production of ferro-chrome is also under consideration.

### Gold and Silver

More than 80 per cent. of Canadian silver comes from the Cobalt region, and, during the period of the war the production has ben falling slowly as the mines became exhausted, and on account of the scarcity of labor and supplies. The recent rise in price of silver has, however, stimulated the production. The metallurgical treatment of the ores had been worked out prior to the war, but the development of the flotation process has improved the concentration processes at Cobalt. The production of silver in 1916 was 25,600,000 ounces, valued at $16,800,000, and in 1917 was about 23,500,000 ounces. The production of gold in Canada was varied from about 800,000 ounces to 1,000,000 ounces per annum during this period; gold is obtained from Yukon, British Columbia and Ontario. Before the war the two Western provinces had the largest outputs, but since the growth of the Porcupine district the production of Ontario is nearly equal to the sum of the other two, and the total production has somewhat increased.

### Lead

The need of lead for bullets caused an increase in the mining and smelting of lead ores, with the result that in 1917, when this demand was reduced, there arose a difficulty in disposing of the lead already on hand and undergoing treatment. The management of the Trail Smelter informed the miners that they would only take ores that were relatively free from zinc, so as to reduce the ore supply, and at the same time obtain a better grade of ore. This ruling gave rise to a great outcry, and arrangements were made with the Munitions Board to take a larger amount of the metal.

The success of the Victory Loan should enable the production to be taken up by the Board, but it may be pointed out that the normal Canadian market for lead and lead products is amply sufficient for the Canadian production, and it is only necessary to arrange for the lead being converted into marketable forms. Some advance has been made in this direction, and there are two "corroding" plants in Montreal for the production of white lead, but red lead and litharge should also be manufactured. The usual production of lead is about 20,000 tons per annum, but in 1917 it amounted to 28,000 tons. The Cottrell electrical precipitation process for the collection of smoke and fume has proved of great service in the treatment of ores of lead and zinc, and has been introduced at the Trail smelter.

### Antimony

The metal antimony was selling at about 8 cents per pound, but early in the war its price rose to 16 cents, and later to more than 40 cents a pound. Antimony is used to a large extent alloyed with lead for making shrapnel bullets, and supply was for a time insufficient for the need, so that bullets have been made of lead encased in a steel shell, the whole being arranged to have the same size and weight as the bullets of alloy previously in use.

Antimony is not produced to any extent in Canada although a small amount is derived from the electrolytic refining of lead at Trail. In view of the high price and unusual demand for the metal a mine of low grade ore at Lake George, New Brunswick, was reopened and after much patient work an efficient process was devised for extracting the metal from the ore by volatilization. An account of this process was recently presented to the Society by Mr. J. A. deCew. By the time that the process had been brought to a satisfactory condition, other suplies of antimony became available, the price fell, and the mine and smelter had to be closed.

The metal aluminum is made at Shawinigan Falls from bauxite which is imported from France and elsewhere as no ores of commercial value have been found in Canada. Figures for the production of this metal are not published as only one firm is engaged in the industry, but there is no doubt that the production has increased materially during the war, aluminum being needed in large amounts for the construction of aeroplanes and other military equipment. The value of metal exported from Canada in 1913 was $1,700,000; in 1914, $2,300,000; in 1915, $3,300,000, and in 1916, $5,200,000.

### Aluminum and Magnesium

The process of extracting aluminum from alumina (purified bauxite) consists, as is well known, in electrolysing fused salts to which alumina is added. Before the war this was the only operation in use in Canada, that depended on the electrolysis of fused salts, but a fresh industry of this kind has been now started—the production of the metal magnesium. Before the war this metal was made in Germany from the natural deposits of carnallite, but the war stopped this source of supply.

The writer succeeded in producing magnesium in the laboratory, and the process was developed into commercial operation at Shawinigan Falls. At present the crude materials are imported, but ultimately it is intended to use Canadian magnesite as the ore of this metal. Magnesium is now made in considerable quantities at this plant; it is used in the form of powder for star shells and

### Brass Melting and Rolling

In connection with the production of zinc and the refining of copper in Canada [illegible] and other metals into marketable forms. The Dominion Copper Products plant at Lachine has been built during the war for melting and rolling brass and copper for use in shell and cartridge cases. As the need for such products decreases, it is expected that this plant and Brown's Copper and Brass Rolling Mills in Toronto will be employed on a large scale for making brass and other non-ferrous alloys and for rolling these and the metals copper and zinc into forms suitable for use by Canadian manufacturing industries, so that a market will be found in Canada for Canadian copper, zinc, nickel, lead and other metals.

### INCREASED VOCATIONAL EQUIPMENT AT MONTREAL TECHNICAL SCHOOL

THE Military Hospitals Commission announces that, through the courtesy of the directors of the Montreal Technical School, additional space has been allotted in their spacious and beautiful building on Church Street for the installation of wood-working machinery as an adjunct to the carpenter shops. There are now being installed bandsaws, turning lathes, drills, etc., all to be operated by electric power. Since the inception of the vocational work, the directors have placed every facility of the school at the disposal of the department, now occupying ten class rooms and a motor garage.

Through the courtesy of the United Machinery Company there has also been installed an eighteen-foot Goodyear shoe-repairing outfit. This is a most necessary and desirable acquisition to the shoe-repairing classes. It is under the direction of an instructor secured from the London Trades Guild, of London, England, who has had a wide experience with some of the best London and Canadian shoe manufacturers.

### EXPORTS OF MANUFACTURES

[illegible] manufactured goods were valued at $33,635,790 in December, [illegible] standards, but very low figures on the [illegible] of the past year.

It was the smallest total to be entered in any Canadian trade return since October, 1916. It was $21,000,000 less than the total for December, 1916, and $55,000,000 less than in November, 1917. It compared with the record-breaking figues of $104,000,000 reported in the return for July last. Concurrently Canadian imports were the smallest reported for any month last year.

As noted in connection with the complementary figures furnished by the American trade returns, the decline is to be viewed as one sequel to the United States' embargo on exports of raw materials—an embargo which has been felt with increasing force since the end of last summer.

Growth in Canada's manufactured exports will depend next year very largely on the extent to which the embargo can be modified in favor of Canada. Hence the importance attached to the recent move to secure a War Trade Board, which could act officially for all Canadian manufacturers in negotiations at Washington that must now be carried on by the manufacturers individually.

### PEAT AND LIGNITE AS FUEL

PRODUCTION of lignite and peat as a means of coping with the fuel situation next year is being investigated by the cabinet committee on reconstruction and development, of which the Hon. A. K. MacLean is chairman. A conference on the question was held at Ottawa on Feb. 5, when Deputy Fuel Controller Peterson, Dr. McCallum, head of the council on scientific and industrial research, and R. A. Ross, chairman of the fuel committee of the research council, spoke of the value of lignite in bricks as a substitute for anthracite. Dr. Hanel, of the mines department, told of the available peat areas. There will be further meetings, and every effort will be made in the coming season, not only to increase the production of the coal mines, but, if possible, to develop the peat and lignite deposits in marketable form. Particular encouragement will be given to the production of wood for fuel.

### AUSTRALIAN MERCANTILE FLEET

THAT government ownership of steamship service has proved a great success in Australia is indicated in a report received here from D. H. Ross, Canadian Trade Commissioner at Melbourne. Mr. Ross states that the fleet of 15 cargo ships purchased in June, 1916, by the commonwealth government, has been actively employed at such remunerative rates that it is now estimated the net earnings have paid off the original outlay of approximately $10,000,000.

The fleet comprises 65,245 tons gross and 41,868 tons net register. In addition, the government shipping department has controlled since the beginning of the war 21 steamers and five sailing vessels. On delivery of the steamers and auxiliary vessels now under construction in the United States the government will be operating a fleet of 56 vessels. This fleet, Mr. Ross says, will serve a most necessary purpose in the transfer of Australian produce overseas, earning profitable returns on return voyages.

### EXPANSION OF MINERAL INDUSTRY ESSENTIAL

CANADA pays out more money for imported mineral products than she receives from her mines. The value of the mineral production for the calendar years 1913, 1914 and 1915 was $145,600,000, $128,865,000 and $137,100,000 respectively. The imports of products of the mine and manufactures of mine products for the same years were valued at $259,300,000, $181,676,000 and $146,324,000. As the imports also include manufactured, or partly manufactured products, they are much more valuable than the minerals we produce. If, however, Canadian minerals were turned into manufactured products in Canada, the present trade balance in minerals would be reversed.

It is only fair, though, to point out that Canada is under serious disadvantages in the matter of manufacturing. The relatively small and scattered population makes distribution from points of production to points of consumption both difficult and costly. Similarly, where, for example, coal is essential for reducing ore and for manufacturing, the cost of transportation necessary to bring the two raw products together bears heavily on manufacture. Copper, zinc and lead are produced principally in Western Canada, while the manufacturers and chief markets are in Eastern Canada.

In spite of these handicaps, a comparison of the figures for imports and those for production shows the opportunity that exists for developing a home market that will increase as the war goes on. Premier Lloyd George in his recent address stated that "Economic conditions at the end of the war will be in the highest degree difficult. There must follow a world shortage of raw materials, which will increase the longer the war lasts, and it is inevitable that those countries which have control of raw materials will desire to help themselves and their friends first."

The mineral resources of Canada, if developed, could supply not only our own needs but also permit the exportation of a surplus to other parts of the British Empire. There is, in Canada, an urgent need for production to pay for our war debt and borrowings before the war, and if we are to get the greatest value out of our mineral industry it is necessary that our metals and minerals be refined and made into manufactured or partly manufactured products in Canada. The production of certain mineral products in Canada has been stimulated by the war and new industries created. In the period of reconstruction, after the war, it will be necessary to safeguard and provide for the further extension of these industries.—*Conservation.*

# Some General Applications of Electric Welding Process*

Special Correspondence

*It is not some years since the first use of the various processes of welding iron and steel electrically, although their extended application has been comparatively recent. Much work impossible of accomplishment by other means can be done rapidly and economically by this method, the instances illustrated being of such as are unquestionably suitable.*

THE electric arc welding process is attaining an ever-widening field of usefulness in practically all branches of industry in which iron or steel are involved in any considerable quantity, and which thus afford opportunities for its application to many purposes incident to manufacture, repair and maintenance.

Although the several processes of welding iron and steel by means of the electric arc have been known for years, their application to useful service in the various industries has been comparatively recent. But since the necessary apparatus has been greatly simplified compared to what it was a few years ago and standard machines and switchboard equipment have been developed and introduced, the process is growing in favor and being generally adopted. In every case its application is favored by reasons of economy and efficiency and often because by means of it work may be accomplished which would be impossible for any blacksmith to do.

Perhaps its chief field of application is in plants such as iron and steel foundries, steel mills, railways, both steam and electric, general repair shops, shipyards, and marine repair shops as well as in general manufacturing work. A few typical instances of the nature of the work to which electric arc welding is put in several of the above classes of service may prove of interest.

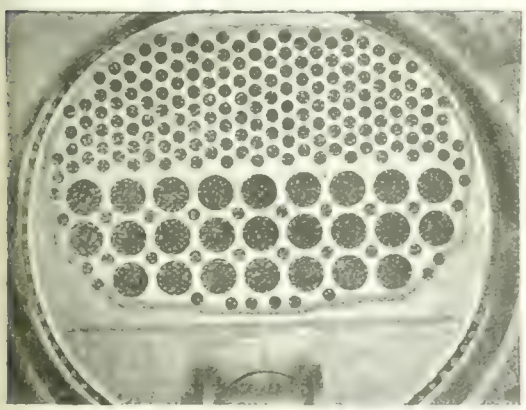


FIG. VIEW OF PATCHED TUBE SHEET IN LOCOMOTIVE BOILER

### Steel Mills and Foundries

One of the most serious mishaps to blast furnaces is to have the tap holes clogged with frozen metal. This necessitates shutting down the furnace and immense loss finally if the trouble is not immediately remedied. A heavy carbon arc provides a prompt and efficient means for overcoming the trouble. Such an arc, using 800 amperes or more, will clear out tap holes or tuyeres at the rate of about 3 feet per hour.

In steel foundries where heavy castings are made the question of cutting off the large risers becomes of considerable importance. This work is quickly and cheaply performed by the electric arc using the carbon electrodes with current as heavy as can be economically obtained. Many large castings are found to be slightly defective, due to misplaced cores, blow holes and cracks. The electric arc provides a means of reclaiming these castings speedily and with low cost by building on metal where needed, such as pads and lugs, also burning out and filling any cracks and holes in the castings. Scrap metal is economically cut by the electric arc into sizes suitable for the cupola.

Rolling mills have found that the electric arc provides a means for saving worn machinery and parts such as shafts, frames, cracked spindles, ladles, rolls with worn wobblers and other parts of rolling mill machinery. These types of equipment involve considerable expenditure if replaced and in many cases the expensive part is not damaged. For example a roll may have its wobblers as good as new. These repairs are easily made at a cost of less than 15 per cent. of the cost of a new roll. In Fig. 1 is shown a repair job of this nature which was accomplished by means of electric arc welding.

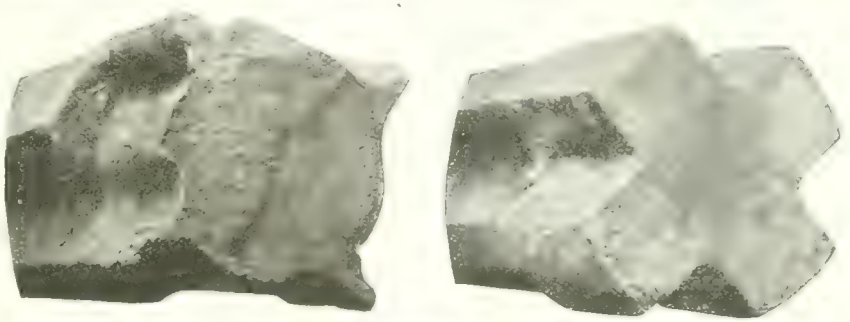


FIG. 1 WORN ROLLING MILL WOBBLERS REPAIRED BY ELECTRIC WELDING

### Railway Shops

In equipments used by railroads, both steam and electric, the construction is such that many of the repair operations are well suited for welding by the electric arc. On steam locomotives, for instance, there are a great many wearing parts which can be easily and cheaply made as good as new by the building up process. Worn spots on the wheels are built up in this manner, saving considerable time and money in the actual repair as well as additional saving due to the fact that the diameter of the wheel is not reduced. Worn mud rings can also be built up by welding on new material.

FIG. REPAIRING HULL OF STEEL SHIP SHOWING SCOPE OF APPLICATION

Undoubtedly the welding of flues in

*Abstract from Bulletin by permission of General Electric Co.

shops. The larger railroads have adopted

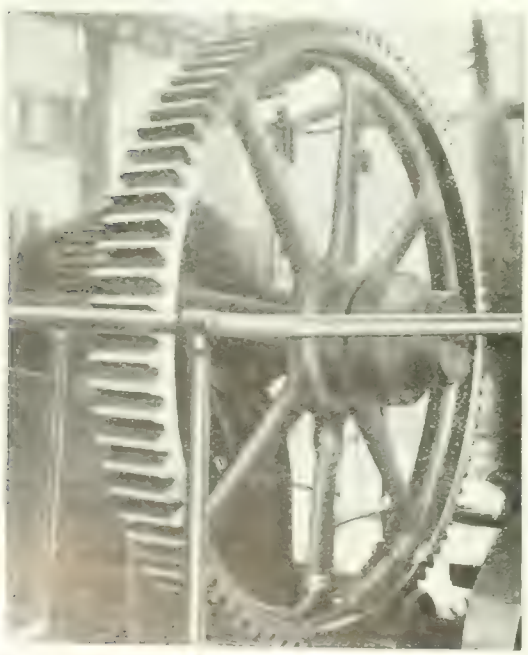
FIG. 1. BROKEN BOLTS HAVE NEW SHANKS AND SQUARE HEAD BUILT UP AND ARE THEN FINISHED WITH LATHE OR FILE

the full life of the tube without leakage at the tube sheet.

Other repairs to the locomotive which

ches on tube sheets or even entire tube sheet, and the caulking of various seams

in Fig. 2. Worn piston rods cause leakage of steam and consequent loss of power. This condition is easily remedied by arc welding, additional metal being built on



THE HUB MACHINE RE- OF SHAFT

a lathe and turned down to proper size. Also fractures in the framework, either of the locomotive or of the cars them-

and a successful weld practically ensur-

### Marine Service

are constructed almost entirely of steel, repairs may be made to practically any

means of an arc welding set.

In a number of large ports, barges, which have been provided with arc welding equipments, are

and by means of cable led through port holes repairs may be made to the boilers or in any part of the ship.

The saving by this method consists partly in the fact that the ship need not be docked and partly in that the repairs can be effected without removing the defective part. Broken stern frames, propellers and damaged plates in the hull can be repaired quickly, although it is generally necessary to dry dock the vessel for repairs of this nature. The view of the damaged ship shown in Fig. 3 will afford some idea of the scope of the work it is possible to do with the electric arc.

### Miscellaneous Repair Work

One cause of considerable loss in manufacturing establishments is caused by taps or tap bolts breaking off in

either scrapping the casting or cutting out the tap with the gas flame and later building up again, redrilling and retapping. By means of the electric arc the metal is built on to the tap and brought up to the level of the casting and there welded fast to a nut. After

the tap or bolt removed without damaging the threads already cut. See Fig. 4.

Smoke stacks, ventilating flues, and similar structures are built and repaired economically by the electric process. The arc can be used for cutting the metal to the required size and later to weld it to the desired shape. Complicated joints are made without particular difficulty.

Cutting points of high speed steel are welded on to less expensive shanks of soft steel by this method.

Large parts of machine tools of various kinds are often broken and considerable expense and loss of time is involved if the ordinary methods of repair are followed or if

depended upon. The electric arc, however, provides means for repairing such parts at a minimum expense of time and cost. Fig. 5 shows a cast iron punch gear which has been successfully repaired by the arc weld without being removed from the machine.

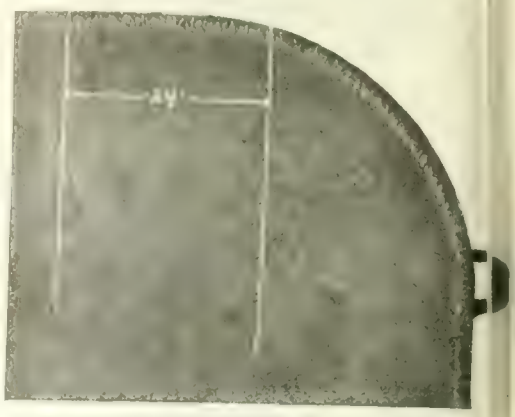


FIG. 6. TANK BOTTOM WELDED WITH METALL ELECTRODE ARC.

### General Manufacturing

The electric arc welding process is just as desirable in a manufacturing plant as it is in repair work. These

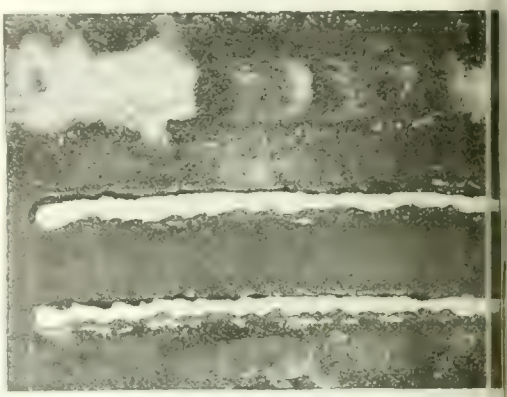


FIG. 7. ILLUSTRATING THE JOINING OF PLATE AND SHOWING THE APPEARANCE OF CUTS MADE BY ARC

equipments are used in automobile plants, manufacturing plants, locomotive shops, tank shops and plants of practically any description where metal is to

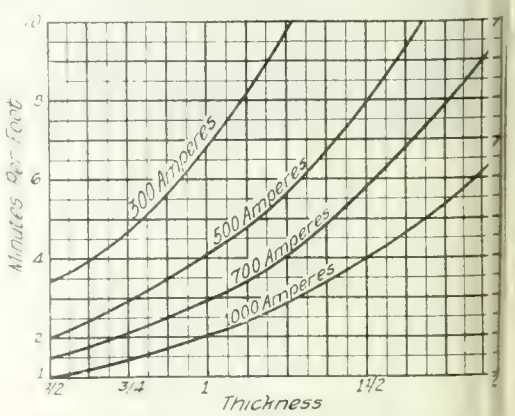



FIG. 8. TABLE OF APPROXIMATE CUTTING SPEEDS FOR DIFFERENT CONDITIONS.

be joined. A good illustration of this class of work is Fig. 6., showing the bottom of a tank welded by means of

the metallic electrode arc. Fig. 7 shows the weld made in joining two plates of steel by the carbon electrode process, also the appearance of cuts made by the carbon electrode.

Where cutting is to be done by the carbon arc the current used will depend on the cutting speed required. For light metal and where speed is not important 300 amperes is sufficient, but where the metal is 2 in. thick or more it is desirable to use heavier currents and up to 1,000 amperes can be used. Curves are shown in Fig. 8 giving the approximate cutting speed for different sections of metal and using different values of current.

## THE FRENCH STEEL INDUSTRY

BEFORE the war, France was already considered by experts as the richest country of the world in iron ore, after the United States. Besides the basins of Lorraine, which produce 3,000,000,000 tons of ore, she possesses the basin of Normandy, which, in an area of 40,000 square kilometers, contains, according to a recent estimate, nearly a billion tons of a superior quality of ore yielding 50 per cent. of iron. In 1914 21 grants in mining districts producing 1,152,000 tons a year, already existed in the departments of the Orne, Manche and Calvados, which yielded 648,000 tons with six grants only under exploitation. About the middle of 1916, a large society, entirely French, the Societe Normande de Metallurgie, was founded, with a capital of 40,000,000 francs, by Messrs, Schneider & Co., the great Creusot manufacturers, the Societe des Acieries de la Marine et Homecourt, and several shareholders belonging to the metallurgic world. This new society leased the foundries and fittings previously organized, or provided for, by the Societe des Hauts-Fourneaux de Caen, formed in 1892, and in July, 1916, started the works afresh now situated at Mondeville-Colombelle near Caen. About 30 kilometers distant is the Soumont mine, capable of yielding even now 4,000 tons of iron ore a month, and which, in the near future will have a larger output. The establishments of the Societe Normande de Metallurgie comprise gas and coke furnaces, large steel works, a flattening mill, smelting works and blast furnaces. Three stations and a railway line 33 kilometers long facilitate the transport service. The line was made by a branch society and runs between the above foundries and the Soumont mines. At present there are four batteries of 42 furnaces each, producing 1,000 tons of coke a day. In January, 1918, two other batteries, now under construction, will be in working order, and will bring the output up to 1,500 tons a day or 500,000 tons a year. The coke, collected by an ingenious system of inclined planes and chains, after being sorted out, is sent in trucks to government metal works. Gas undergoes a series of processes for the purpose of extracting the secondary products obtained by the distillation of coal such as tar, phenol, benzine, tuluol, naphthalin, sulphate of ammonia, used in the manufacture of explosives and for dyeing purposes, and which, prior to the war, were almost exclusively produced by interests in Germany.

The blast furnaces, the first of which has been recently inaugurated, are in themselves 29 meters high, but with their basements tower 45 meters above the foundry ground plot. They can produce 400 tons a day, which is said to be the largest output obtained in Europe up to the present day. To each furnace is affixed a battery of five metal cylinders, or "Cowpers," seven meters in diameter, for heating the air for the combustion of coke, and the reaction of carbon on the oxides of the ore, which is the source of production for cast iron. Three of these gigantic blast furnaces will be ready in the autumn of 1918 and the whole installation, when completed, will allow of an output of 450,000 tons of cast iron a year. The steel works, properly so-called, contain four converters of 30 tons, and five Martin furnaces of 30 tons, allowing of an output of 275,00 tons of Thomas steel and 125,000 tons of Martin steel every year.

The flattening mill can pass 500,000 tons of ingots a year, and is supplied with several reversible trains for the production of all small samples. The Societe already possesses stocks of iron ore sufficient to insure the supplies for its factories without any difficulty. It has had a large water tower, 66 meters in height, built in the neighborhood, with two reservoirs and a canal to the Orne, so that 10,000 cubic meters of water could be supplied hourly. A vast hall 200 meters long contains the electric machinery for distributing motive force, two turbo alternating generators of 3,000 kilowatts, one of 5,000, six gas alternating generators of 6,000 horsepower, and three of 3,000 horsepower. A private harbor has been built on the Orne canal, and it is now ready for vessels of 2,000 tons, and will soon be open to boats of 8,000 tons capacity.

The preceding facts show how the Societe Normande has been able to create in the midst of war one of the most important metallurgic centers in the whole of France. The mining industry of the entire region has followed its example. At present 30 fresh grants have been made for exploiting of the layers of iron in Normandy, Brittany and Anjou. On the other hand, the French government is preparing to work the Littry coal fields, situated between Saint-Lo and Bayeux. Lastly, owing to many recent improvements, trade with Caen harbor is increasing every day.

*From the Paris Chamber of Commerce bulletin.

## SALVAGE OF GREASE AND OILS FROM BRITISH MOTOR VEHICLES

THE grease removed in the cleaning of wheels, axles, and other parts of motor omnibuses, trucks, and other motor vehicles, is now utilized by the London General Omnibus Co., London, England. The process of reclaiming the oil is thus described in the *Commercial Motor*.

Before the war kerosene was largely employed for the cleansing of engines and other parts of vehicles, but now its consumption is restricted to the barest minimum, the net effect being the saving of five-sixths of the former consumption. Kerosene, as a matter of fact, is now only employed on certain parts of the mechanism for the cleaning of which there is no practical substitute. For the cleaning of wheels, axle casings, and front axles, a weak solution of hot caustic soda is employed.

When engines, gear boxes, back axles, or any other parts are stripped for overhaul, a very great saving is effected over former practice.

### Process of Reclaiming

The unit is dismantled and the parts are placed in a cradle and dumped into a tank of water into which a jet of steam is turned so as to bring the water to boiling point. Caustic soda is added to the water until a solution of about 3 per cent. strength is obtained. The whole of the grease is removed from the parts in the process of boiling and comes to the top of the water. Before the contents are removed the grease is drawn off the top. This is done through an overflow pipe which leads into a barrel.

The cradle of parts is then transferred to a second tank of clean, boiling water, which finishes the cleansing and, as the parts are drawn out quite hot, they drain perfectly dry and absolutely clean.

The result, so far as cleanliness of parts is concerned, is considerably better than if kerosene had been used. All minute parts of metal, dirt, and grit go to the bottom of the first cleansing tank.

### Oil Put Through Process

The London General Omnibus Co. has a central depot for reclaiming oil and washing rags, and to this depot the barrels of waste oil, as they are obtained from the various garages, and the rags are sent.

At this depot there is a battery of three tanks erected over a furnace, each of which is filled to about two-thirds with water, which is brought up to the boiling point. The barrels of oil as they come in are drawn off into the first boiling tank, a little being added at a time. The oil is thoroughly boiled, and when it overflows into the second tank (by the adding of more oil to the first) it has become almost fit for use again, but it passes into the second tank and is given a second boiling, and then on to the third tank, where it goes through its final stage of cleansing, and from the last tank it is drawn off and run into barrels.

### Salvage of Rags

As to rags, their price to-day is much higher than before the war, when they were thrown away after being used. At present every rag is collected in each garage and sent once a week to the central cleaning depot.

# PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

## MACHINING A GAS ENGINE CYLINDER

By C. [illegible]

THE cylinder shown in Fig. 1 was used on a 1½ horsepower gas engine, the cooling of the form type and [illegible] and as large quantities [illegible] it was necessary that the methods of

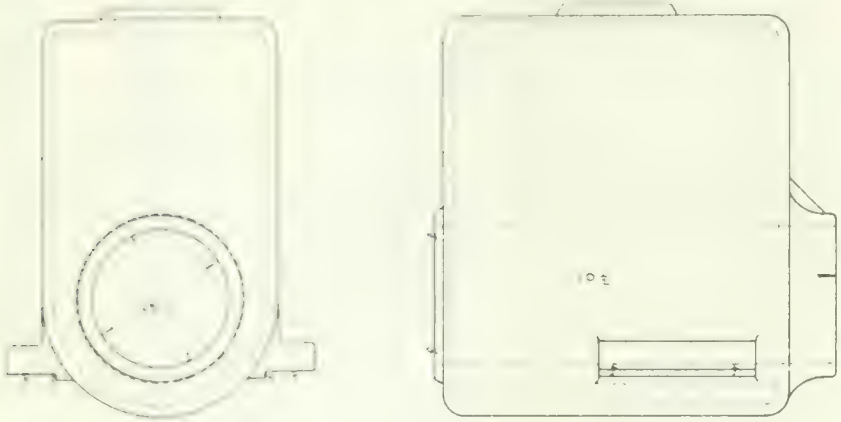


FIG. 1.

manufacture would enable the engine to be placed on the market at the lowest possible cost as it is necessary to compete with many of the cheaper makes of engines then turned out. The bore of the cylinder was 3½ in. while the length of the cylinder casting was about 10½ in. The water jacket extended entirely around the working barrel but did not run through into the cylinder head as this was air cooled. At the one end the barrel also extended for a short distance from the jacket, forming a very convenient means for centering as will be later explained. At the other end a small ridge about ¼ in. wide was provided around the bore, this being finished and forming a seat for the cylinder head, gas tightness being obtained through the use of a copper-asbestos gasket. The foot projecting on either side of the side was machined on the bottom as well as to a shoulder, forming a ready means for securing perfect alignment with the crankshaft when placed on the bed.

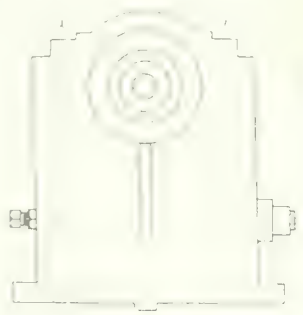
### Milling Feet

These feet were finished on the milling machine, this being the first operation. As the casting was located from these milled surfaces during the boring and drilling operations, it was necessary that, in the first operation, the rough casting be acurately located with respect to the bore of the cylinder. In Fig. 2 is shown the milling fixture, which is of the box type, the one end being provided with a hinged cover H which may be [illegible] K. To [illegible]

[illegible] these enter the cover when locked, effectively binding the two sides. Both [illegible] are pinned to the one shaft so that opening one will also open the other. Springs are placed behind them so that they are normally held closed. The cover is ribbed on the outside and carries the steel piece J which is turned out in the form of a cone and then relieved so that there is but a bearing at three points, this being used to center the projecting end of the casting on the outside.

### Centering and Clamping Mechanism

The mechanism at the other end of the fixture, which is used to perform both the functions of centering and clamping simultaneously, is shown in detail in Fig. 3. The projecting boss of the fixture is bored out to receive the steel piece B, to the end of which is bolted the cap D. Two keys G are rigidly fastened to the end of B and move in the slots in the slots in the main casting, thus preventing rotation as B is moved back and forth. Running through



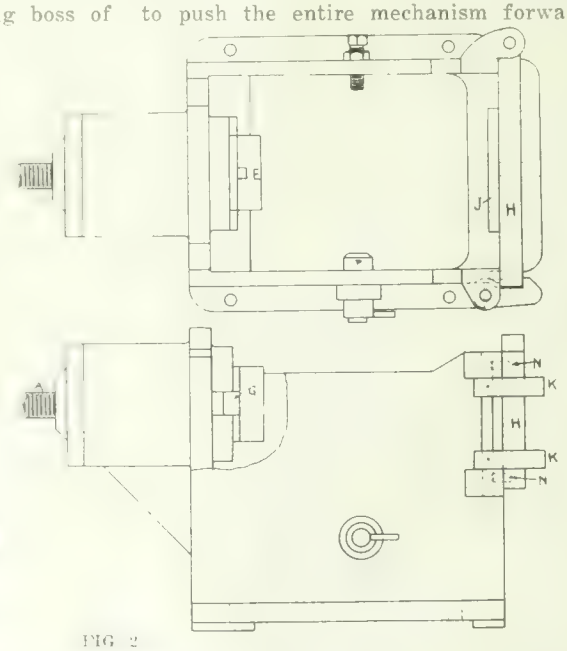



FIG. 2

B is the shaft A which is threaded on the outer end and passes through the nut C, also bolted to the main casting. The screw is rotated by means of the capstan nut which is provided with a locknut on either side. The other end is turned down and extends through the cap D with locknuts at the end. Against the shoulder and back of the hardened steel cone F are the two hardened steel collars. This cone bears against the three square centering pieces E which move in slots in the cap. These are held in toward the center by the springs and plugs shown. A heavy coil spring at the end of B tends to force same toward the fixture.

Two hardwood strips are placed in the bottom of the fixture so that the casting is brought to such a height that it will just slip over the piece D. The end is then snapped shut, and the plunger P, which has been drawn back, allowed to seat against the side of the hopper forceing the casting over against the adjustable stop screw at the other side, this being so set that when the cylinder is properly centered by the bore the sides are vertical. The drawing of this plunger in Fig. 4 is self-expanatory.

The screw A is now turned in a clockwise direction and this allows the heavy coil spring to push the plunger B forward until the hardened steel pieces G bear against the end of the casting when this will be pushed into the centering cone at the other end. Further movement of the screw will bring the cone F into contact with the three centering pieces and these will be pushed out against the inner surface of the barrel and accurately center the same. Any further movement of the screw will tend to push the entire mechanism forward and will tightly clamp the casting between the pieces G and the cone of the hinged cover.

Inserted tooth milling cutters were used

and these were accurately set by means of the finished surfaces 'a' at the end of the fixture. These surfaces, however, were not machined to the exact size but were somewhat smaller and a hardened steel gauge of the correct thickness was used for setting the cutters. In this manner the blades of the cutters never came in contact with the finished cast iron surfaces, with the consequent liability of destroying their accuracy. After taking the cut and running back the table it was but a moment's work to turn the plunger P, run back the clamping screw, throw back the cover H, withdraw the casting and insert another. After getting the cutters set to the proper position it was all routine work

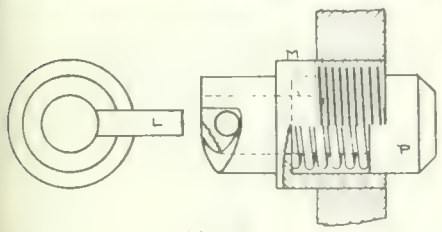



FIG. 4

and there was no opportunity of getting the casting in wrong. Centering the projecting end of the cylinder on the outside insured an even thickness of metal around the bore.

### Boring

The next operation was boring and this was carried out on a 24 in. heavy duty engine lathe. The tool carriage was run to the front and the fixture shown in Fig. 5 bolted to the carriage. This was quite heavy and well ribbed so there would be no distortion; permanent dowel pins were provided so that the positioning would be correct at all times. The boring bar is shown at 'b,' Fig. 6, being three inches in diameter and turned to one and one-half inches where the boring heads are carried. A draw-in bolt was provided through the spindle to prevent any possibility of the bar lossening on the facing cuts. The cylinder holding fixture was bored out at the forward end to carry the boring bar, a cast iron bushing being provided and the casting split so that a slight adjustment might be obtained with the clamping screws. This hole was bored out with a bar between centers so that it would be in absolute alignment with the spindle.

The other end of the fixture was

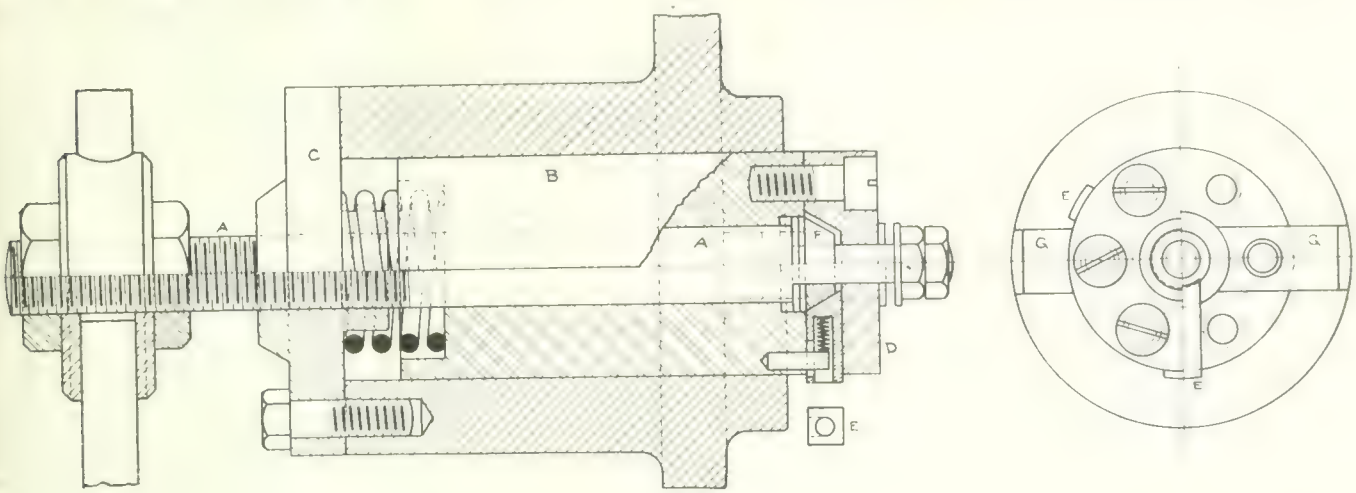



FIG. 3.

planed to accommodate the cylinder casting, these being placed with the neck toward the bar. Slotted clamps with springs beneath were used for clamping and a stud was placed in the casting to take the thrust of the heavy cuts. Two one-half inch steel pins in the body of the bar provided the drive for the boring heads, the holes being drilled slightly larger so that they could easily be slipped into position by hand while the bar was running. The bar turned about forty revolutions per minute and was operated continuously. The space between the end of the cylinder and the end of the bar was just sufficient for the boring heads. This was done to bring the start of the cut just as close to the bar support as possible. A roughing and finishing boring cut was taken through the cylinder before reaming; the construction of the boring heads being shown at 'c,' Fig. 6.

### Detail of Boring Heads

Six blades were used in each head, being unevenly spaced to prevent chatter; the blades were of high-speed steel, ¼ by ⅝ in. and were held in place by the ⅜ cold drawn steel pins which were set into the body at an angle of one and one-half degrees with the axis. The holes for the pins were first drilled and reamed and the slots milled with the pins in place. This insured an absolute fit between the blades and pins. In the two roughing heads ¼ in. steel pins were placed back of the blades to prevent their being pushed back under heavy cuts, though, in all probability, this was not necessary. The heads were taken off the bar as they came through the casting at the outer end. The head at 'd' was used to chamfer the end of the cylinder so that the piston rings would enter more easily.

The head at 'e' was for facing the end of the cylinder for the gasket fit. The bar was run entirely through the cylinder and the head slipped on but as the thrust of the cut was in the opposite direction from the boring heads it was necessary to make some provision for holding the head to the bar; this was done by the T-handle screw shown. The end of the bar being tapped, the screw was merely run until the shoulder rested against the steel plate on the head and which was used to support the cutting blades. To release it was only necessary to give the end of the handle a light tap and unscrew even though the bar were turning in the same direction. This head was of cast iron as the service was fairly light and was provided with a bearing in the bore of the cylinder only for a short distance at the center, the relief enabling the blades to be ground in below the diameter of the bore.

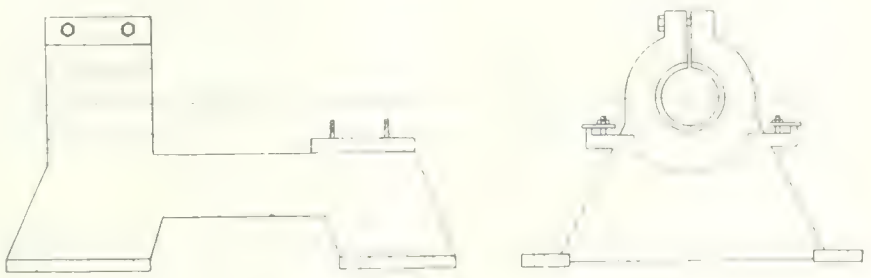


FIG. 5

### Output Capacity

In a test run on a small number of

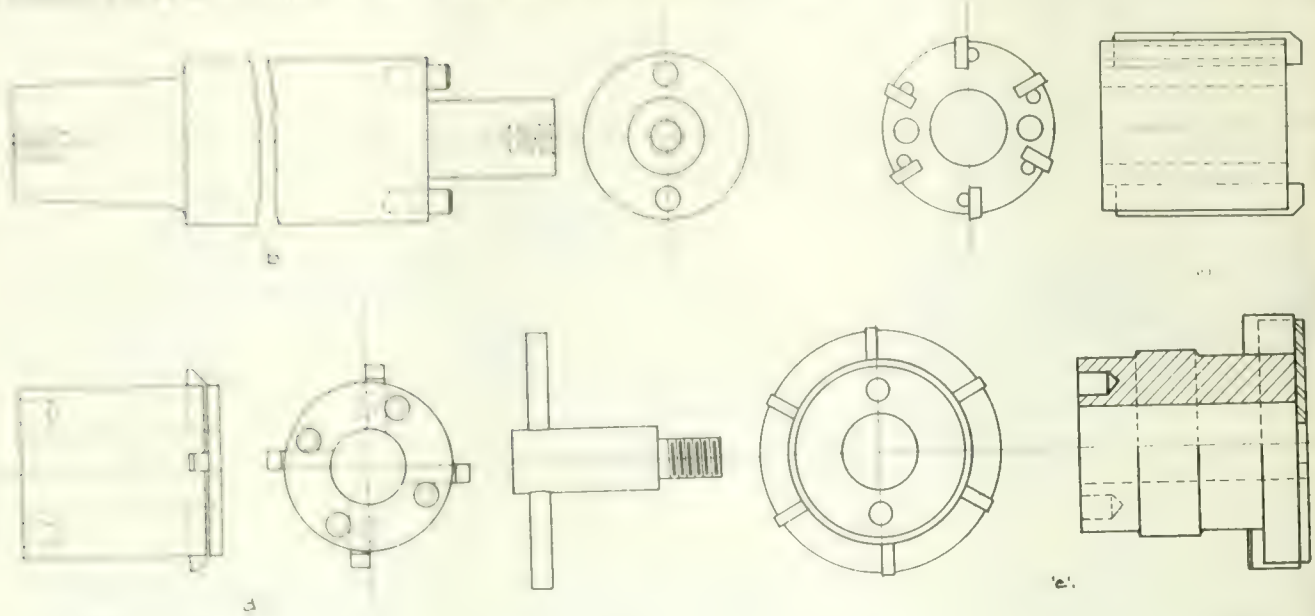


FIG. 6.

what bettered. The rigidity of the tools and fixtures enabled heavy cuts to be taken and the finish was all that could

## SHOT BLASTING H.E. SHELLS

By J. W. D.

JUDGING by the troubles which some firms are having in getting rid of the discoloration in the bore of the British H.E. shell, caused by the heating for the nosing operation, it would seem that a few remarks on the subject would not be out of place. Whether you use steel shot, angular grit or flint shot, there are two very essential points to keep in mind. The first is that the shot must be kept perfectly clean and free from grease. The second is that if a clean bore is expected from the shot-blasting machine the shell must be sent to this machine with the bores in a clean condition, free from grease or cutting compound. I have seen many firms who send the shell straight from a machining operation to the shot blast machine and expect it to collect all this dirt and grease and give them a clean bore, but this is not possible. The natural result of the above conditions is that the bore is covered with a film of a black greasy nature, which it is almost impossible to remove by washing, even with benzine. The only way to remove this is by polishing with emery.

In order to get away from this troublesome film of black grease, it is necessary to use a small quantity of shot; [illegible] twice a day or oftener if necessary. The shot may be cleaned by [illegible] it in a very fine sieve, then washing it in gasoline. Once it has been

This would also eliminate a lot of the varnish trouble, as varnish will not adhere properly to a greasy surface. Most shell makers would claim it ridiculous to say that varnishing a H.E. shell is as important as varnishing a piano or an automobile. The truth of the matter is that a shell is the most important, in as much as a badly varnished shell is very dangerous, while a badly varnished piano or automobile merely looks bad

## MARKING OFF GAUGE FOR SHELL BASES

By Munitions

GAUGING the thickness of the base of the shell forging preparatory to cutting off the surplus metal is an elementary but important detail. Owing to the greater difficulty that is experienced in the machining of the interior it is advisable to commence the primary gauging from the rough bore of the forging; it is therefore essential when cutting off the excess metal from the exterior of the base, that the thickness at this point be sufficient for finishing to the desired dimensions after the end has been cut off. A long U shaped gauge is generally adopted for determining the point for cutting off. The gauge shown in the accompanying sketch is made from a piece of ordinary angle iron, the finger portion that enters the bore of the shell being drawn down from an angle to a round shape to insure lightness and accuracy of operation. In constructing this gauge care should be taken that the point of the finger will be equi-distant from each edge of the angle iron, so that when the long straight portion of the angle iron rests on the outside of the shell the end of the finger will bear approximately on the middle of the interior base. To form a support for the center punch that marks the location for cutting off, a steel block is secured to the end of the angle iron as shown at A. With this piece fastened in position, the hole for the punch is put in and counterbored to receive the spring B that reacts against the collar on the center punch C. The pin D is inserted in the angle iron above the collar of the center punch to prevent the latter jumping out after the mark has been

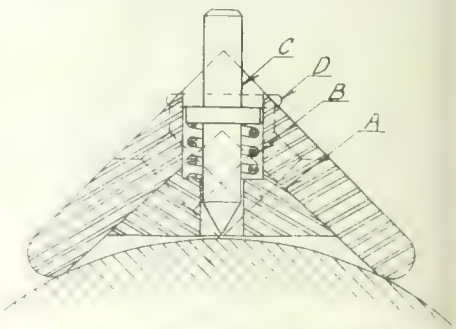



FIG. 7. CROSS SECTION THROUGH PUNCH.

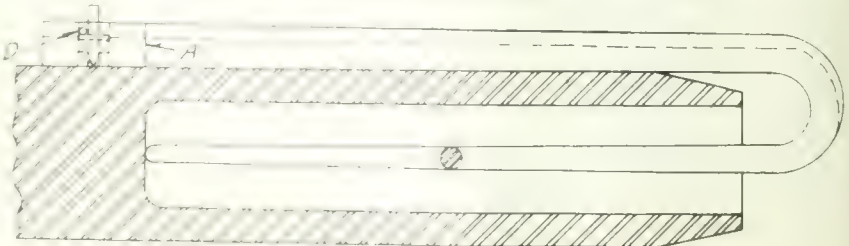



FIG. 8. SIDE VIEW OF GAUGE IN POSITION.

made. Fig. 1 is a general view of the device and Fig. 2 is a cross section through the center punch.

## VENTILATOR COWL QUERY

WE HAVE a number of ventilator cowls to make, similar to the one shown in the accompanying sketch. These are to be made of 16 gauge stock, in four sections, and with vertical seams. Owing to the necessity of hammering or swedging the pieces before the same are assembled, the writer would like to obtain some information on the development of the various portions on the flat sheet and the method adopted in the subsequent operations of forming the different sections to get an even and regular contour. Any data in this connection will be greatly appreciated.

* * *

## METHOD OF LAYING OFF COWL

FIG. 1 shows a ventilator cowl built up of four pieces with vertical seams. This type of cowl is much preferable from its visual effect to that made up with girth seams, and where pleasure yachts, passenger vessels and Government or naval craft are concerned the plate arrangement here featured is usually insisted upon. Fig. 2 illustrates the construction of the cowl, the layout of which may be drawn to any desired scale, or be made apply to any required size pipe.

Measure off A B equal to 20 inches, bisect at P and raise the vertical line V P equal to 40 inches. Draw the overhang V C at right angles to P V and equal to 18½ inches. With E as centre and radius (equal to 25 inches) draw in the arc C K F J so as to be tangent to the perpendicular A J raised from A B. Raise the perpendicular B L M.

Locate the point G, which is 4 inches above the line A B and 2 inches from B L M. With G as centre and 2 inches radius, strike the quadrant M N D tangent to B L M. Directly above the point G locate D, which is on the quadrant M N D. Connect by a straight line the

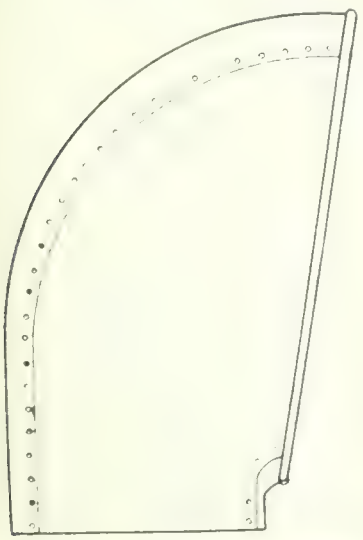


FIG. 1. VENTILATOR COWL WITH VERTICAL SEAMING.

points D and C, thus completing the outline of the cowl. Now divide the back into four equal parts as shown by A J F K C. Similarly divide the throat

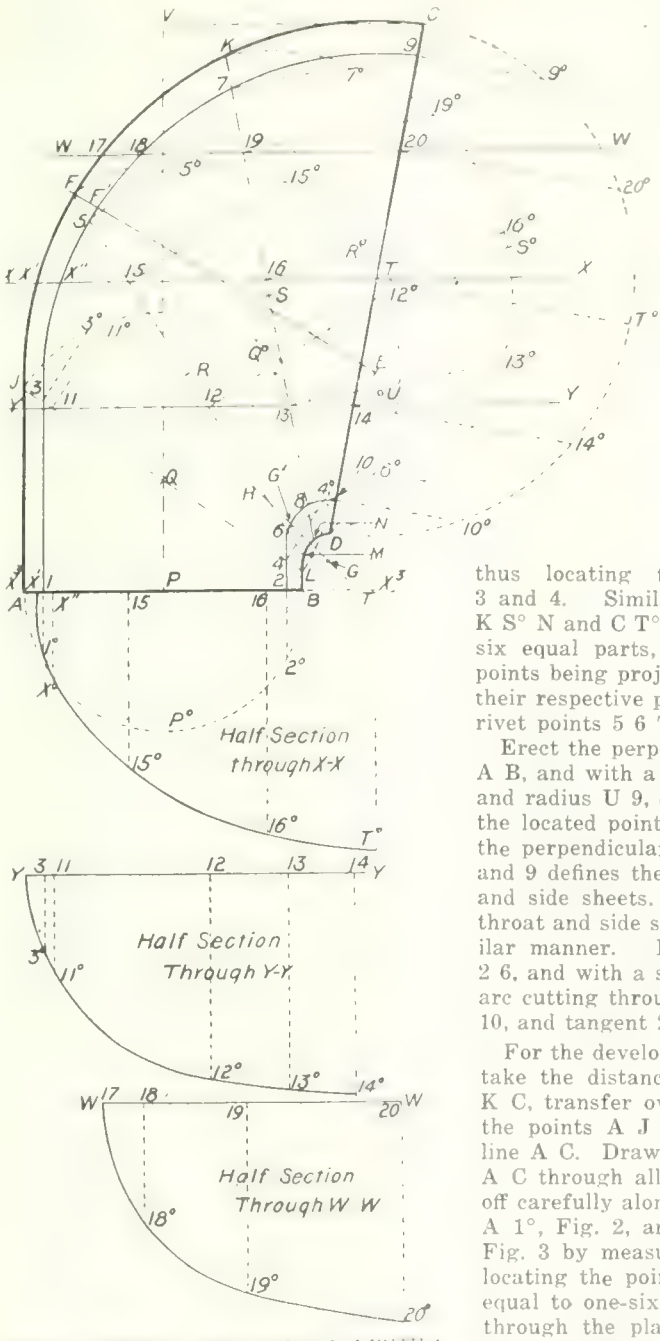



FIG. 2. GENERAL ANALYSIS OF VENTILATOR COWL CONSTRUCTION

sheet line into the same number of equal parts as shown by the points B L M N, and D. Connect these points by straight lines to their relative points on the back sheet line, as J L, F M, K N. These lines will be used as sectional planes and on them will be constructed the half sectional views.

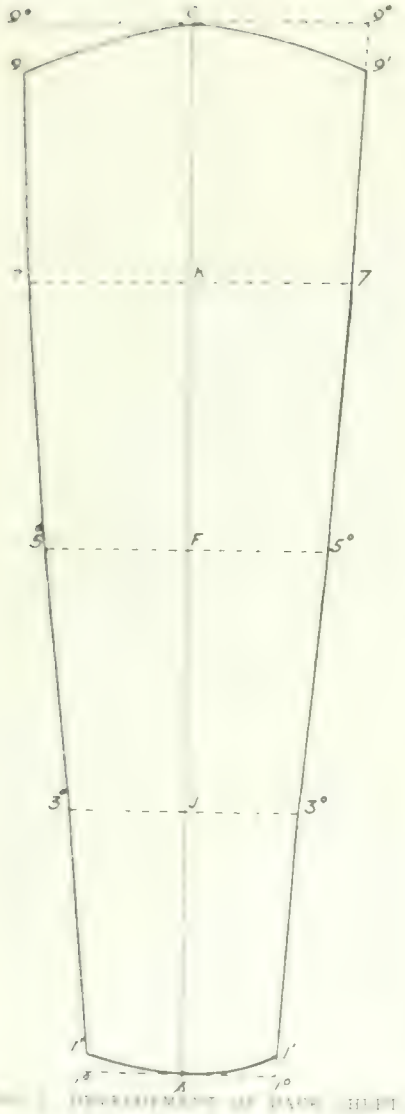
With P as centre and radius P A, strike the semicircle A P° B, thus defining the half-sectional view through the plane A B. Bisect J L at Q, then with Q as centre and radius Q J strike the semicircle J Q° L. Again, with R as centre, describe the semicircle F R° M. Similarly with S K and T C as radii, strike the half section views K S° N and C T° D respectively.

It is the usual practice in this type of cowl to make the back and throat sheets each equal to one-sixth of the circumference and the side sheets each equal to two-sixths. On this principle our patterns and templets will be developed. Divide the semicircle A P° B into exactly six equal parts and locate the end points 1° and 2°. At right angles to A B project the lines 1° 1 and 2° 2, thus locating the points for the rivet lines. Divide the arc J Q° L into six equal parts, the extreme points 3° and 4° being projected at right angles to the plane J Q L, thus locating the rivet line points 3 and 4. Similarly, the arcs F R° M, K S° N and C T° D are each divided into six equal parts, their extreme division points being projected at right angles to their respective planes, thus locating the rivet points 5 6 7 8 9 and 10.

Erect the perpendicular 1 3 to the line A B, and with a suitable centre as at U and radius U 9, describe an arc through the located points 9 7 5, and tangent to the perpendicular 1 3. The line 1 3 5 7 and 9 defines the rivet line for the back and side sheets. The rivet line for the throat and side sheets is drawn in a similar manner. Erect the perpendicular 2 6, and with a suitable centre draw the arc cutting through the points 6 8 4 and 10, and tangent 2 6.

For the development of the back sheet, take the distances A J, J F, F K and K C, transfer over to Fig. 3 and locate the points A J F K C on the straight line A C. Draw lines at right angles to A C through all these points. Measure off carefully along the curve the distance A 1°, Fig. 2, and transfer this over to Fig. 3 by measuring at each side of 1, locating the points 1° 1°, which will be equal to one-sixth of the circumference, through the plane having A B as diameter. Similarly measure J 3°, Fig. 2, and transfer to J 3°, Fig. 3. Again, transferring all the distances as F 5°, K 7° and C 9°, measured along the curve (or calculated), Fig. 2, to their respective locations in Fig. 3, an even curve is drawn in through these points by the aid of a flexible batten.

It will be observed that in Fig. 2 the line 1 3 5 7 9 is shorter than the line A J F K C; this, then, will have to be shown in Fig. 3. From the located point E, draw a straight line to F, locating the point F' where this line intersects the rivet line, Fig. 3. Measure carefully along the curve from this point F' to the point 9. This distance is then measured from 5° to 9' in Fig. 3. The dis-



transferred over to Fig. 4 and located on the straight line by the points B L M N D. Parallel lines at right angles to B D are drawn through these points. In Fig. 4, [illegible] is also equal to A 1², Figs. 2 and 3. Again, L 4², Fig. 4, is made equal to L 4², Fig. 2. Similarly the distance M 6², N 8², D 10², Fig. 2, are transferred over to their respective positions

these located points draw an even curve with the flexible wooden batten, as was done in Fig. 3.

It will be noticed that the rivet line 1 3 5 7 9 10, Fig. 2, is longer than the ellipse B L M N D. This extra length must be added on to the rivet line in Fig. 4. From the point G, through the centre of the quadrant M N D, draw the line G H. Measure from D to this intersection point on the quadrant, and transfer this distance over to Fig. 4, thus locating the line G H. From G¹, measured along the curve to 10, Fig. 2, transfer this distance to Fig. 4 by measuring from the line G H to 10¹. Similarly, transfer the distance G¹ to 2, Fig. 2, over to Fig. 4 as from the line G H to 2¹. Connect the points 2¹ B 1¹ and 10¹ D 10¹ each by suitable curves.

Fig. 4 shows the templet for the throat sheet, suitable laps to be added. The side sheets are developed in a slightly different manner. Transfer the outline of the side sheet as shown by 1 3 5 7 9 10 8 6 4 2, Fig. 2, to the similarly numbered outline in Fig. 5. Connect the points 1 P 2, 2 Q 4, 5 R 6, etc., Fig. 5, similar to Fig. 2. Measure off P 1″ and P 2″, Fig. 5, each equal to 1/6 of the circumference of which 2 B¹, Fig. 2, is the diameter, or measure along the semicircle the distance 1° 2°, Fig. 2, and place half of this at each side of point P, Fig. 5, to locate the points 1″ and 2″.

Calculate or measure off half the distance along the arc of 3° to 4°, Fig. 2, and place this distance at each side of the centre Q on line 3 Q 4, thus locating 3² and 4² in Fig. 5. Again, take the length of the arc 5° 6°, Fig. 2, and place half of this on each side of R on the extended line 5² R 6² to locate the points 5² and 6², Fig. 5. Similarly transfer the distances 7° 8° and 9° 8°, Fig. 2, to their relative positions to locate the points 7² 9¹, and 8² 10″. Connect the points 1″ 3² 5² 7² 9¹ and 2″ 4² 6² 8² 10″, as shown in Fig. 5. Measure the length of the line 1 3 5 7 and 9 and also the line 1″ 3² 5² 7² and 9¹. Take half the distance between these two lengths and locate the points 9² and 1² by measuring from 9¹ and 1″ respectively. Similarly measure to find out how much longer the line 2 4 6 8 10 is than the line 2″ 4² 6² 8²″. Take this difference and add half from 10″ to 10² and half from 2″ to 2². Connect 1² to 2² to locate the outline for the bottom of the side sheet.

To obtain the curved line 9² to 10², it is necessary to find out the points W″ T¹ and Y″. This is done in the following manner: Divide C D, Fig. 2, into four equal parts, and through these points draw the planes WW XX and YY parallel to the line A B. Project the points X¹ and X″ through, and at right angles to A B, thus locating the points X¹ and X″ on X¹ X³, which is shown on, and is continued on each side of A and B. Where the line F R M intersects the line X X, locate the point 15. Also locate 16 where K S N intersects the line X X. T is already located on X X. Project these points 15 and 16, and T down to and at right angles to X¹ X³. Continue [illegible] projection

section view through X X. On the elevation, Fig. 2, raise the perpendicular 15, 15° to its intersection of its arc F R° M. Take this perpendicular length and transfer to the line 15, 15° in the half-

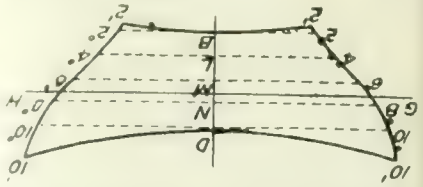


FIG. 4. TEMPLET FOR THROAT SHEET.

sectional view X X, Fig. 2. At right angles to K S N draw the perpendicular 16, 16° intersecting the semicircle K S° N at 16°. Transfer this length 16, 16° to 16 16° in the sectional view for this plane, which is X X. T T° is drawn at right angles to C T D, and its length transferred to T T° in the sectional view.

The distance X″ X° in the sectional view is equal to the distance through X″ on the line X X in the elevation. This distance is not shown in the elevation view, but it is obtained by using a little judgment. The distance through the point 5 is equal to 5 5° and through the point 3 is equal to 3 3°, so if X″ was midway between the points 3 and 5, it would be equal to the mean of the two distances 3 3° and 5 5°. But X″ is nearer to 5 than 3, so it will be seen that it is not difficult to get the distance X″ X° for the cross-section. An even curve drawn through the points T° 16° 15° 5° and X¹, in the section view, will define the half-section for the plane X X.

The sections for YY and W W are constructed in a similar manner.

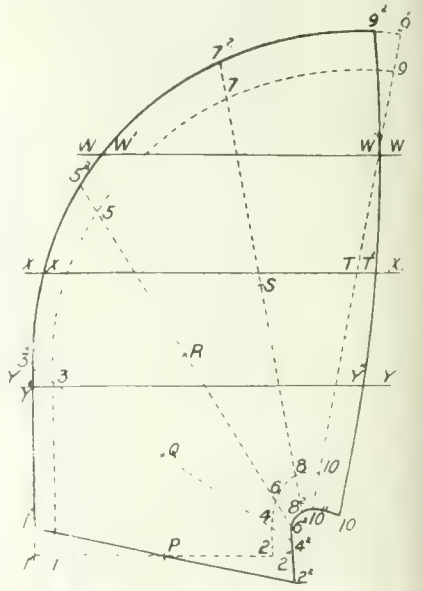


FIG. 5. DEVELOPMENT OF TEMPLETS FOR SIDE SHEETS.

The plane lines WW, X X and Y Y in Fig. 2 are transferred over to their proper positions in Fig. 5. The distance X° 15° 16° and T° in the sectional view, Fig. 2, is equal to the curve of the side sheet; it is, therefore transferred over to Fig. 5, measuring from the point X¹ along the line X X to the point T¹. With the three points 9², T¹ and 10² located,

the curve may be drawn in by a flexible batten. The points W" and Y" on this curve are located by taking the length of the curve 3° 11° 12° 13° and 14°, Fig. 2, and measuring this along the line Y Y, Fig. 5, from the point $Y^1$ to locate Y". To locate W", the distance 18° 19° and 20°, Fig. 2, is measured from $W^1$ along the line W W, Fig. 5. Five points are shown to locate the curve 9° W" $T^1$ Y" and $10^2$ and, although three points would be quite sufficient, the number is left to the option of the reader. If three points are chosen, it will be then only necessary to construct the cross-sectional view through X X in Fig. 2.

The heavy lines in Fig. 5 show outline of the templet, minus the laps, for the side sheet.

Sets or gauges of the sections of the various planes will be used for trying out the templets, during the process of hollowing or blocking out.

The continuation of the cowl below the line A B is a straight cylinder and is developed as such. This cylindrical course is, of course, fitted inside the cowl for water-shed purposes, using the line A B as the girth seam line.

## CLERGYMEN INVENTORS

IN referring to the work of the Rev. Robert Stirling, inventor of the heat regenerator, an English contemporary remarks that quite a large number of scientists and a good many inventors, some of marked eminence, have been in holy orders. The very earliest scientists, men like Roger Bacon and Schwartz, who vie for the proud distinction of having invented gunpowder, were naturally churchmen, because knowledge was practically concentrated in ecclesiastical circles. The first really eminent clergyman-inventor that we are able to recall was Lee, of Elizabeth's time, who in an age when mechanical knowledge was very small, laid by his invention of the stocking-frame, the beginning of a great industry. Cartwright, the inventor of another textile machine, the power-loom, was also a parson. Possibly these three, Stirling, Lee and Cartwright, stand out above all other mechanical inventors in holy orders, but in the domain of chemical science Priestly, a Unitarian minister, holds the highest place. Then we have Bell, who invented the reaper; Forsyth, a Scottish divine who produced an exceedingly ingenious percussion cap for fire-arms—it had a magazine of percussive pellets, and unluckily the explosion of one used to fire the others; Desaguliers— familiarly called amongst the old mining engineers of Cornwall, Desagulez, and well known as the philosopher of early steam engineers; Gainsborough, a brother of the famous artist, and an "ingenious mechanick;" C. W. Cecil, an inventor of a gas engine in 1820; the Abbé Arnal who, according to report, first proposed the use of the crank in the propulsion of ships, 1788, and, if our recollection serves us aright, Capel, the inventor of the mining fan. Other names occur to us. The Rev. Edward Berthon, Canon of Romsey, whose collapsible boat is well known, and Dr. Watson, Bishop of Llandaff, who was an ardent experimentalist in electricity and the first man to send charges, from frictional machines, of course, through considerable distances—through 10,000 ft. of wire at Shooter's Hill in 1748 or so was amongst them.

## THE STEAM GUN

AT a time when many novel devices are being employed to hurl death and destruction at an enemy, it is interesting to recall that amongst the inventions of that remarkable genius, Jacob Perkins, was a steam mitrailleuse, which astonished the good people of 1826 no little, but which was never used to any more serious purpose. Jacob Perkins was the pioneer of really high pressure steam. A mere 200 lb. or so was nothing to him; he preferred to employ 1,000 lb., and spoke lightly of a hundred atmospheres.

The pressure used in the gun was probably irregular, but according to Perkins' own statement it was at least 750 lb. The whole thing was extremely ingenious. The steam generator consisted of a stout steel tube 3 in. diameter and 6 ft. long, provided with headers into which a number of smaller tubes were welded. With the two headers were connected the ends of a coil of stout iron tube, 80 ft. in developed length, which was placed in a furnace. The coil and headers and pipes were filled with water, which circulated under the influence of the heat, and ultimately reached a very high temperature and pressure, the amount of which was controlled by a damper, regulated by the expansion and contraction of part of the tube system. When the generator was sufficiently hot water was injected into the space outside the tubes by a hand pump, and was rapidly converted into steam which was conveyed to the gun.

The gun was not more than a tube with a valve near the breech end, and just in front of the valve a hopper provided with a shutter for the bullets. On pressing the discharging lever the steam struck the bullet in the barrel and drove it out with considerable force. It was reported in 1826 that the gun had been brought to such perfection that it was exhibited before the Duke of Wellington.

Lead balls of an ounce in weight were driven at a range of 35 yards through an iron plate ¼ in. thick, or through eleven planks of hard wood one inch thick and placed one inch apart. But what most surprised the spectators was that the bullets issued in such rapid succession that a long plank was almost sawn in two longitudinally when the gun was swung round slowly in front of it. The piece with its generator was much too cumbersome and unwieldly for the field, but as an example of the use of very high pressure steam the invention is full of interest. Perkins was miles before his time if ever a man was, but his descendants are already beginning to see signs of the advent of much higher pressures than those in common use, even nearly a century after Perkins' time.—*The Engineer.*

## DEEPEST AMERICAN DRILL HOLE

A DIAMOND-DRILL hole in Sussex County, New Jersey, 4,920 feet deep, has recently been completed by the contract drilling forces of the Sullivan Machinery Co. A 2-inch diameter core was removed to a depth of 1,600 feet, beyond which tools removing a 1⅝-inch core were used to the completion of the hole. When the depth of 4,900 feet was reached the long line of rods required for drilling weighed 13 tons, and it took eight hours' steady work for hoisting them out, replacing them, and resuming drilling. It is said that the hole showed no deviation from the perpendicular. It required 20 months to complete the hole, which is 1,700 feet deeper than the deepest previous hole of which there is any record in North America. Only three or four diamond-drill holes have been put down in this country, it is said, exceeding 3,000 feet in depth.

## PEAT DEPOSITS IN CANADA

DR. EUGENE HAANEL, Director of the Mines Branch, has made a valuable report on the subject of peat, which is being given consideration in formulating a policy. Dr. Haanel estimates the total area of the Dominion overlain by peat bogs as 37,000 square miles, and of this total area the known peat bogs of Ontario, Quebec and Manitoba comprise 12,000 square miles, with an average depth of six feet. He estimates the 12,000 square miles will contain about 9,300,000 tons of peat, having a fuel value equivalent to about 5,400,000 tons of coal.

Seven bogs within convenient shipping distances of Toronto are estimated to be capable of producing approximately 26,500,000 tons of fuel; and seven bogs in the vicinity of Montreal could supply that city with 23,500,000 tons of fuel.

Five bogs along the Lower St. Lawrence, conveniently situated as regards water transportation to the City of Quebec, can, it is estimated, supply 16,250,000 tons of fuel and 5,700,000 tons of peat litter.

The bogs examined in Nova Scotia can produce 6,200,000 tons of fuel and 500,000 tons of peat litter, and those of Prince Edward Island produce 1,250,000 tons of fuel and over 1,000,000 tons of peat litter.

In Manitoba the aggregate fuel content of the bogs is estimated at less than 2,000,000 tons. One bog alone, however, it has been estimated, is capable of furnishing 2,500,000 tons of peat litter.

CONTENTS of a circular tank in Imperial gallons can be found by multiplying the diameter in inches by itself, the product by .7854, and this product by the length (also in inches), then divide the result by 277.

# Shell Inspection: What a Shell Inspector Should Know-II.

By Chief Examiner

*The profession of the eye with the increasing importance attached to quantity and quality of output under G.M.C. rules, is essential that inspection, to fulfill its purpose, must be applied with skill, honesty and intelligently. A little knowledge is sometimes dangerous if misapplied, and the author of this article endeavors to make clear the object of inspection, correct methods of applying it and incidentally the disastrous results attending ignorance or carelessness in performing the duties attached thereto.*

Final Inspection.

The final inspection of the shell is the most important of all, and the inspector must be careful and painstaking in his work. First see that the shell is clean. Dirt, grease and oil will not hurt. Machine oil collects dirt, and makes the scale slow.

After weighing comes the screwgauge. See that the threads in nose of shells are clean—not merely so-so—but CLEAN. Every little [illegible] and carelessness in this respect will mean considerable loss to the firm, not only in new gauges at $50.00 a time, but in rectifications, owing to the gauge being worn and misleading the inspector.

Before this should come the visual on fuse hole. See that the threads are clean and not damaged or torn in tapping; that the container seat is flat and not rounded at the edge; that the recess is not too wide; and that there are no burrs or sharpness at the top of the bore underneath the parallel portion below container seat. The screw gauge is the "low" and must go in the full length, without being forced at all. Its own weight should carry it home it must fit angle of fuse seat so that a .002 in. feeler can not enter, while a .001 in. feeler should not enter. After that, try the "high" to see that the diameter is not too great at the points of thread.

Now comes "bearing of recess from top of fuse-hole"; the H. and L. diamter of bore below fuse hole; see that the slots are equi-distant round the top of shell, and are deep enough; then pass on to the "body" rings H. & L.; the "cylinder" for concentricity of band with body; the form of "head" or "profile"; the "wall calipers" again; and the "dia. of driving band" (ring), "low." Now try the latter dimension "high" and at the same time, as you lift the shell out of the ring, turn it on its nose—base up-

for flaws which may have developed in facing off the base plate and see that

4 oz. hammer for looseness and listen

and clear. Then pass the "body" rings.

Second Visual

ing the band. Examine each shell visually, again, for the same defects as at preliminary, but especially for ghost lines if the shell has been in the varnish baking oven. The heat always brings these to the surface if they are prevalent in the steel. Next comes the "base distance"—the distance of base from driving band—H. & L.; the "width" of band, H. & L.; and the "form"; also "visual" on band for flaws and bruises and to see that the serrations are good. Then put the "body snap" over; then the length over all; and "base calipers." Don't forget to tap the band with the 4 oz. hammer, lightly, for looseness. If there is any vibration put on a new band. Everything being O.K., the shell now goes to be varnished and baked, after which the varnish inspector should see that it has an even continuous coat, with no "runnings," "overlappings," "crinkling," rust or grease spots, cracks, nor any foreign matter under or in the varnish.

It is now ready for the government men, and should be a correctly finished article if the shop inspectors have done their "bit" properly, honestly, and without fear or favor. Unfortunately, however, a man who is what he should be seldom holds his job, because he has of necessity to act in opposition to the foreman, who in his turn wants to get the shells shipped. Hence the necessity for government men who don't care what the foreman likes or dislikes.

### Regarding Proof Shells

Before leaving H.E. shell it would be well to say a word about the "proof." One shell is taken from each series, and on the success of this the fate of the whole series depends. If it fails, a second proof is sent, and if this fails, the series is rejected.

Think of it, you who inspect the shells for the firm—if the series is running at 501 and the proof fails, the firm stand to lose in machining alone somewhere around $1,000.00.

This proof is sent, in Canada, to Quebec to be proved. Two chisel cuts are placed half on the band and half on the steel in order to note the slip of the band. On the larger shells, the adapter carries chisel cuts also. Punch marks are made on the body for the "set up" and "set down" tests. The shell is carefully measured with micrometers at the punch marks, the wall thickness is gauged and the shell is filled with sand to the required weight. It is then fired into a sank bank. In the old country, proofs are fired from high tide to low tide, to avoid the concussion of the sand bank.

After recovery, it is again measured and gauged, the band and base plate—or adapter—are removed and the recess gauged. If any part of the shell has sprung, or given, or if the band or base plate have loosened, or if the band is not properly pressed into the groove and undercut; the shell is rejected, i.e., the proof has failed.

### Shrapnel Features

In the case of shrapnel,—the shell of which it is made contains more carbon than that used in high explosive, thus making it harder. It is further hardened, or tempered, at the machining plant. Forty per cent. of a shrapnel shell is filled with bullets, about the size of a marble, and the whole interior, after some of the component parts have been inserted, is filled up with rosin to prevent the bullets from moving about.

The inspection is, of course, different from that previously described, but the main principles are the same. Cleanliness, inside and out, is of the first importance. Defects in the manufacture of the steel, are much the same as in H.E., but in addition, "scale" is peculiar to shrapnel, and indicates defective material. Heavy scale denotes that the steel has been burned, and thereby deprived of its strengthening element—carbon. A further steel defect, peculiar to shrapnel, is the "water-crack." This is caused by uneven quenching, and also by water being mixed with the oil in tempering.

When inspecting shrapnel, examine the cup recess. This must be smooth and free from tool cuts and scratches. The cup must "seat down" correctly. The disc seating must also be correct because this component has an important function, and there must not be the smallest opening that would allow the rosin to get into the cup, and mix with the powder charge therein. The disc seating must have a square corner, no ridge or shoulder, and must on no account be eccentric. Examine carefully the walls; also the threads in nose, of which there must not be less than three. Look and feel for "pockets," which are sometimes caused at "heading-in," by the die becoming worn, or the shell not having been heated uniformly.

A tolerance is allowed in the thickness of shoulder, and a little lower down, but

absolutely none at the neck, or thinnest part of the wall. At this point, the thickness must be neither more nor less than .1 in.—1/10 inch. The shell must also be ground perfectly smooth externally.

**Components Assembly**

The driving band recess and undercut are examined in the same way as in H.E. shell. The cup and disc are inserted before heading or nosing in. The tube, which must be absolutely free from scratches inside, is screwed into the disc, and the center of the tube must be in the center of the shell. If not, the socket which is placed on the top end of the tube, and soldered there, will not fit. In this soldering, there must be no blow holes or other imperfections that would allow the rosin to boil out. Note the body just above the driving band, to see that it has not been squeezed when the D.B. was pressed on.

The cup is filled with black powder, at the loading plant—then the tube is filled up with three different kinds of explosive. When the time fuse starts work the flame passes down the tube, ignites the powder in the cup, and the bullets are forced towards the nose end, when the shell bursts at the neck. The entire nose of the shell flies off and the bullets spread out in the shape of a fan. A shrapnel shell always points towards the object at which it is aimed, when it bursts.

**Conclusion**

This article has been written in order to try and promote more interest in the actual inspection of shell than the mere "production at any cost." The better the article is made, the bigger the production, and the greater the safety of those who use them.

The writer met a returned soldier recently, who informed him that one of our own 4.5 in. shells hit him from behind, taking his right arm off just above the elbow. The driving band had slipped and the shell dropped too soon. Another returned man was the sole survivor of a gun crew—a shell had exploded prematurely, owing to a faulty base. There have been numerous cases where the fuse has blown out, the shell not bursting properly owing to the nose threads having been too large in diameter; also numerous cases where the fuse could not be screwed in because the diameter was too small. There is no time to make any repairs on the field of battle.

Every shell inspected by a government man carries the work mark of that man—his signature—covering the operation of inspection and impressed by him. This makes him responsible to his chief examiner, who is responsible to the assistant inspector for the district, who, in his turn, is responsible to his superior officers for his district. A good inspector or examiner is a man who is amenable to discipline, and who will let nothing interfere with his duty of inspection. All personalities must be put aside, and none of the good-fellow ideas taken advantage of. If the shell is right—pass it. If it is wrong—don't pass it, even if your own brother wants you to.

## ELECTRICITY FOR THE BRITISH NATION

ONE of the most far-reaching suggestions towards national reconstruction is set forth in an interim report made to the British Ministry of Reconstruction by the Coal Conservation Sub-Committee. The report is now issued to the public with the following preface by Dr. Addison:

"Minstry of Reconstruction.

"This report, which was presented to the Reconstruction Committee, is issued for the information of the public, and in the hope that the very important matters with which it deals may receive adequate consideration at the hands of all those likely to be affected by its proposals.

"It will be observed that important issues affecting municipalities and public bodies are raised in the report, and they will be explored in all respects by the Government before any action is proposed to Parliament upon the subject. In its legislative aspect the whole matter is being investigated by a Committee appointed by the Board of Trade, and presided over by Sir A. Williamson, M.P.

"(Signed) C. Addison."

The Sub-Committee proposes briefly, to supply all our industries with electrical power generated at big "superpower stations," not more than 16 in number for the whole country, and to eliminate or combine all smaller stations.

The primary object of the scheme is to economise our coal supplies. The amount of coal used in the United Kingdom for the production of power is 80,000,000 tons, at a cost of, say, £40,000,000 at the pithead. The Committee confidently states that, by an up-to-date and national scheme of electrification, 55,000,000 tons of this (£27,000,000 a year) could be saved. This, with a saving of the by-products now wasted by the burning of coal in open grates and boiler furnaces would effect a national economy of £100,000,000 a year.

**Economy Possibilities**

The most economical way of obtaining power from coal on a large scale is by generating electricity from it. The coal now used, says the Committee, would, if used economically, produce at least three times the present amount of power. An increased use of power is of the highest importance to the future prosperity of the country. It is the best way to increase the net output per head and, therefore, the prosperity of the worker. "The best cure for low wages is more motive power."

In the United States the amount of power used per worker is half as much again as in the United Kingdom. Leaving out of consideration workers in trades where the use of power is small or even impossible, it is probably nearly double what it is here.

It has been settled conclusively during the past 15 years that the most economical means of applying power to industry is the electric motor. In the factories put down for the production of munitions during the war, 95 per cent. of the machinery is driven by electricity, and it is only a question of time for all power to be applied in this way. The problem is not how to apply electric power but how best to generate it.

The development of electricity in this country has been hindered by the numerousness and the smallness of the electrical undertakings. At the present time the supply of electricity in Great Britain is split up among about 600 companies and municipal undertakings. The average generating capacity of such of these undertakings as possess power stations is only 5,000 horse-power, or about one-fourth of the capacity of one single generating machine of economical size, and about one-thirtieth of that of a power station of economical size. Technically and commercially the big generating station is admittedly the best.

**Proposed Reform Scheme**

The reform proposed by the Committee is to supersede all these small undertakings by laying down throughout Great Britain main trunk lines to be fed by some 16 "superpower stations."

The generating machines in these stations should be of large size, not less than 20,000 horse-power each. In more important industrial districts machines of as much as 50,000 horse-power might be used with even greater advantage. The generating station s should be on large sites with ample coal and water transport facilities. It is contemplated that at each generating station by-products might be extracted from the coal before it is used for the production of power, and that various electro-chemical processes which are essential for this country should be carried on near by. The sites for the stations must be outside, not inside towns. This would improve the health of the great industrial centres by the reduction of smoke, and would relieve the congestion of the railway lines in their neighborhood by practically abolishing the carriage of coal.

Various forms of electricity supply authority, both public and private, are considered, but the committee, on the whole, favors private enterprise. They are "impressed with the special need for initiative and resource in the management of the business of power supply, and they are of opinion that the freedom of range and keenness which are distinctive of private enterprise will be found to be in a high degree conducive to the fullest measure of success."

The 16 great power authorities, whether private companies or public bodies, would be controlled by a National Board of Electricity Commissioners. Existing plants would be handed over on equitable terms to the new authorities. In addition to the main generating stations, subsidiary generating plants would be set up wherever there was surplus gas or waste heat, as at blast furnaces and coke ovens, and the electricity so generated would be fed into the main-trunk system. In the same way, waste coal,

### Extreme Importance

As showing the importance of the scheme the report says: "It is scarcely possible to exaggerate the national importance of a technically sound system of electricity supply, because it is essentially one with the problem of the

dently (which is the position to-day) as it would be to have an efficient railway system if each municipal area owned its lines and long-distance transport was provided for by running power agreements. History shows that, in the early stages of railway development in this country, exactly the same process of amalgamation had to be gone through."

### REGARDING AERONAUTICAL INVENTIONS

All parties desiring to bring to the attention of the U.S. Government inventions pertaining to aeronautics, or suggestions for improvements of existing types of aircraft and their appurtenances, are requested to communicate with the National Advisory Committee for Aeronautics, Munsey Building, Washington, D.C., and to submit comprehensive outlines of the proposed devices, together with necessary drawings, data and the results of tests, if tests have been made.

All such suggestions and inventions are considered confidential, and where devices or suggestions of merit are submitted they are referred to the proper officials with suitable recommendations.

A special sub-committee on engineering problems has also been organized to assist in the work of examining inventions submitted.

Attention is called to the fact that many devices and proposals are submitted by persons unfamiliar with the principles and practices involved, hence such parties desiring to submit plans or devices should, as far as possible, secure competent scientific and technical advice before taking the time of the officials of the Government in examining devices or plans which clearly violate scientific laws or are contrary to the best aeronautical practice.

### BIG JUMP IN RADIUM

THE effect of war on prices has been more strikingly exemplified in the metal industries than anywhere else, particularly among metals which have practical use in war—although this includes nearly all of them. An article in the Railroad Red Book says the war pressure has been felt as keenly in the market for the rarest and costliest metal as in the commoner metals. Consequently the price of radium, which before the war was somewhere around $1,000,000 an ounce, is now approximately $2,800,000 an ounce.

Practically all the world's commercial supply of radium comes from the carnotite beds of Colorado and Utah, which also yield the rare metals uranium and vanadium. Even these deposits, however, are limited in extent and are difficult to work, and some of them are being worked out, so that the output of radium is likely to decrease rather than increase. Last year from 1,500 to 1,800 tons of carnotite ore was mined in Colorado, and this was considerably less than the quantity the previous year. The amount of radium extracted from a single ton of ore is infinitesimal.

### VOCATIONAL TRAINING FACILITIES INCREASED

ADDITIONAL machinery is being added by the Military Hospitals Commission to the equipment in the Calgary Institute of Technology and Art for the purpose of affording more returned men the opportunity to take up electrical and mechanical engineering.

The constantly increasing number of men returning from the front makes it imperative for the vocational training centres to be ready to receive them and grant them at once the training necessary to fit them to return to civil life.

In British Columbia, the vocational training facilities at the Shaughnessy Convalescent Hospital in Vancouver are being increased by the addition of twelve extra class rooms, while at Fairmont the equipment is to be supplemented by the addition of a big machine shop and drafting room. Accommodation will also be made for a large shoe repairing department.

#### Re-educational Centres

Provision for a centre of vocational re-education in Fredericton, N.B., is also being made in the fine vocational building now under construction there.

In carrying out its vocational re-education powers the Military Hospitals Commission has provided as wide a variety of courses as possible at all centres. The policy has been adopted, however, of developing centres of re-education with special equipment at important points as follows, Halifax, Montreal, Toronto, Guelph, Winnipeg, Calgary and Saskatoon.

Centres of re-education for agriculture are being developed at Guelph, Winnipeg, Saskatoon and at Olds, Alta., where the Provincial Department of Agriculture placed one of its agricultural high schools at the disposal of the Commission.

SIMPLICITY in cutting tools, so as to make them easy to sharpen and easy to replace, is the basis of good design. The designer should resist the temptation to allow his ingenuity to run away with his judgment. "Ingenious" tools spend most of their time in the tool room being kept in repairs, and the greatest production is nearly always obtained from a lay-out of a simple nature which is easily understood and taken care of by the operators.—Herbert.

ONE of the biggest difficulties connected with the quantity production of ships is the question of rivet driving. An idea of the magniture of the task may be obtained when it is said that if a concern were to build one ship a week, a weekly number of 650,000 rivets must be driven. When we consider that the best rivet drive is by a company which drives 250,000 per week, and the next best is by the three largest shipyards on the Atlantic coast, the magnitude of the task involved in driving 650,000 rivets in one week may well be imagined.

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## DEVELOPING PRESENT LABOR FOR FUTURE REQUIREMENTS

THE question of an ample supply of skilled labor wherewith to maintain Canada's industries in a desirable state of efficiency, both as to quantity and quality of output as well as variety of product, assumes an increasing importance with every month's continuance of the war.

The great activity in plant extension three years ago was accomplished by a plentitude of funds previously unavailable to most of our manufacturers, and the chance of thus securing high grade equipment was wisely taken advantage of. Had the same conditions obtained with the labor supply as with plant equipment, the prospects of successful competition in the future with world competitors would be very much brighter.

That we did not suffer more severely from the lack of really skilled labor was due to certain peculiar features of the situation—first, the type of product; second, the development of special purpose machines to suit unskilled labor; third, the availability of much skilled help from the United States.

The first two of these conditions will continue during the war only, while the third has been gradually disappearing since the States entered the war a year ago. It is stated that the call to arms there by both volunteering and conscription will soon have reduced the technical school attendance to one half, instead of it being doubled to meet the country's regular requirements. It is also stated further by the same authority that despite the present cessation of work in many lines and the lack of available capital for important projects of a peace character, the manufacture of war supplies has absorbed the young graduates of technical schools to such an extent that there is already a marked dearth of such assistance, which will become more and more accentuated as demand increases with military activity.

When one considers the enormous increase of Canada's machine shop products now over those of 1914, the industrial disturbance which must accompany anything like a return to pre-war outputs will result in much hardship, probably of a temporary nature only but sufficiently undesirable to make it the duty of both employers and employees to maintain themselves in a state of preparedness.

In reverting to peace products the phases of transition will probably be the exact reverse from those mentioned above. The type of product will become diversified instead of specialized; the completeness of design and finality of operation pertaining to one particular type of shell enabled exact methods of production to be outlined rapidly and effectively as each successive type of shell appeared. The specifications were placed on the producer's desk with, so to speak, instructions to go ahead.

Such will not be the case later; the manufacturer will have to find out what is wanted, may have to supply the necessary technical ability to design special products to meet varying demands from different countries, and his desire to go ahead and shove stuff through the factory like shells will be governed by his ability to dispose of them.

The fact that such conditions are more than probable causes further interest in the labor question, especially as to the availability and adaptability of women workers. This is a direct outcome of the second feature mentioned above, viz., the special purpose machine. It has been too frequently and too rashly assumed that because they have made good on shells they will make good on any class of machine shop work, but careful consideration gives pause to such anticipation.

The women who are making good now are not the same type as those who jumped into the game for the sake of temporary adventure coupled with high wages then prevailing. Conditions more nearly approach a normal state and the fashion-plate and society debutante are now eliminated along with their unsettling influence and unjustified usurpation of jobs which were a necessity for less favored individuals.

The amount of woman help thus permanently available is not sufficient in quantity or possessed of mechanical instinct or adaptability to permit any neglect by employers in regard to training and educating their present help. The necessity for immediate action becomes more evident when the improbability of the supply of help from the States again becoming plentiful is noted.

Because of its assumption of a man's share of the Allies' burden, financially and physically, the share which the American Republic will take in the work of reconstruction will be great in proportion and the probable stay abroad of many of the forces for such work in civilian capacity will prevent any available surplus at home.

It is therefore incumbent on all of our manufacturing firms, engineering or otherwise, to do all in their power to stimulate the interest of their employees in all branches of their work. Opportunities for machinist experience in shell shops are somewhat limited under present conditions, but the strong probability that an employer will need these men in the future, and need them plus, makes the question of present training and education a most vital one.

The greatest stimulation to study by shop hands is the knowledge that the management is watching their progress and that advancement is largely influenced by results attained. Firms who undertake educational work even in a limited way are more likely to be regarded with some degree of sentiment by the students, and when shells are forgotten and a hundred different things have to be investigated and produced, the firm which has the allegiance of its employees as a result of judicious apprenticeship and class work will be in an enviable position compared with those who take a chance on transient labor. The losses due to inefficient methods of utilizing permanent help and high proportions of floaters are enormous throughout the industry and employers owe it as a duty to themselves to reduce such losses by aiding in the gradual and complete improvement of their employees, physically and mentally.

# Milder Weather Affords Welcome Relief to Manufacturers

*Washington To Restrict Higher Copper Price Desired By Producers Machine Tool Market Quiet*

**THE temperature, although somewhat easier, is not yet [illegible]. The improvement in the weather has been of material assistance in the movement of freight but there still remains to be much [illegible] before the congestion is materially relieved. The coal situation, in the west and east, is coming in from the [illegible] Strict economy, however, must still be exercised in order to conserve available supplies and head off further drastic restrictions in consumption of fuel. The steel plants will benefit by the milder weather both in regard to easier operating conditions and heavier supplies of fuel. No substantial relief, however, is to be expected until next month when conditions will be more favorable. Advices from Washington state that restrictions are to be placed on the manufacture of steel for export. While this may not affect Canadian consumers engaged on war contracts, other consumers will likely be affected. The situation in the iron and steel trade in the States has not improved materially and the operations are still considerably below capacity due to the traffic congestion. The pig-iron situation is unchanged. The non-ferrous metal markets are devoid of any particular interest except that the price of zinc has been officially fixed by the United States Government. The copper market continues steady at unchanged prices. It is reported that an agitation is to be started for higher prices for copper in order to stimulate production. There is practically no spot tin on the market and some time must elapse before conditions show any material improvement. The scrap metal market is very dull and business quiet. Indications point to a continuance of prevailing conditions for some weeks. There has been little enquiry for machine tools and the market is quiet. Deliveries from United States builders are becoming more backward and prices are still very firm with an upward tendency on many lines.**

MONTREAL, Que., Feb. 18, 1918.—Owing to the fact that the first of the embargoes was ushered in with a heavy snowstorm in certain sections of the country, the reports that have been made regarding the results of the conservation order have been of a very encouraging character. The release of cars will relatively assist the railroad transportation problem. Disorganization, however, has been so general that it will take some little time to again return to normal operating conditions. To conserve the available ocean tonnage, shipping is being more and more confined to those essentials that are of primary importance for the successful prosecution of the war. Registration and inventory of labor resources with the purpose of utilizing the same to the best possible advantage, is being contemplated by the Government and the officials are now working on the details for putting the scheme into operation.

### Steel

The paralyzed condition experienced throughout every department of industry during the past two months, is showing [illegible] owing to the more moderate weather, which has materially assisted in relieving the congestion. [illegible] conditions are noted in furnace operation, as coke and [illegible] moved more [illegible] that the worst of the heavy weather is over, and from now on the railroads will be [illegible]. Steel production has shown a slight improvement but freight embargoes and accumulation of freight at various terminals [illegible]. New regulation in this respect has added to the nervous tone of the situation. As a result the mills are reluctant to accept orders other than those for Government requirements. Everything is being done to supply the demands of shipbuilders for the necessary plates and shapes, and in this connection capacity production is being urged. Work has commenced on the first of the fleet of merchantmen to be built by the Dominion Government; the first three vessels to be laid down will be of 4,350 tons, 8,200 tons and 3,800 tons, the first two at Montreal and the latter at Collingwood. The programme so far prepared includes about 40 ships, all of these to be laid down before the summer of 1919. Ten of the largest of these will be built on the Pacific coast but will be used in the Atlantic service during the war. Arrangements have been whereby an ample supply of plates will be obtainable from the American mills, contracts to be placed through the United States Purchasing Commission. Canadian railroads are still more or less congested and difficulty is still experienced in moving material to destination owing to embargoes and other troubles. Dealers report a good demand but are unable to accommodate customers owing to the inability to secure shipments of material. All quotations are firm and unchanged.

### Metals

The general tone of the metal situation is practically unchanged although strength is shown in some directions. Copper is well maintained but domestic consumers are operating under great difficulties. Tin is the center of interest and has again advanced, giving the situation a very strong tone. Spelter is inactive but a shade stronger. Lead has advanced on a quiet demand. Antimony and aluminum are both quiet and weaker.

**Copper.**—Although the available supply of copper is sufficient to meet all essential requirements, there is apparently little surplus for domestic use, and producers are showing some reluctance to release any of that held in stock owing to the possible contingencies that may arise, feeling that it is well to carry an over supply rather than be short. No doubt many consumers will be inconvenienced through this action of the refineries but it is well to recognize the fact that at any time heavy demands may be made for immediate quantities of metal. The local situation is relatively unchanged with no features of interest. Dealers report a steady market with quotations firm at 32c and 31c per lb.

**Tin.**—Further advances on the London market and the continued difficulty experienced in the obtaining of permits to ship tin from England and other eastern points had added to the strength of an already strong situation, which has been reflected in the market that prevails in the United States and also Canada. The demand for tin is quite heavy but the available supply is insufficient to meet all requirements, and therefore only the more essential needs are being supplied. Dealers, however, are in a little better position as the commandeering of tin is not so frequent. The New York situation is still very unsettled and quotations are generally of a nominal character but stronger than those of a week ago. Dealers here report considerable difficulty in obtaining supplies but are able to secure sufficient for all essential requirements. Quotations of 83½c show an advance of 4½c per lb.

**Spelter.**—The question of a fixed price on spelter is still deferred by the American Government and the market is more or less unsettled as a result. The situation, however, has taken on a little strength and prices are somewhat firmer. New York prices are maintained at

slightly below 8c. Local dealers are asking 11c, this being an advance of ½c over that of last week.

**Lead.**—No developments of special interest have transpired in the lead situation but the strength of the market can be indicated in the fact that the Trust price of lead in New York has been advanced ¼ cent per lb., to the base price of 7c; the market is, however, not active and the demand is quiet. Dealers here are quoting 9¾c or an advance of ¼c per lb. over last week.

**Antimony.**—The market is quiet both here and in New York, with an easier tone in the American situation, the quotation of 13¾c representing a decline of ¼c per lb. Dealers here continue to ask 18c but report a weak and declining market.

**Aluminum.**—The market is inactive with an undertone of weakness; the demand is light on the market quotation of 55c per lb., a decline over last week of one cent per lb.

### Machine Tools and Supplies

The demand for machinery has been slightly better than the previous week but the activity has been confined to equipment of a general character; munitions equipment is not very active although some little business is reported. Shipbuilding machinery has had a very fair week but tools requiring to be imported from the States are exceedingly difficult to obtain owing to the abnormal demands on all classes of machinery in the States and the necessity of securing shipping licenses before tools are permitted to leave the country. Canadian manufacturers are taking a greater interest in the production of such tools as are required for general domestic purposes and greater activity has been noted in the production of the recognized standard tools for general purposes. A Montreal firm is making preparations to manufacture a high grade type of tool room lathe, and hope to have the same on the market within a few months. The restrictions that are being placed upon the shipment of machine tools from the States will undoubtedly stimulate the production of such tools that have, up till now, been manufactured in America. Considerable business is being done in partly used machinery. Conditions in the supply market are about normal as the requirements for munitions operations and shipbuilding maintain a steady demand for small tools and general machine shop supplies.

### Scrap

The long expected regulations and the fixing of prices on certain scraps has at last materialized, as the American Government has adopted a schedule in relation to operations on some of the more important materials. A fixed price of $30 per ton has been placed on heavy melting steel, old iron car wheels, and No. 1 cast iron. A price of $35 per ton on low phosphorus steel, re-rolling rails, old steel wheels, No. 1 R. R. wrought iron, and $40 on standard low phoshorus steel. Cast borings and machine shop turnings have been set at $20 per ton. Dealers are permitted a commission of 3½ per cent. over these prices, when operating with consumers. The Canadian market has become a little steadier owing to these developments but activity is not pronounced; prices are comparatively firm in old iron and steel but old metals have a stronger tendency. No. 1 red brass turnings are now quoted at 16c per lb., an advance on the week of 2c per lb. Stove plate is stronger, the current quotation of $19 per ton being $2 higher than last week. Scrap zinc has advanced one cent. over that quoted last week, dealers asking 6½c per lb. Heavy lead shows an advance of 1½c, the quotation being 7c per lb.

## Toronto

TORONTO, Ont., Feb. 19.—Favorable weather conditions have enabled the railways to make a successful drive on fuel shipments, with the result that the situation locally has considerably improved and the threatened coal famine has been broken. There has also been a good movement of all kinds of freight, which will help to relieve the congestion. There is still a great deal to be done, however, before any permanent relief can be effected. Reports from Buffalo state that the Canadian market will likely suffer from a shortage of soft coal and that the situation will be serious. Supplies are understood to be far short of requirements in that city and the quality is often poor.

### Iron and Steel

Conditions in the iron and steel trade have somewhat improved, but not to a sufficient extent to justify the hope that the shortage of steel will be materially relieved in the near future. The improved weather has enabled the railways to tackle the freight congestion, but owing to the shortage of cars progress is rather slow. The steel companies are still suffering from lack of efficient transportation facilities and are not getting sufficient supplies of raw materials, nor are they able to ship the finished product as rapidly as is desirable. Operating conditions have improved somewhat, which should result in an increase in output. The export demand continues satisfactory principally from customers in India, New Zealand, Australia and South Africa, but shipping space is limited, and shipments are slow in moving. If it was not for the shortage of tonnage the export trade would be considerably heavier. At present shippers are handicapped by traffic congestion and lack of tonnage.

The American Government is discouraging the manufacture of iron and steel for export. Manufacturers have been notified not to produce export material until export licenses are secured. The principle involved is that iron and steel products have been placed on the conservation list. Incidentally this gives the Government a measure of control over prices at which commercial steel for export is sold. Technically it does not come under the set price regulations, the principle of set prices having been agreed upon last September to cover material bought by the United States Government, by the Government's Allies, and by the general domestic trade. The above will probably not affect Canada in so far as war work is concerned, but will likely lessen the supply of material available for consumers not engaged upon war orders. Traffic conditions across the line continue unsatisfactory, and there is still a large tonnage of steel of various descriptions awaiting shipment from the mills, yards and warehouses. Practically every mill is up to the limit of its storage capacity in warehouse and yard. The steel industry in the States is estimated to be now operating on a 50 per cent. basis, and no decided improvement is to be expected for several weeks.

The merger talk connecting the Dominion Steel Corporation and the Nova Scotia Steel & Coal Co. seems nearer realization than former reports have been. It now appears likely that the Dominion Steel Corporation will be the controlling interest and that developments may be expected in a few weeks.

### Scrap

The scrap market is still very unsettled and depressed and the freight congestion continues to curtail business on account of the difficulties of shipping and receiving material; no decided improvement is expected until the spring, when conditions generally will be more favorable. Prices of steel and cast iron scraps alone are firm, although unchanged, and stocks of these materials are low. There is not much of a demand for brass or copper scraps, and prices of these materials have a lower tendency.

### Machine Tools

This week has been a quiet one in the machine tool market. The demand for machinery for munitions is dull and consists of a few single tools for replacements or increasing production. There have been a few scattered inquiries for equipment for shipbuilding. Considerable difficulty is still being experienced in getting some lines from the United States on account of the heavy demand for machine tools in that country. The situation in regard to deliveries is becoming more acute, as the builders have more business than they can conveniently handle. Prices are still very firm, with an upward tendency.

### Supplies

Business in machine shop supplies is fairly active and prices are holding firm. Difficulty is still being experienced in getting some lines of supplies on account of the raw material situation, although no shortage in any particular line has been reported. Canadian crude oil has advanced, but there has been no change as yet in prices of gasoline or other refined products.

### Non-Ferrous Metals

There have been no developments of particular importance in the non-ferrous

last week. The copper situation is unchanged. [illegible] of copper in the United States has been curtailed in recent weeks by the severe weather, but a new wave of activity is starting which is expected to result in the largest output of copper, each month from now on, that has ever been recorded. Lake and electrolytic are unchanged at 29c and casting at [illegible] per pound.

**Tin.**—There is no improvement in the tin situation. Spot supplies of tin continue extremely scarce and command almost any price holders care to ask. From now on the requirements of customers on this continent will be filled direct from the Far East. As deliveries from primary sources to New York and Eastern Canada take at least 90 days, it may be several months before any real relief is experienced from the tin shortage. Quotations are entirely nominal at 80c per pound.

**Spelter.**—The maximum price of grade A zinc has been officially fixed at 12c per pound f.o.b. St. Louis, subject to [illegible]. A maximum of 14c per pound for plate zinc f.o.b. at plants and 15c per pound for sheet zinc f.o.b. at plants has been fixed, subject to the usual trade discount. The market is quiet and local price unchanged at 9½c per pound.

**Lead.**—The lead situation is unchanged, although an active buying movement would likely send prices up. At present there is no indication of any material fluctuation. Local price, 9c per pound.

**Antimony.**—The market has been rather unsettled by cheaper offerings from the Far East, but quotations are unchanged at 17c per pound.

**Aluminum.**—There is a better tone to the market, with more inquiry. Local price, 52c per pound.

## New York

NEW YORK, Feb. 16.—Several contracts for projectiles have been placed by the Government in the last few days and large additional contracts will be [illegible]. None of the shell makers have purchased any tools, but in anticipation of larger Government orders manufacturers holding Government orders have also bought shop equipment. Among the purchasers are the Standard Roller Bearing subsidiary of the Marlin-Rockwell Corporation, Philadelphia, and the Babcock & Wilcox Co., of Bayonne, N.J. Arthur Brock, Jr., Philadelphia, has purchased screw machines. The British Government has placed a contract for the manufacture of parts of the Rolls-Royce motor with the H. H. Franklin Manufacturing Co., Syracuse, N.Y. To execute this order the latter company has reduced its output of automobiles by 40 per cent.

Purchases of drills are about to be made by the Government for the manufacture of gas masks at the Long Island City factory, which is being operated under the direction of the medical department of the army, and is known as the Gas Defence plant. The Simplex Automobile Co., which is manufacturing airplanes of the Italian type, has bought a number of grinders. The Duesenberg Corporation, Newark, which has secured the Fiatt automobile plant at Poughkeepsie, N.Y., for the construction of airplane motors of another Italian type, is expected in the market for machine tools soon, and will later make heavier purchases when the plant extension at Newark, which is just begun, has been completed.

munitions are again buying machinery on a liberal scale. The Savage Arms Corporation has issued a list for several hundred new tools for installation at its Utica, N.Y., plant, by which output will [illegible] when the new equipment is in operation it is designed that the Utica factory will manufacture 300 Lewis machine guns a day. It is now turning out 130 guns of this type daily.

### Arms and Aviation

A new order for 9.5 in. shells has been given to the Picatinny Arsenal at Dover, N.J., and an order for the same size shells has been given to the A. P. Smith Manufacturing Co., East Orange, N.J. Word comes from the trade that the Pollock Steel Co., with a plant at Cincinnati, has been awarded another contract for 8-in. shells.

The Watervliet Arsenal has made a few additional purchases of tools in this market, and several private manufac-

**CANADIAN GOVERNMENT WAR PURCHASING COMMISSION**

**The following gentlemen constitute the new war Purchasing Commission. Sir George Foster, Minister of Trade and Commerce; Frank P. Jones, Montreal; J. W. McConnell, Montreal; James H. Gundy, Toronto; Charles McNaught, Toronto, and Joseph Gibbons, Toronto. C. A. Magrath, as Fuel Controller, and Hon. H. Laporte, as chairman of the War Purchasing Commission, are members of the board ex-officio. Sir George Foster is Chairman of the Board.**

### General Contracts

Inquiries are in the market for eight locomotive cranes for construction work on the powder plants which are being built for the United States Government by the Du Pont Powder Co., and large purchases of machinery as well as of small cranes will also be necessary for these various plants. Greater activity is evident in the demand for cranes, and there is increased competition among manufacturers for the business that is coming out; some of the larger companies can now make shipments in four to six months. The American Smelting & Refining Co. has bought a crane for shipment to its Chili, South America, copper works, and the Brooklyn Rapid Transit Co. is understood to have virtually closed for an electrical travelling crane, 85-foot span, for the Williamsburg power house.

Structural work on Government account is active, revised bids having been taken by the Signal Corps of the army on a number of hangars in units of 100, which will be built in France. It will be recalled that estimates of the steel required for the building of these sheds for the allies and the United States Governments amount to approximately 100,000 tons. According to trade estimates, fabricated structural steel work placed in January amounted to 80,000 tons. The official report of the Bridge Builders' Society will be available early next week.

## Washington

WASHINGTON, Feb. 16.—The United States is confronted to-day with conscription of labor. The labor shortage and growing numbers of strikes have brought the Administration face to face with the fact that there must be quick and drastic action if the full force of the industries of the United States is to be felt in the European war.

### Labor Situation Critical

There is well-founded rumor in Washington that President Wilson has become so aroused over the labor situation that he is inclined towards a proclamation conscripting labor. Such action would meet with violent opposition from labor leaders. Samuel Gompers, president of the American Federation of Labor, has appeared within the week before Congressional committees to tell them that there is no labor shortage, but there is maladjustment of labor. He contends that there have been no proper facilities for distributing labor to points where it is needed. Despite these protests of a plentiful labor supply coming from the labor leaders, it still remains a fact that industries throughout the entire United States are failing to meet their contracts because of an inadequate labor supply.

The labor situation, as it regards the shipbuilding industry, is the most vital question now confronting the Government. With a general strike among shipbuilders called on the Atlantic coast,

there seems to be a very well founded fear that the shipping programme of the United States will be seriously interrupted. A joint commission of members of the National Council of Industrial Safety and the American Federation of labor is struggling with the problem and attempting to reach a settlement which will stop any prolonged strike and tie up of the shipbuilding industries of the Atlantic coast, where the majority of the work in building a merchant marine is being done.

All foreign trade in the United States imports and exports are now under license. This step has just been taken in accordance with a proclamation issued by President Wilson and was determined on to form a part of the general programme of the Allies to release ships for transport service.

### Shipbuilding Query

The first keel for the portion of the American merchant marine to be built at Hog Island, Penn., was laid this week. At the same time President Wilson ordered a thorough investigation to be made to determine whether the charges of extravagance of Government funds at Hog Island are substantiated to a sufficient degree to bring criminal action. The investigations of the Senate Commerce Committee have brought out evidence that the American International Corporation estimated the cost of a shipyard of fifty ways at Hog Island at $21,000,000. Already more than $28,000,000 have been spent, and the plant is still far from completion, while only one keel has been laid for the fifty vessels which the corporation is under contract to produce. It has been testified that the total cost to the Government will be $42,000,000. Charges have been made of gross inefficiency, of thousands of laborers employed at the yard and under Government salary with no work to do. The Senate Commerce Committee will send a subcommittee to the yards to investigate during the coming week, and the Department of Justice has already started a separate investigation. There has been intimation from the Shipping Board that the contract with the American International Corporation will be cancelled and the Government will take over the task of finishing the yard, which was planned to be the largest shipyard in the world. In this plant lays the test of America's shipbuilding capacity. It has been characterized by experts as "the most stupendous task" in the history of industry, for according to plan it was to have been completed in less than a year, with ships being turned out in some eight months' time. There is every indication now that the project has at least failed in part. The officers of the American International Corporation declare they are on schedule, and they have had to forget costs in the interests of speed.

The industry of the United States is once more on a normal basis of six working days a week. The order of Dr. Garfield, Federal Fuel Administrator, closing all factories manufacturing non essentials or unengaged in any war industry, has been revoked. This has been brought about in part by the clemency of the weather and the untangling of railroad congestion, which has allowed coal to move more freely in the past two weeks than it has done at any other time since late fall.

### Concrete and Submarines

The United States Shipping Board is not going ahead with its plans without trying some experiments at least. Chairman Hurley has reported to the Senate Commerce Committee that the Shipping Board is now experimenting with concrete vessels. There are three ships of this construction now being manufactured, and if they prove to be seaworthy and practicable a number of contracts for concrete vessels will be let.

The Navy Department has announced that a new type of submarine destroyer is now being constructed at the Ford automobile plant in Detroit. This vessel will be of light draft and will be transported overland to the coast. It is stated that within a short time quantity production will begin and the little ships will be constructed in less than thirty days' time.

War for a reorganization of the war machinery of the United States still goes on in Congress. Speeches for a greater centralized power over the industries of the nation are still being made in both the Senate and the House. Little hope is extended, however, that the United States will at this time adopt the plan of a director of munitions.

The United States navy is asking for bids on a quantity of miscellaneous hardware. Manufacturers desiring to bid should write to the Bureau of Supplies, Navy Department, Washington, D.C., asking for schedules 1687, 1686, 1680, and 1688.

## Pittsburgh

PITTSBURGH, Pa., Feb. 16.—There has been no iron and steel market, in the ordinary sense of the term, for weeks past, because shipments of pig iron and steel were far short of contract obligations, and shipments were small because the railroads were unable to handle more material, and the railroads were in that position by reason of the weather. Hence the dominant factor in the iron and steel situation is the weather, and the important news of the week is that there have been seven days of very favorable railroad weather since last report, making a spell of favorable weather of 11 days to date, with temperatures averaging about 40° and scarcely any precipitation.

### Railroads Make Improvement

The railroads have made excellent progress in clearing up congestion. In tangible results, by way of there being heavier shipments of pig iron or finished steel products, the trade observes very little improvement, but that circumstance arises from the nature of the case. The railroad executive have addressed themselves to the clearing of congestion caused by loaded cars in yards and on sidings. A large amount of freight has been moved forward to destination and receipts at nearly all points have been heavy, but thus far the return of empty cars has continued relatively light. Obviously the moving of freight already en route was the most important work to undertake but the railroad executives were doubtless quite conscious of the fact that if a large increase in the supply of empty cars to shippers were effected they would be offered a correspondingly larger amount of freight to move.

Receipts of coke at blast furnaces the past week have been very heavy and have represented the major portion of the coke that was stalled en route. Shipments from Connellsville ovens have not increased materially. For the six days of the week car supplies in the coke region have been, respectively, 70, 30, 35, 40, 20 and 30 per cent. of allotments. Production of pig iron has increased very considerably while steel works operations have increased but slightly, and some pig iron has been accumulating. For weeks past there have been railroad embargoes that covered nearly all consuming points, and permits to ship through or into the embargoed territory have been very difficult to secure. Up to date there has been very little easing off in this respect, and shipments of finished steel from mills in the past week cannot be estimated at more than 60 per cent. of capacity. The average thus far this year is a trifle under that, about two-thirds of the material being war material and no more than one-third ordinary commercial steel.

By an order issued the middle of the week the "Garfield Mondays" have been canceled, and plants are now entirely free from the fuel saving order, which closed plants for the five days ended with Tuesday, January 22, and three Mondays succeeding. The original order contemplated closing for six Mondays in addition. While Fuel Administrator Garfield took the entire responsibility for the order, it is the firm belief in the trade that the railroad administration was really responsible for it, its rescinding being of course based upon better traffic conditions developed since.

### Steel Production

Reports of the American Iron and Steel Institute show that 29 steel making concerns which in 1916 produced 88.14 per cent. of the country's total output of steel ingots (disregarding castings) made 2,733,722 gross tons of ingots in December and 2,203,845 tons in January. Allowing for the producers not reporting, the figures indicate that the annual rate of steel ingot production was 38,340,000 tons in December, and 28,620,000 tons in January. The most conservative estimate admissible is that there is 47,000,000 tons capacity at present, and it is possible the capacity may really be close to 50,000,000 tons. Thus the production in January was at not

rapidly once the improvement is really [illegible] supply of pig iron for the steel works [illegible]

Shipments, and in turn production, may increase rapidly in the next few weeks and the question is whether there will be sufficient commercial demand to absorb the steel. Since the first of the year shipments have been at about 40 per cent. of capacity in war material and 20 per cent. in commercial steel, or 60 per cent. altogether. There is no occasion to make any great increase in the shipment of war steel, which has been at very nearly an adequate rate. With improved traffic conditions the demand for commercial steel may greatly increase, but it is rather questionable whether it could increase enough to furnish full employment to all the steel making capacity.

For some time export houses have found steel mills quite unwilling to quote on export business, and with such unanimity as to create suspicion that they were acting under more or less definite instructions. In the past week it has been announced officially that the War Industries Board has ruled that mills should not begin producing any export material for which an export license has not already been granted by the War Trade Board. This was followed by announcement in Washington yesterday that all foreign trade, both imports and exports, all commodities, was put under license. One object, of course, is to conserve merchant shipping space. Another object, doubtless, is to curtail unessential industrial activity, in which matter there are many who feel the Government has pursued altogether too lax a policy in the past. As to iron and steel, another object, which will be developed by the freedom or otherwise with which export licenses are granted, is doubtless to exercise control over prices, for the present set prices are by agreement made to apply to purchases by the Government, its Allies, and [illegible]

[illegible] that non-contiguous countries in

# Enlarged Canadian Trade Intelligence Service

**Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.**

CHILE—Valparaiso, British Consul General.

COLOMBIA—Bogota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT—Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General..

INDIA—Calcutta, Director-General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul. Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA—Caracas, British Vice-Consul.

BRAZIL—Bahia, British Consul. Rio de Janeira, British Consul General.

# Canadian Commercial Intelligence Service

**The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.**

### CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address, Canadian

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address. Cantracom.

UNITED KINGDOM—Harrison Watson, 73 Basinghall Street, London, E.C.2, England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Anne's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Cantracom.

### CANADIAN COMMERCIAL AGENTS.

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—C. E. Sontum, Grubbegd No. 4 Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

### CANADIAN HIGH COMMISSIONER'S OFFICE.

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England Cable address, Dominion, London.

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago | 37 50 |
| Standard low phos., Philadelphia | |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 33 00 |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | | |
| Victoria | | 50 00 |

## FINISHED IRON AND STEEL

| Per lb. to Large Buyers. | Cents |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 5 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 5 75 |
| Chequered floor plate, 3-16 in. | 13 20 |
| Chequered floor plate, ¼ in. | 13 00 |
| Staybolt iron | 8 50 |
| Bessemer rails, heavy, at mill | |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | *3 50 |
| F.O.B., Toronto Warehouse | |
| Steel bars | 5 50 |
| Small shapes | 5 75 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

## FREIGHT RATES

Pittsburgh to Following Points

| | Per 100 lbs. C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 35.1 | 45.5 |
| Halifax | 35.1 | 45.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

## METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $32 00 | $29 00 |
| Electro copper | 32 00 | 29 00 |
| Castings, copper | 31 00 | 28 00 |
| Tin | 82 00 | 80 00 |
| Spelter | 11 00 | 9 50 |
| Lead | 10 00 | 9 00 |
| Antimony | 18 00 | 17 00 |
| Aluminum | 55 00 | 52 00 |

Prices per 100 lbs.

## PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¼ to ½ | $10 00 | $10 00 |
| Heads | 10 30 | 10 30 |
| Tank plates, 3-16 in. | 10 10 | 10 10 |

## WROUGHT PIPE

Effective Feb. 5, 1918.

| | Black | Galvanized |
|---|---|---|
| **Standard Buttweld** | Per 100 feet | |
| ⅛ in. | $ 6 00 | $ 8 00 |
| ¼ in. | 5 16 | 7 29 |
| ⅜ in. | 5 16 | 7 29 |
| ½ in. | 6 55 | 8 12 |
| ¾ in. | 8 28 | 10 41 |
| 1 in. | 12 24 | 15 39 |
| 1¼ in. | 16 56 | 20 82 |
| 1½ in. | 19 80 | 24 89 |
| 2 in. | 26 64 | 33 49 |
| 2½ in. | 42 72 | 53 53 |
| 3 in. | 55 85 | 70 00 |
| 3½ in. | 70 84 | 87 86 |
| 4 in. | 83 93 | 104 10 |
| **Standard Lapweld** | | |
| 2 in. | $ 29 60 | $ 36 08 |
| 2½ in. | 44 46 | 54 70 |
| 3 in. | 58 14 | 71 53 |
| 3½ in. | 72 68 | 90 62 |
| 4 in. | 86 11 | 107 37 |
| 4½ in. | 97 79 | 122 56 |
| 5 in. | 114 00 | 142 82 |
| 6 in. | 147 80 | 185 28 |
| 7 in. | 192 80 | 241 57 |
| 8 L in. | 202 50 | 253 75 |
| 8 in. | 233 30 | 292 32 |
| 9 in. | 279 50 | 350 18 |
| 10 L in. | 259 20 | 324 80 |
| 10 in. | 333 70 | 418 18 |

Prices—Ontario, Quebec and Maritime Provinces.

## WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

## OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 22 50 |
| Copper, heavy | 22 50 | 22 50 |
| Copper wire | 22 50 | 22 50 |
| No. 1 machine composition | 21 00 | 20 50 |
| New brass cuttings | 16 00 | 14 00 |
| Red brass turnings | 17 00 | 17 00 |
| Yellow brass turnings | 12 50 | 12 50 |
| Light brass | 10 00 | 9 50 |
| Medium brass | 14 00 | 12 00 |
| Heavy brass | 15 00 | 14 00 |
| Heavy melting steel | 21 00 | 21 00 |
| Steel turnings | 12 00 | 12 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 23 00 | 18 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 23 00 |
| No. 1 machine cast iron | 27 00 | 25 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 17 00 | 13 00 |
| Car wheels, iron | 26 00 | 25 00 |
| Steel axles | 38 00 | 35 00 |
| Mach. shop turn'gs | 9 00 | 8 50 |
| Cast borings | 12 00 | 12 00 |
| Stove plate | 19 00 | 19 00 |
| Scrap zinc | 6 50 | 6 50 |
| Heavy lead | 7 50 | 7 00 |
| Tea lead | 5 00 | 5 75 |
| Aluminum | 25 00 | 20 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, ⅜" and less | 10 |
| Carriage bolts, 7-16 and up | net |
| Coach and lag screws | 25 |
| Stove bolts | 55 |
| Plate washers | List plus 20 |
| Elevator bolts | 5 |
| Machine bolts, 7-16 and over | net |
| Machine bolts, ⅜ and less | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | 10 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | add 25 |
| Nuts, square blank | add $1 50 |
| Nuts, square, tapped | add 1 75 |
| Nuts, hex., blank | add 1 75 |
| Nuts, hex., tapped | add 2 00 |
| Copper rivets and burrs, list plus | 30 |
| Burrs only, list plus | 50 |
| Iron rivets and burrs | 15 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 37½ |
| Wood screws, O. & R., brass | 32½ |
| Wood screws, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

## MILLED PRODUCTS

| | Per Cent. |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil. Head Cap Screws | net |
| Flat ⅞ But. Hd. Cap Screws plus | net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. & Semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2 in. | plus 10 |
| Studs | net |
| Taper pins | 40 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | list plus 20 |
| Collar screws | list plus 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | 65 |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add 7 00 |

## BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $47 50 |
| Open-hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.

F.O.B. Pittsburgh.

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails | $5 25 $5 20 |
| Cut nails | 5 70 5 65 |
| Miscellaneous wire nails | 60% |
| Spikes, ⅜ in. and larger | $7 50 |
| Spikes, ¼ and 5-16 in. | 8 00 |

## ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 41 |
| Plumbers' oakum, per lb. | 0 09 |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila rope | 0 33 |
| New Zealand hemp | 0 33 |
| Transmission rope, Manila | 0 45 |
| Cotton rope, ¼-in. and up | 0 47 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | net |

Putty, 100-lb. drums .... 4 75

CARBON DRILLS AND REAMERS

| | Per cent |
|---|---|
| S.S. drills, wire sizes up to 52 | 30 |
| S.S. drills, wire sizes, No. 53 to 80 | net |
| Standard drills to 1½ in. | 30 |
| Standard drills, over 1½ in. | 30 |
| [illegible]ted drills, plus | 10 |
| Jobbers' and letter sizes | 20 |
| Bit stock | 25 |
| Ratchet drills | 15 |
| S.S. drills for wood | 30 |
| Wood boring brace drills | 25 |
| [illegible]tricians' bits | 30 |
| [illegible] | 40 |
| [illegible] | 40 |
| [illegible]r pin reamers | net |
| Drills and countersinks...list plus | 30 |
| Bridge reamers | 52½ |
| Centre reamers | 10 |
| Chucking reamers | net |
| Hand reamers | 10 |

COLD ROLLED SHAFTING

At mill ..... list plus 40%
At warehouse ..... list plus 50%
Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

| | | |
|---|---|---|
| Sheets, black, No. 28 | $ 9 50 | $ 8 50 |
| Sheets, black, No. 10 | 12 00 | 12 00 |
| Canada plates, dull, 52 sheets | 9 00 | 9 00 |
| Canada plates, all bright | 10 50 | 10 50 |
| [illegible] galvanized | [illegible] | [illegible] |
| Queen's Head, 28 B.W.G. | [illegible] | [illegible] |
| Fleur-de-Lis, 28 B.W.G. | [illegible] | [illegible] |
| Gorbal's Best, No. 28 | [illegible] | [illegible] |
| Colborne Crown, No. 28 | [illegible] | [illegible] |
| Premier, No. 28 U.S. | 9 45 | 9 45 |
| Premier, 10¾ oz. | 9 75 | 9 75 |

PROOF COIL CHAIN

[illegible] for B.B. Cham, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $15.50; 3-16 in., $11.70; ¼ in., $8.40; 5-16 in., $7.40; ⅜ in., $6.35; 7-16 in., $6.35; ½ in., $6.35; ⅝ in., $6.35; ¾ in., $6.35.

Prices per 100 lbs.

FILES AND RASPS.

| | Per cent |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 40 |
| Black Diamond | 40 |
| J. Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 37½ |
| Disston | 50 |
| Whitman & Barnes | 50 |

COAL AND COKE

Solvay Foundry Coke
Connelsville Foundry Coke
Steam Lump Coal
Best Slack

Net f.o.b. Toronto.

BOILER TUBES.

| | Seamless | Lapwelded |
|---|---|---|
| 1 in. | $36 00 | $ |
| 1¼ in. | 40 00 | |
| 1½ in. | 43 00 | 36 00 |
| 1¾ in. | 43 00 | 36 00 |
| 2 in. | 50 00 | 36 00 |
| 2¼ in. | 53 00 | 38 00 |
| 2½ in. | 55 00 | 42 00 |
| 3 in. | 64 00 | 50 00 |
| 3¼ in. | | 58 00 |
| 3½ in. | 77 00 | 60 00 |
| 4 in. | 90 00 | 75 00 |

Prices per 100 ft., Montreal and Toronto.

OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | 52 |
| Royalite, per gal., bulk | 17 |
| Palacine | 20 |
| Machine oil, per gal. | 26½ |
| Black oil, per gal. | 15 |
| Cylinder oil, Capital | 45½ |
| Cylinder oil, Acme | 36½ |
| Standard cutting compound, per lb. | 0 06 |
| Lard oil, per gal. | $2 50 |
| Union thread cutting oil antiseptic | 88 |
| Acme cutting oil, antiseptic | 37½ |
| Imperial quenching oil | 39½ |
| Petroleum fuel oil | 13½ |

BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30-5% |
| Standard | 40% |
| Cut leather lacing, No. 1 | 1 95 |
| Leather in sides | 1 75 |

TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 06 |
| Emery glue | 15 to 20 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 35 |

Prices Per Lb.

BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 38 |
| Brass sheets, 24 gauge and heavier, base | 0 43 |
| Brass tubing, seamless | 0 46 |
| Copper tubing, seamless | 0 48 |

WASTE.

| White. | Cts. per lb. | | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 18½ |
| Peerless | 21 | X Empire | 17¼ |
| Grand | 19¾ | Ideal | 17¼ |
| Superior | 19¾ | X press | 16 |
| X L C R | 18½ | | |

Colored.

| | | | |
|---|---|---|---|
| Lion | 15 | Popular | 12 |
| Standard | 13½ | Keen | 10½ |
| No. 1 | 13½ | | |

Wool Packing.

| | | | |
|---|---|---|---|
| Arrow | 25 | Anvil | 15 |
| Axle | 20 | Anchor | 11 |

Washed Wipers.

| | | | |
|---|---|---|---|
| Select White | 11 | Dark colored | 09 |
| Mixed colored | 10 | | |

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard ... 10% Best grades .. 15%

ANODES.

| | |
|---|---|
| Nickel | .50 to .54 |
| Cobalt | 1.75 to 2.00 |
| Copper | .44 to .46 |
| Tin | .49 to .56 |
| Zinc | .23 to .25 |

Prices Per Lb.

COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | 42 50 | 43 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 46 00 | 44 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 48 00 | 48 00 |
| Copper sheet, planished, 16 oz. base | 57 00 | 45 00 |
| Braziers,' in sheets, 6x4 base | 45 00 | 44 00 |

LEAD SHEETS.

| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $13 25 | $13 25 |
| Sheets, 3½ lbs. sq. ft. | 13 25 | 13 25 |
| Sheets, 4 to 6 lbs. sq. ft. | 12 50 | 12 50 |

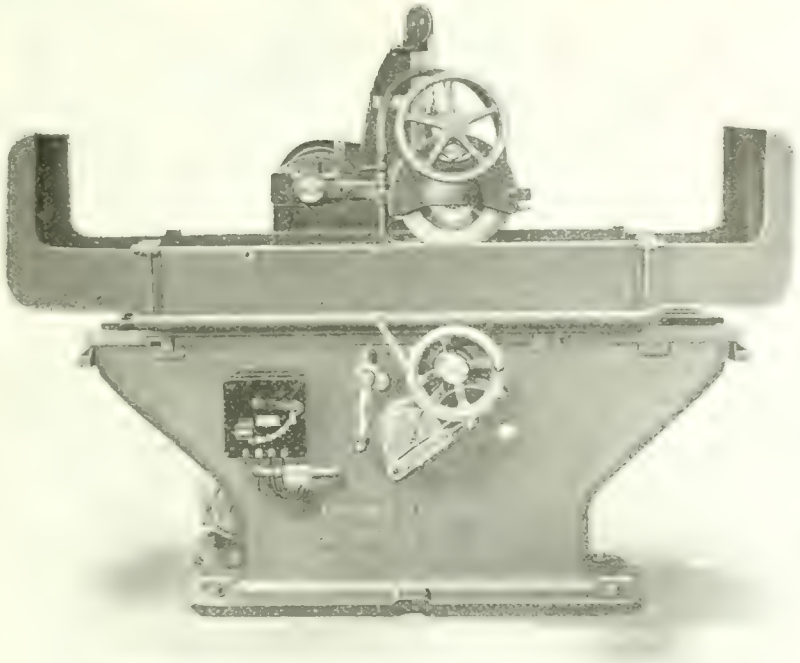
Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

| | |
|---|---|
| Acid, boracic | $ .15 |
| Acid, hydrochloric | .05 |
| Acid, hydrofluoric | .14½ |
| Acid, nitric | .10 |
| Acid, sulphuric | .05 |
| Ammonia, aqua | .08 |
| Ammonium carbonate | .15 |
| Ammonium, chloride | .11 |
| Ammonium hydrosulphuret | .40 |
| Ammonium sulphate | .07 |
| Arsenic, white | .12 |
| Copper, carbonate, anhy | .35 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .70 |
| Iron perchloride | .20 |
| Lead acetate | .16 |
| Nickel ammonium sulphate | .12 |
| Nickel carbonate | .35 |
| Nickel sulphate | .15 |
| Potassium carbonate | .75 |
| Potassium sulphide (substitute) | .20 |
| Silver chloride (per oz.) | .65 |
| Silver nitrate (per oz.) | .55 |
| Sodium bisulphite | .10 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .41 |
| Sodium hydrate | .04 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | .14 |
| Tin chloride | .60 |
| Zinc chloride | .60 |
| Zinc sulphate | .09 |

Prices per lb. unless otherwise stated.

# DIAMOND HEAVY-DUTY SURFACE GRINDERS



**Made in 4 Sizes to grind from 12" x 12" x 24" to 16" x 20" x 60"**

***Belt or Motor Drive Automatic Feeds***

**Bed and Column are of integral construction giving great rigidity, therefore large production.**

*EARLY DELIVERIES*

*Write for prices.*

## The A. R. Williams Machinery Company, Limited

64 W. Front St., Toronto

# *Tycos*

## TEMPERATURE INSTRUMENTS

Indicating — Recording — Controlling

Mercurial, Recording and Index Thermometers for all industrial and laboratory applications.
Electric Contact Thermometers.
Temperature, Pressure and Time Regulators.
Mercury Column Vacuum Pressure and U Gauges.
Base Metal, Rare Metal and Radiation Pyrometers.
Fery Radiation Pyrometers.
Hygrometers.
Hydrometers.
Mineral Oil Testing Instruments.
Aneroid Barometers.
Mercurial Barometers
Recording Barometers.
Pocket Compasses
Surveying Compasses
Rain Gauges.
Anemometers
Air Meters
Thermographs
Hand Levels.
Aviation Barometers.
Inclinometers.
Sphygmomanometers
Fever Thermometers.
Urinary Glassware.
Thermometers of all kinds for home and general use.

ENGRAVED STEM THERMOMETERS

Made of special glass and with bore above mercury column insuring stability and resistance at high temperatures. A vital feature of their construction is the *Tycos* process of artificial ageing, which secures permanent accuracy of scale indications.

The valuable *Tycos* catalogue will be mailed you on request.

*Taylor Instrument Companies*
ROCHESTER, N.Y.
210 Royal Bank Bldg., Toronto

# NOSING DIES

## *For All Sizes of Shells*

Recently we told in this space of a Nosing Die in use in our own shops which had nosed 35,000 shells, and was still working. This die is still in use, and doing good work.

We now publish the following letter from one of our customers as a further proof of the long life of our CHILLED IRON NOSING DIES.

Messrs. March & Henthorn,
Belleville, Ont.

Gentlemen,—

We have been using your Nosing Die in our shop for six months past and they have given better satisfaction than anything we have yet tried. The die which we are now using has nosed nearly 10,000 shells and it is as good as ever and no doubt will nose a great many more.

We would say that the material you are using for these dies at present seems to be very good, and we are getting the same satisfaction.

Yours truly,

Name given on application if required.

We make these Chilled Iron Nosing Dies for the various sizes of Shrapnel and High Explosive Shells, and also for the .75 Millimeter French Shell.

We also make Chilled Iron Sleeves for Forging Billets for the .75 Millimeter Shells.

## MARSH & HENTHORN, Ltd.

BELLEVILLE ONTARIO

*If any advertisement interests you, tear it out now and place with letters to be answered.*

# INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

## ENGINEERING

[illegible] concrete factory to cost $150,000.

**Winnipeg, Man.**—The Central Tools & [illegible] such as chisels, punches, sub- [illegible] smith supplies, etc.

**Hamilton, Ont.**—[illegible], manager of the United Gas and Fuel Co., stated recently that he would bring up at a meeting of the directors of his company the question of reviving the coke oven proposition.

**Hamilton, Ont.**—The Provincial Government estimates include $92,027 for the asylum. Of this sum, $40,000 is for an additional building, $10,000 for a new boiler house, and $3,000 for fire alarm system and fire protection.

**Montreal, Que.**—The Southern Canada Power Co. is contemplating the construction of about 100 miles of high tension transmission line and has called for tenders on poles, cross arms, insulators, cross arm braces, wire and other materials.

**Montreal, Que.**—Through an error in our issue of Feb. 7th it was stated that the plant of the St. Lawrence Welding Co., 138 Inspector St., had been destroyed by fire. The actual damage to the building was confined to a small portion of the roof, and no material inconvenience was experienced in the operation of the plant.

**Toronto, Ont.**—The Provincial Hydro Electric Commission have made an important departure from the old policy with reference to the erection of steel work in new buildings and in the extension of their transmission lines, and in the future this work will be done under the control of the commission instead of private steel companies.

**Ojibway, Ont.**—Approved by Dr. J. W. S. McCullough, chief provincial medical health officer, a complete waterworks plant for Ojibway, to have a daily pumping capacity of 7,000,000 gallons, will be constructed this spring. The Canadian Steel Corporation has decided to go ahead with the plan, as negotiations with Walkerville and Windsor Water Commissioners have got progressed rapidly.

**Weston, Ont.**—Building operations on [illegible] factory of the K. and S. Can- [illegible] at Weston, have re-

**Port Arthur, Ont.**—The Port Arthur Pulp Mill commenced the manufacture of pulp last week. The mill will soon be [illegible] 60 tons of pulp daily to the paper mills.

**Toronto, Ont.**—Permit to reconstruct the munition plant which was damaged by fire has been granted by the city architect to the Toronto Laundry Machine Co. of Dundas Street and Sorauren Avenue. The repairs will cost $15,000.

**Three Rivers, Que.**—Arrangements are under way here, it is understood, for the erection of a $1,000,000 steel plant in this city. The Page Wire Fence Co. of Canada, Walkerville, Ont., which has lately been incorporated with a capital stock of $250,000, is carrying out the undertaking. Montreal capital is said to be largely interested, and the object is to manufacture iron and steel products and ingots.

**Sarnia, Ont.**—A number of factories here have been affected by the order issued by the Ontario Railway Board, cutting off the supply of natural gas for manufacturing purposes. The firms in Sarnia affected by the order are not using the gas for fuel, but for power-generating. The gas engines are in such plants as the Lougheed Machine Co., Sarnia Fence Co., Cleveland-Sarnia Saw-mills Co., Doherty Stove Co., Canadian Printing Co. and others. These firms will have to close unless they can either obtain special permits to use gas or the order is rescinded. The firms cannot secure hydro equipment owing to the conditions prevailing. No gas has been supplied any local firms for fuel since last November. The big plant of the Imperial Oil Co. is not affected. Its gas supply for fuel was cut off with others last November, and since that time oil and coal have been used.

## MUNICIPAL

**North Vancouver, B.C.**—City Council contemplate the erection of a $50,000 filtration plant.

**Picton, Ont.**—The Town Council contemplates installing a pump of 1,000 gal. per min. capacity in its waterworks.

**Strathroy, Ont.**—The Public Utilities Commission is calling for tenders for a pump house. F. R. Smithrin, sec-treasurer.

**Gananoque, Ont.**—Application has been made to the Provincial Legislature for permission to float an issue of $30,000 debentures, $15,000 of which is to pay the general floating debt of the town and $15,000 for extension of water works system.

**Sudbury, Ont.**—The Town Council has petitioned the Provincial Legislature asking for confirmation of certain money by-laws passed by the town. These by-laws are for the issuing of debentures to obtain sums of money to purchase a library site, to get lands for park purposes, for the construction of sewers and water works, for the extension of the present waterworks system and sewers, and for the cost of concrete sidewalks. The money to be raised amounts to about $134,000.

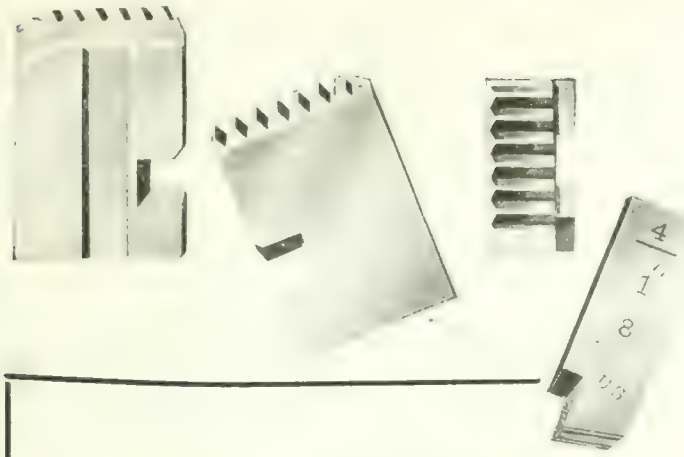
**Chatham, Ont.**—The Ontario Railway and Municipal Board has issued an order permitting the use of natural gas in small factories not using more than 10,000 cub. ft. daily and other plants using coal partly as fuel will also be permitted to use 10,000 cubic feet daily for the purpose of making weldings or other special work. Factories using gas engines, the waterworks, chopping mills and others producing feed will also be permitted to burn the commodity. In addition all factories having war orders such as the sugar factories and flour mills will be allowed to use a maximum of 75,000 cubic feet daily.

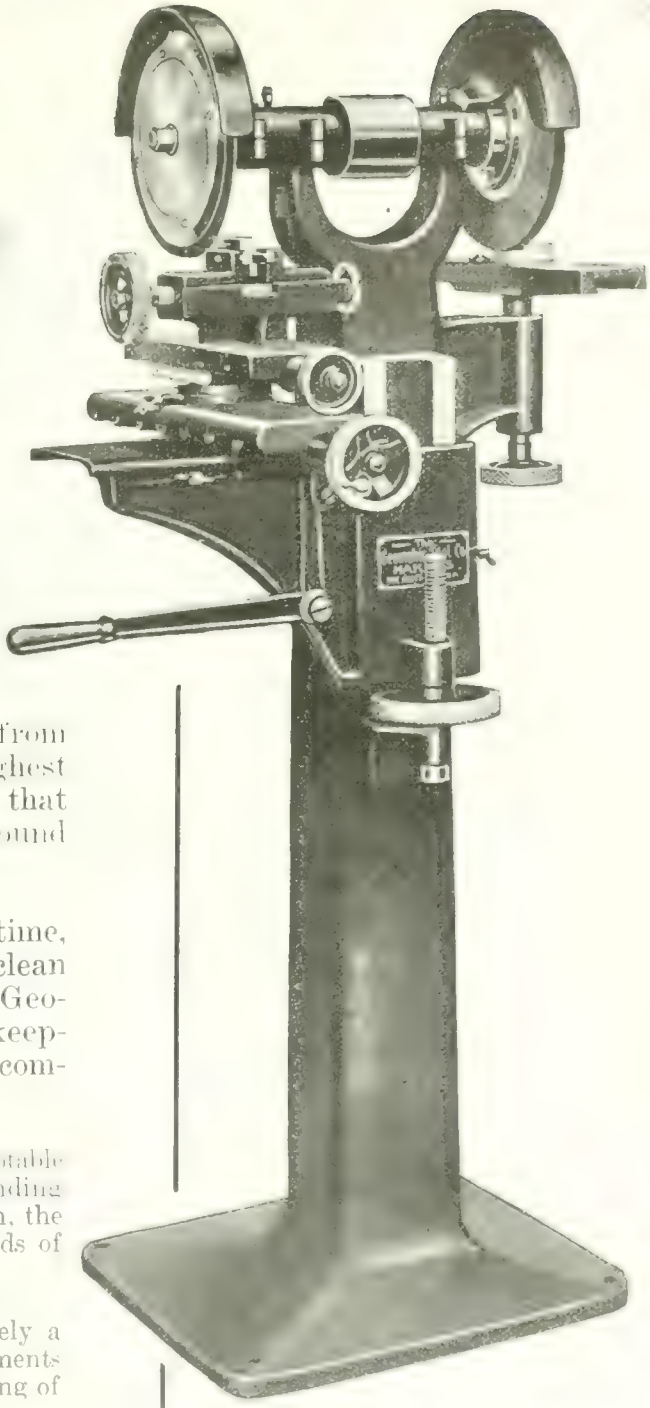
## TENDERS

**Melbourne, Australia.**—Tenders for the following may be addressed to the Director of Navy Contracts, Navy Office, Melbourne: Supply, delivery and erection at Garden Island, of one (1) 200 horsepower prime mover set of either semi-Diesel type or other heavy oil engine direct coupled to 2-65 K.W. 240 volt D.C. electric generating set. All accessories, tank and fittings to be supplied by tenders as per specification. Date of closing June 7, 1918. Tender forms are open for inspection at the Department of Trade and Commerce, Ottawa. File No. 20117.

**Hamilton, Ont.**—Tenders will be received by the Board of Control, up to Monday, March 4, 1918, for supplying the city with the following materials: Castings (ordinary and special), iron pipe, hydrants, valves, extension boxes, hardware, lead pipe, pig lead, road oil, lubricating oil, flux, fuel oil, lumber, gasoline, brass work, including ordinary and special brass castings for the Water Department. Specifications and form of tender for all of the above can be obtained at the office of the City Engineer, Hamilton, Ont.

**Ottawa, Ont.**—Tenders will be received until March 18, 1918, for heating and ventilating equipment required in the reconstruction of the Parliament Buildings. All tenders to be based on the execution, erection and completion; together with the furnishing of all materials, tools, appliances, scaffolding, apparatus and labor required for the installation of the heating and ventilating equipment as called for in the plans and specifications. All information can be obtained at the office of the general contractors, P. Lyall & Sons Construction Co., Ottawa. A set of plans and specifications may be had by depositing an accepted bank





# Sharp Chasers Cut Clean Threads

Accurate, uniform threads result only from dies which are maintained in the highest state of cutting efficiency. This means that chasers must be kept sharp, and ground uniformly.

Even if just touched up from time to time, the chasers respond splendidly, with clean threads. And with this machine—the Geometric Chaser Grinder—the matter of keeping threading tools up to scratch is a comparatively simple matter.

Any make of chaser can be ground on this adaptable machine. The two wheels permit the easy grinding of both milled and tapped chasers. In addition, the plain wheel lends itself readily to various kinds of tool grinding.

Uniform grinding of a set of chasers is purely a mechanical matter through the use of adjustments which can be accurately set to govern the grinding of an entire set of chasers.

***The Catalog describing this machine is a mine of information on chaser grinding. Write for it.***

**THE GEOMETRIC TOOL COMPANY**
**NEW HAVEN CONNECTICUT**

***Canadian Agents:***

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B.

may be directed, and be carried out in ... Plans and specifications, and any other information required can be obtained at the ... & Sons Construction Co., Ottawa.

## GENERAL

**London, Ont.**—The ... Co. ... their factory here.

**Port Dover, Ont.**—Last Friday, a fire in the picking department at Penman's woollen mills did considerable damage.

**Fort William, Ont.**—The Ogilvie Flour Mills Co., will erect a warehouse and dock here to cost $80,000. Barnet & Mc... are the contractors.

**Redcliff, Alta.**—A ... concern known as the International Log Bunk & Equipment Co., will establish a plant here for ... apparatus for handling and transporting logs and lumber, etc.

**Quebec, Que.**—The main building of the Industrial Manufacturing Co. at Rimouski, Que., was destroyed by fire Saturday. The firemen saved the outlying buildings of the plant. The damage is estimated at $12,000.

**Winnipeg, Man.**—The Lake of the Woods elevator at Bosenfeld, Man., was totally destroyed by fire which broke out last Monday. Eight thousand bushels of wheat and 1,000 bushels of barley were destroyed. A stock of flour was saved. The total loss will be about $30,-...

## BUILDING

**Ottawa, Ont.**—Plans for expropriation of the land required for the new departmental building to be erected on O'Connor street have been filed. This building will be 200 by 100 feet, and will be in the form of a square with a courtyard in the centre. It will contain 700 rooms. The building will be nine stories high at least, and higher if the city by-laws will permit.

**Ottawa, Ont.**—Hon. Frank B. Carvell, ... the approval of the committee in ... meeting the pressing and growing need for office buildings for the Government in Ottawa. The two wings which will be rushed to completion will contain eighty-two large offices. It is expected to have this ready for occupation by November. The new buildings, as a whole, may not be finished for two years.

## PERSONAL

**R. J. Younge**, general manager of the Export Association of Canada, has been attached to the Canadian War Trade Board at Washington. His duties will ... there will be fully taken care of by the assistant manager and other members of the staff, and there is every reason to believe that the work of the association will not be retarded.

**H. A. Bayfield,** engineer in charge of the building of the Government's big assembling plant at Ogden Point, Victoria, B.C., where all the Imperial Munition Board's ships are to be outfitted, died on February 13. He was formerly Superintendent of Dredges for British Columbia under the Federal Government, and before that was in charge of extensive wharf construction at St. John, N.B., and other Eastern seaports.

**Lieut.-Col. Charles N. Monsarrat,** who has just been elected a director of Canada Foundries and Forgings Co., is one of the best known bridge engineers in Canada. Entering the service of the Canadian Pacific Railway as structural draftsman in the office of the chief engineer in 1889, he was inspector of steel bridges, 1896-97; engineer in charge of designing and erection of important structures in British Columbia and elsewhere, 1897-1901; assistant engineer in Montreal, 1901-03, and engineer of bridges, 1903-11. In 1911 he was appointed chairman and chief engineer of the Quebec Bridge Commission, and to that important work he devoted himself until the completion of the great structure.

## TRADE GOSSIP

**Embargo on Machine Planers.**—An order in Council under date of Feb. 8 has been issued by the Commissioner of Customs prohibiting the exportation, except under license, of machine planers of metal.

**Canadian Crude Oil Advances.**—The sale price of Canadian crude petroleum has advanced 10 cents a barrel, making the price $2.50, with bounty at $3.10½. This is the highest price Canadian crude has reached in over forty years.

**Algoma Steel Corporation Output.**—The output of the Algoma Steel Corporation plant in Sault St. Marie, Ont., for the six months ending Dec. 31, was as follows. The figures are in tons: Magpie ore, 108,824; Helen ore, 44,612; coke, 193,435; pig iron, 147,813; steel ingots, 249,774 tons.

**The Canadian Hoskins Ltd.,** of Walkerville, Ont., manufacturers of electric gas and oil furnaces and pyrometers, are moving their plant from the Walker Building to the Gram building on the Walker road where they will have larger floor space and improved facilities for manufacturing their product.

**The Canadian Locomotive Co.,** Kingston, Ont., has just completed delivery of ten "Mikado" type locomotives for the Grand Trunk, and ten more of these locomotives are on order for use in freight service. Among the new orders placed by the Grand Trunk Railway for motive power is one for 25 switch engines.

**Emergency Fleet Co. Laying 25 Keels a Month.**— George J. Baldwin, chairman of the Board of the American International Shipbuilding Corporation, which has contracts for the construction of ships for the Emergency Fleet Corporation, told the Senate Commerce Committee the company expected to lay fifty keels during February and March.

**Allan Line Discontinues Service From Boston.**—The Allan Line, which for more than 25 years has operated steamships between Boston and Glasgow, is to discontinue its Boston service on May 1. The C.P.R. obtained control of the Allan Line about two years ago, and many of its ships have been requisitioned by the British Admiralty for war service.

**Decreased Output of U.S. Steel Ingots.**—January output of steel ingots in the United States estimated on returns from companies producing eighty-eight per cent. of the country's steel ingots in 1916 was 2,500,400 tons, against 3,106,500 tons, the estimate for December and 3,809,000 tons for October, the month of largest production in 1917. The February rate thus far has been well below that of January. The marked reduction in the pig iron output in the past six weeks points to a shortage in the later months of the year, and this may be more than is now counted on in standard irons since irregular operation of furnaces and poor coke have much increased the percentage of off-grades.

**Dominion Government Buys Ford Tractors.**—The Government has purchased 1,000 Ford tractors at cost. They will be sold to Canadian farmers also at cost, plus freight. Details of freight costs have not yet been worked out, but it is estimated that the average cost to the farmer, including freight, will be about $800. In addition, the Government has secured options on another 1,000 of the Ford tractors. The tractor burns either kerosene or gasoline. It is designed as a two-plough machine. A fuel consumption of 2½ gallons of kerosene per acre is regarded as a fair average. It is claimed for the tractor that it can plough an average of eight acres in ten hours. The ploughing speed is given as 2¾ miles per hour.

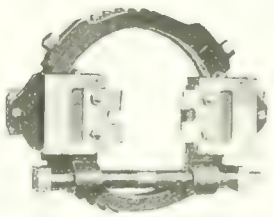
**Big Steel Interests May Merge.**—Reports of a merger between the Dominion Steel Corporation and the Nova Scotia Steel & Coal Co. have been discussed in financial circles for some weeks and more recently have assumed more definite form. According to Mark Workman, president of the Dominion Steel Co., the matter has not been seriously considered as yet although some develop-

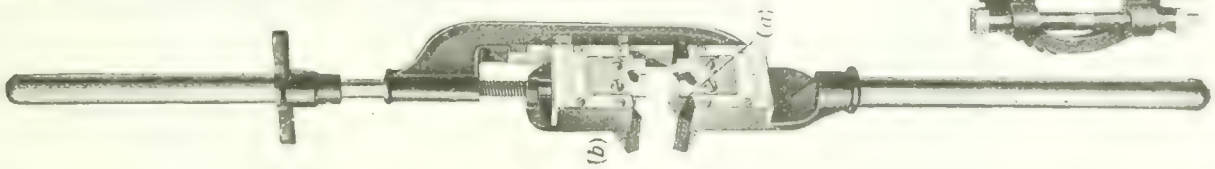
# Beaver Square-End Pipe Cutters

**Adopted** by more than 100,000 users within the last five years because

Beaver Square-End Cutters leave a clean-cut square end. No burr outside to ruin threading dies and no burr inside to be reamed out.

Resharpen the knives on a grindstone after hundreds of cuts and they will make a hundred more as clean and fast as before.



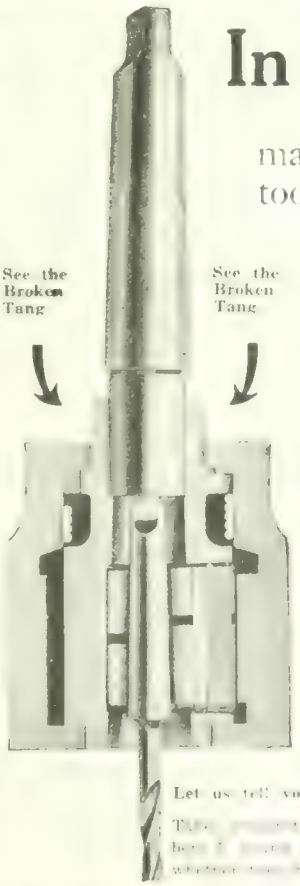



Beaver Square-End Cutters are sturdy, one-piece tools. No feeding necessary—the knives are fed automatically by powerful springs which are compressed when cutter is centered on the pipe. To operate, simply turn "T" handle until "V" jaws grip pipe—then revolve cutter like a die stock.

Do your pipe cutting easier, quicker and better. *Write*

## AIKENHEAD HARDWARE LIMITED

**17, 19, 21 TEMPERANCE STREET, TORONTO**




# In Two Seconds—Not Minutes

make tool changes while spindle of machine is running. The tool is automatically self-centred with this

# Wahlstrom Chuck

Gripped by the entire shank—note the arrows pointing to the broken tang—it is impossible for the tool to slip.

There isn't a motion lost, there isn't a second wasted, there isn't a tool marred, where this Automatic Wahlstrom Chuck is used. It's a great help to the speeding up of output.

Let us tell you about it in detail

This [illegible] Wahlstrom [illegible] whether [illegible] to a lathe or [illegible]

*Aikenhead's*

**17, 19, 21 TEMPERANCE STREET, TORONTO**

*If our advertisement interests you, trade [illegible] with letter to us mentioned*

[illegible] was published at Niagara Falls, Ont., last Thurs- [illegible] Niagara River [illegible] control. An additional diversion of 20,000 cubic feet was asked from the [illegible] tion of the upper and lower river diversion of water, at least 575,000 horse-power could be made for American manufacturers without disturbing the existing conditions or lowering the level [illegible]

**Cannot Use Peat for Fuel.**—The fuel famine has aroused interest in the manufacture of peat fuel and has also stimulated the organization of companies to develop the large areas of peat bogs which Canada possesses. It is, therefore, of interests to the general public to know that the Dominion Government, through the Mines Branch of the Department of Mines, thoroughly investigated the manufacture of peat fuel some years ago. The investigation proved that, as the water in peat is what is called the "colloidal" form, it cannot be expelled by pressure. Similarly, processes for expelling the moisture by the application of artificial heat will inevitably fail on account of excessive cost. It is because such methods of manufacture have been stubbornly adhered to in the past that so much money has been lost in attempts to create a peat fuel industry in Canada.

**Sample Fair at Lyons.**—Merchandise intended for the Sample Fair, the third one which is to open at Lyons, France, on March 1st next, will be allowed temporary admission to that country under deposit of duty without special authorization. The period allowed for re-exporting these [illegible] from the [illegible] of the closing of the fair, and no special formalities will be required. The usual [illegible] articles if they remain in France. It is expected that the fair will attract buyers from all neutral and allied countries, and there will be a great fight for the French trade. Owing to the difficulties of transportation, Canadian and American manufacturers have been unable to send many [illegible] of their wares to Lyons, but they [illegible] their catalogues. At [illegible] Sample Fair, in 1917, more [illegible], of which the United States, through the catalogue exhibit, captured over 50 per cent.

**Quebec Railway to Stimulate Manufacturing.**—At a meeting of the Quebec Railway, Light, Heat & Power Co., plans were discussed in connection with a proposal to advertise the company's [illegible] with a view to inducing Western capital into the Province of Quebec, particularly on the company's lands in and around the City of Quebec, the purpose in view being the furnishing of electric power to the industries backed by the capital induced. The company has water powers at Montmorency Falls, the Natural Steps just above the falls, at the Chaudiere Falls, and on the Jacques Cartier and Ste. Anne rivers. The total amount developed is 48,000 h.p., and there is further power, as yet unharnessed, of 25,000 h.p., with an additional 3,000 when the proposed dam on the Jacques Cartier river is completed. The company is placing before the Government at Ottawa a proposal asking that the company electrify the new Quebec Bridge, and take all trains across by means of electric engines.

# MARINE

**Vancouver, B.C.**—The first of the vessels being constructed at the Lvall shipyard will be named "War Puget" and the second the "War Cariboo."

**St. John's, Nfld.**—The keel of the largest vessel yet to be built in Newfoundland has just been laid at a shipyard at Harbor Grace. The ship will be built of wood, and will be 600 tons deadweight.

**Bridgewater, N.S.**—J. N. Rafuse & Sons, of Bridgewater, have launched a schooner of 113 feet keel, named Industrial, at the Foley shipyard, Salmon river and will immediately start the construction of another vessel off the same model.

**Collingwood, Ont.**—At the annual meeting of the Colingwood Shipbuilding Co., the following officers were elected: President, A. H. Johnson; vice-president, W. G. Smart; managing director, Capt. G. C. Coles and assistant manager G. T. Foulis.

**Vancouver, B.C.**—In addition to getting her hull cleaned and painted, the auxiliary schooner Jessie Norcross, Captain McIntyre, is getting two new tail shafts at the Wallace shipyards. She will leave shortly for Chemainus to load a cargo of lumber for Australia.

**Vancouver, B.C.**—It is understood that several of the dredgers employed by the Dominion Government will be laid up on March 1, until then end of the fiscal year. The vessels affected by the order are as follows: Ajax, King Edward, Mastodon, Mudlark, Victoria and drill plants Nos. 1 and 2, and rock-breakers Nos. 1 and 2.

**Victoria, B.C.**—The auxiliary schooner Beatrice Castle, which was launched at the Cameron-Genoa Shipbuilders' yards about ten weeks ago, being the last of the schooners built for the H. W. Brown interests, has been rechristened the Stasia. The vessel has been granted provisional French registry.

**North Vancouver, B.C.**—The Wallace Shipyard Ltd. will launch the War Power early in March. The War Power is the same size as the War Dog, 4,700 tons deadweight, which the firm put in the water recently. The engines, a triple set of 1,650 i.h.p. are now completed in the yard's machine shop. The boilers, two 15 ft. 6 ins. diameter by 11 ft. 3 ins. long, are being built by the Vulcan Iron Works at their Granville Island plant in Vancouver.

**Montreal, Que.**—The steamship Percesian," commanded by Captain Joseph Bernier, the Arctic explorer, has been sunk, according to a cable received by the Robert Reford Company here. The "Percesian" left Halifax Jan. 1. She was a vessel of 782 tons, the property of the Gaspe & Baie des Chaleurs Steamship Co. She was well known in the local shipping trade, as she was for years engaged in the service between Montreal and Gulf ports. Latterly she had been transferred to overseas service.

**Victoria, B.C.**—Construction of two big tugboats for North Coast service and several scows, all for the Whalen pulp interests, is likely to be the next shipbuilding order awarded to the Foundation Company's yard at Point Hope in the inner harbor. The tugboats will have a length of 128 feet, a breadth of about 26 feet and a depth of 16 feet, so that they will be practically the largest vessels of their kind in these waters, and by a wide margin the biggest and most powerful tugboats ever built in the North-west.

**Vancouver, B.C.**—The wooden steamer War Nootka, launched from the Western Canada Shipyards on January 14, will leave False Creek some time this week. She will be towed to Victoria and berthed at the Ogden Point fitting-out plant of the Imperial Munitions Board to receive her engines and boilers. The spans at Granville street and Kitsilano bridges will therefore be open one morning while the ship passes out. She is the Munitions Board fleet to be launched here. The yard is making good progress on the other three hulls and the number five hull, building on the ways vacated by the War Nootka, is now in frame.

**Vancouver, B.C.**—The wooden steamer *War Nootka*, one of 46 similar standard type vessels contracted for in Canada by the Imperial Munitions Board, has been launched by the Western Canada Shipyards, False Creek, Vancouver. The dimensions of the vessel are as follows: Length between perpendiculars, 250 ft.; length over all, 259 ft.; breadth, extreme, 43½ ft.; breadth, molded, 42½ ft.; depth, molded, 25 feet; depth, over keel, 27 ft.; draft for displacement, 22 ft.; draft over keel, 21 ft.; deadweight on 20 ft. maximum, to Lloyd's summer freeboard, approximately 2,500 tons; deadweight on 20 ft. draft, approximately 2,800 tons. Only the completed hulls are furnished by the

contractors, all other iron work and fittings being supplied by the Munitions Board.

## CONTRACTS

**Three Rivers, Que.**—The St. Maurice Foundry Co. has secured a contract to make cast iron moulds for the Mechanical Engineering Co.

**Winnipeg, Man.**—The following firms have been awarded contracts for supply of cast-iron gate valves, air valves and sluice-gate for the Greater Winnipeg Water District; The Kennedy Valve Mfg. Co., Elmira, N.Y.; Drummond, McCall & Co., Montreal, and the Empire Waterworks Supply Co., Winnipeg.

## REFRIGERATION

**Shelburne, N.S.**—Frank J. Carter, of Dartmouth, it is announced, will build and operate a cold storage warehouse at Shelburne, building and equipment to cost not less than $40,000.

**Toronto, Ont.**—The Provincial Government contemplates purchasing a cold storage building in Toronto for the purpose of saving the fish caught in the summer and fall for use in winter.

**Redonda Island, B.C.**—The Redonda Canning & Cold Storage Co. are having their fish freezing plant equipped with a 12-ton refrigerating machine furnished by the Armstrong Machinery Co., Spokane, Wash.

## WOODWORKING

**Toronto, Ont.**—Fire of unknown origin did $1,000 damage to the C. E. Williams planing mill, St. Alban and St. Nicholas, and $1,000 damage to the contents. The loss is covered by insurance.

## RAILWAYS

**Vancouver, B.C.**—The G.T.P. tug Lorne, recently purchased and refitted, has left for the North to inaugurate the company's transfer barge service out of Prince Rupert.

**Toronto, Ont.**—The Toronto & York Radial car barns on the Metropolitan division, situated on the west side of Yonge street, south of St. Clair avenue, were burned to the ground last week. The damage was roughly estimated by officials at $40,000.

**Toronto, Ont.**—The Toronto, Hamilton and Buffalo Railway is running a line from Dunnville to Port Maitland, on the Grand River, Hon. W. D. McPherson, provincial secretary, announced recently and has a large area of land, between four and five miles long, which will be developed for an industrial site, if present plans carry.

**Ottwa, Ont.**—The Edmonton, Dunvegan and British Columbia Railway Co. will apply to Parliament at the next session for an Act authorizing an extension of the railway to the boundary line between the Provinces of Alberta and British Columbia, a distance of approximately 65 miles.

**Victoria, B.C.**—Legislation that will permit of the completion of the incomplete portion of the Pacific Great Eastern Railway from the end of steel, some 23 miles north of Clinton, to Prince George, and thus finish the line so far as was projected under the contract between the province and the P.G.E. Railway Co., is likely to be introduced at the present session of the Legislature.

## INCORPORATIONS

**The Manitoba Steel & Iron Co.** has been incorporated at Ottawa to purchase and take over the Manitoba Bridge & Iron Works of Winnipeg, Man. The capital of the new concern is $500,000 and the president is Thomas R. Deacon of Winnipeg.

**Monarch Tractors Ltd.**, has been incorporated at Ottawa with a capital of $1,000,000 to manufacture machinery and farm tractors. The head office is at Toronto and the incorporators are E. J. Swift, A. J. Gannon and E. G. Gore, all of Toronto.

**The Ontario Oakoal Co.** has been incorporated at Toronto, with a capital of $25,000, to manufacture a fuel known as oakoal. The head office is at Toronto, and the provisional directors are J. A. Armstrong, J. E. Potts and W. R. Jackson, all of Toronto.

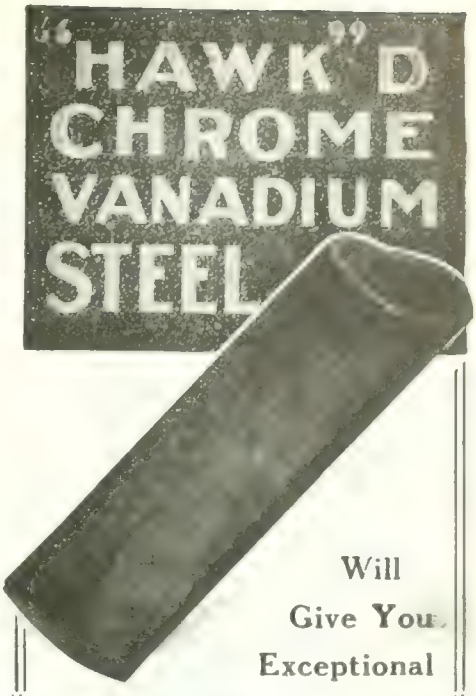
**The Nyanda Pulp & Paper Co.** a corporation incorporated in the United States, has been granted an Ontario provincial license to manufacture pulp and paper products. The capital of the concern shall not be more than $1,000,000. William A. Dowler of Fort William, Ont., is the attorney.

**Metals Chemical Ltd.** has been incorporated at Toronto with a capital of $1,000,000 to manufacture all kinds of chemicals, compounds and to carry on a mining and smelting business at Welland, Ont. The provisional directors are A. W. Holmested, J. L. Ross and W. J. Cluff all of Toronto.

**Green's Economiser Ltd.** has been incorporated at Ottawa with a capital of $50,000 to manufacture all kinds of machinery, plant, mechanical appliances, etc., with head office at Toronto. The incorporators are W. Gilchrist, J. Stewart and H. J. Stuart, all of Toronto.

**Franklin Railway Supply Co. of Canada, Ltd.**, has been incorporated at Ottawa, with a capital of $25,000, to manufacture and deal in railway supplies and equipment. The chief place of business is Montreal, and the incorporators are: J. S. Coffin, jun., of Montreal, also J. S. Coffin and S. G. Allen, of New York.

**The Page Wire Fence Co. of Canada Ltd.** has been incorporated with a capital of $350,000 to carry on the businesses of wire manufacturers, steelmakers, smelters, engineers, etc. The chief place of business is Montreal and the incorporators are A. R. W. Plimsoll, R. Brodeur and A. Clouinard, all of Montreal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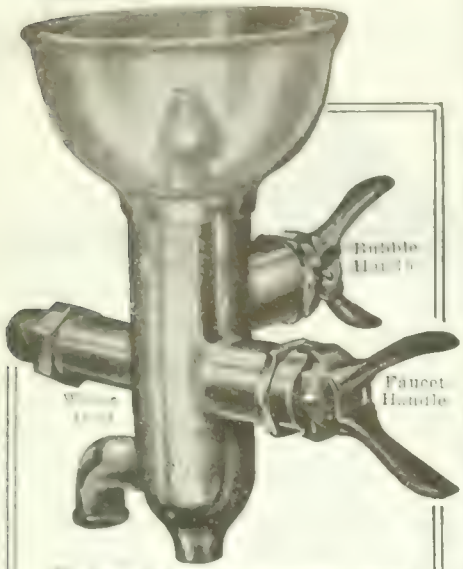


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LIMITED
Owen Sound Iron Works
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# CATALOGUES

**Recuperative Gas Oven Furnaces** is the title of Bulletin No. 160 issued by Tate-Jones & Co., Inc., furnace engineers, Pittsburgh, Pa. This bulletin is devoted to a complete description of the Tate-Jones recuperative type of furnaces as well as an explanation of their advantages and the economy derived from their use. The bulletin also deals with the advantages of recuperation, construction of the recuperator and measuring the temperature of the work etc., The illustrations show the construction of the furnace and also two types of recuperative furnaces, the views being accompanied by tables giving the principal dimensions for the various sizes.

**Turning Waste Into Profit.**—This is the title of a 28-page booklet, size 8½ x 10¾, recently issued by the Prest-O-Lite Co., Inc., Toronto, dealing with the importance of conservation of steel and iron through oxy-acetylene welding and cutting. This booklet is profusely illustrated with half-tone engravings showing many examples of Prest-O-Lite welding repairs, which have saved money for manufacturers, railroads, mines, machine shops, engineering and industrial plants in almost every line. We have been advised by the Prest-O-Lite Company that a copy of this booklet will be mailed free of charge to anyone interested.

**New Canadian Patents Issued.**—The following is a list of Canadian patents recently issued through the agency of Messrs. Ridout & Maybee, Toronto: Charles Haythorpe, prevention of pitting and corrosion in steam boilers; W. H. Banfield & Sons, central tubes for shrapnel shells; Universal Tool Steel Co., key bolts; Arthur G. L. and Harry C. W. Neighbour, internal combusion engine; Anders B. Reck, sections for sectional boilers; Olof Swanson, plow; James S. Foreman, fittings or supporting combinations for electric lighting and other purposes; Jefferson Glass Co., headlight lens; Herbert Thompson, automatic foot rest shock absorber.

**Venturi Meter.**—Bulletin No. 84, issued by the Builders' Iron Foundry, Providence, R.I., describes the Venturi meter and its application with cold water for gravity mains, filtration plants, pump lines, hydraulic turbines, etc., accompanied by illustrations showing diagrams and installations of standard and special meters. The bulletin also contains a description of the type M register-indicator-recorder with views of charts. The [illegible] contain tables giving principal dimensions and capacity of the various sizes of standard Venturi meter tubes and also gives the directions for installing the venturi tube. Copies of the bulletin may be obtained from the special agents, the Allen General Supplies, Ltd., Toronto.

## MANITOBA STEEL & IRON CO.

THE organization meeting of the Manitoba Steel & Iron Co., Ltd., was held in Winnipeg recently, and the following Board of Directors was elected for the ensuing year:—T. R. Deacon, H. B. Lyall, Sir Augustus Nanton, Geo. F. Galt, G. W. Allan, Sir Douglas Cameron, Chas. Pope, Capt. Wm. Robinson, W. H. Cross. At a subsequent meeting of the directors the officers were elected as follows: T. R. Deacon, president; H. B. Lyall, vice-president; Walter Stuart, secretary.

The company has been incorporated with a Dominion charter, with an authorized capital of $500,000, to take over the merchant end of the business of the Manitoba Bridge & Iron Works, which has grown to considerable dimensions. The new company is strongly financed and will carry on a general merchant business in heavy steel goods, such as structural steel, plates and sheets, bar iron and steel, boiler tubes, rivets, bolts, railway supplies, mining equipment, heavy forging billets and stock for shipbuilding. An entire block of land with suitable warehouse has been secured on Logan Avenue, with railway siding facilities, and business will be commenced on March 1. The business will be carried on along lines similar to the large steel and iron merchant businesses of the United States, contracts for large tonnages being made at one time with the rolling mills. Authority is also given under the charter to build and operate rolling mills and blast furnaces.

The Manitoba Bridge & Iron Works purpose confining their business more to the purely manufacturing side of the business, for which this change will afford them more needed room on their present site. The latter company is also applying for a Dominion charter, with an authorized capital of $1,000,000.

## TRADE ENQUIRIES

THE following trade enquiries have been received by the Department of Trade and Commerce, Ottawa. Further particulars may be obtained on application.

42. **Steel plate.**—A London, England, company is desirous of obtaining steel plates from Canada according to the following specifications: 144 square feet about) of steel stokehold plate, 5-16-inch thick over the checkers, standard sized plate say 6 feet long by 3 feet wide; 3½ tons ⅛-inch mild stele plate; 1½ tons 3-16-inch mild steel plate. The company states that it is inclined to purchase from Canada supplies which in the past have been obtained elsewhere.

43. **Rubber tires for bicycles and automobiles; rubber shoes, rubber hose and rubber belting.**—Wholesale merchants and manufacturers in ths Netherlands would like to correspond and make arrangements with Canadian manufacturers for the 'after-the-war" importation of the articles mentioned. The firms in question are all of the highest standing and could arrange for payments through New York bankers against surrender of bill of lading.

44. **Belting of rubber, balata, cotton and leather.**—Canadian manufacturers interested in the "after-the-war" trade in belting of rubber, balata, cotton and leather are requested to communicate with wholesale merchants and manufacturers in the Netherlands who are interested in the importation of the said

articles. Terms as in the previous inquiry.

45. **Wire nails and straw baling wire.**—Manufacturers and wholesale merchants in Holland would be glad to get in touch, with a view to "after-the-war" trade, with Canadian manufacturers of wire nails and straw baling wire.

46. **Lubricating oils and greases.**—Canadjan manufacturers of lubricating oils and greases, who are interested in the "after-the-war" exportation of such articles, will do well to communicate with wholesale merchants and manufacturers in Holland who are desirous of importing these products.

47. **Graphite.** — Manufacturers and wholesale merchants in the Netherlands wish to get into communication with Canadian manufacturers of graphite with a view to the "after-the-war" importation of the same.

48. **Asbestos.**—Firms in the Netherlands are anxious to prepare for the "after-the-war" importation of Canadian asbestos, and with this view will be glad to get in touch with Canadian exporters of same.

49.—**Calcium Carbide.**—Canadian manufacturers of calcium carbide are asked to communicate with wholesale merchants and manufacturers in the Netherlands who are seeking to make arrangements for "after-the-war" trade in Canadian calcium carbide.

50. **Machinery; labor-saving devices, works and domestic appliances; apparatus, such as railway signals, switches etc., car movers, electric appliances, balers; hardware; anchors and chains; rails, patent sleepers; "chairs," etc.; tramway rails; motor-cars; motor-engines; motor-craft; motor-ploughs.**—A Glasgow firm of importers is anxious to communicate with Canadian manufacturers of the above articles. Writing under date of December 29, 1917, the managing director says: "I have the pleasure to send you enclosed a list of some of the lines which it occurs to me we might be able to handle to advantage on this side, provided suitable arrangements and terms were practicable. My idea is that this business could best be fostered by properly displaying the goods in the ground floor of a public thoroughfare, thus giving the passing public an opportunity not only to see, but also to handle such goods or articles; thus also providing a centre to which likely users and buyers in other districts than Glasgow could be specially invited to come and see and handle the goods, which, of course, is a very great advantage, for any articles not already known, as compared with mail-order business based on mere advertising by people a long way off."

---

THE regimental sergeant-major was on parade, and spotting the recruit, who as usual kept making a hash of things, started on him in a compassionate tone.

"Say, son, if your body was one long fuse, and your brain all gun-powder, and if they burned you, there wouldn't be a big enough explosion to blow your cap off."


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Original Solid Woven Cotton Belt

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143-153 University Ave., Toronto

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[illegible]

[illegible]

[illegible]

[illegible]

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MANUFACTURERS WE CAN UNDERTAKE [illegible] production [illegible] Write W. H. [illegible] 78 Mary St., Toronto

## WANTED

WANTED — DESIGNS, SHOP DRAWINGS [illegible] specifications made to [illegible] by experienced practical engineer and designer. Any mechanical proposition carried through. Box 365, Canadian Machinery. (c6m)

WANTED ENGINE LATHE, 18 TO 24-INCH x 10 or 12-foot bed. Give full particulars and price. Northwestern Iron Works, Regina, Sask. (c9m)

OLD BOILER TUBES WANTED — ELEVEN hundred three-inch tube, not less than nine feet long. Box 372, Canadian Machinery. (c7m)

TWO SQUARE EXHAUST RUMBLERS, 30"x4' more or less. Write stating condition and best price. Box 374 Canadian Machinery. (c6m)

POWER PRESSES, STRAIGHT-SIDED, FOR trimming forgings, 2 to 3" stroke, also geared presses with 4 and 6" stroke. Powerful presses wanted. State full particulars.

MILLING MACHINES WANTED. BECKER OR Pratt and Whitney vertical, suitable for die-sinking. Also lathes, 24 x 12. Kraeuter and Co., Inc., 63-85 18th Avenue, Newark, N.J., U.S.A. (c9m)

## SITUATIONS WANTED

WANTED -POSITION AS CHIEF ENGINeer or technical adviser with engineering firm. 20 years' experience, 6 years of which on munitions. Highest British and American references and testimonials. At present in responsible position with munition firm. Lowest salary considered $3,000. Box 373, Canadian Machinery. (c6m)

PRACTICAL FOUNDRYMAN WITH GOOD technical training desires position as foreman. Good on cupola practice and semi-steel. McLain graduate. Box 367, Canadian Machinery. (c9m)

WANTED—POSITION AS MECHANICAL OR general superintendent, any size plant; 21 years' experience with marine, stationary and portable engines, pumps and machinery of all kinds; 3 years' experience on all sizes of shells. First-class organizing and executive abilities and references. Box 366, Canadian Machinery. (c9m)

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1— Nosing press, 14" x 24".
1—"Bertram" wave rib attachment.
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1—"Matheson" nose nick miller.

[illegible] and prices.

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[illegible] Montreal [illegible] Toronto

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Single Crank Straight-sided Geared Presses as follows:

2 only No. 54 Cleveland
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2 only No. 58 Toledo.
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1 only No. 76 Bliss Adjustable Patterned.

suitable for nosing operation, heavy steel shells. Also a lot of open back, inclinable presses. Specification and price upon application.

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PITTSBURGH, PA.

(c8m)

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**This referred to an ad. on a recording thermometer and baking oven for sale.**

**And another says:**

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**And there are others that tell of results just as pleasing.**

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**Canadian Machinery**
***Classified Advertising Section***
**143-153 University Ave., Toronto**

# CANADIAN MACHINERY

## AND MANUFACTURING NEWS

*A weekly newspaper devoted to the machinery and manufacturing interests.*

Vol. XIX. TORONTO, FEBRUARY 28, 1918 No. 9


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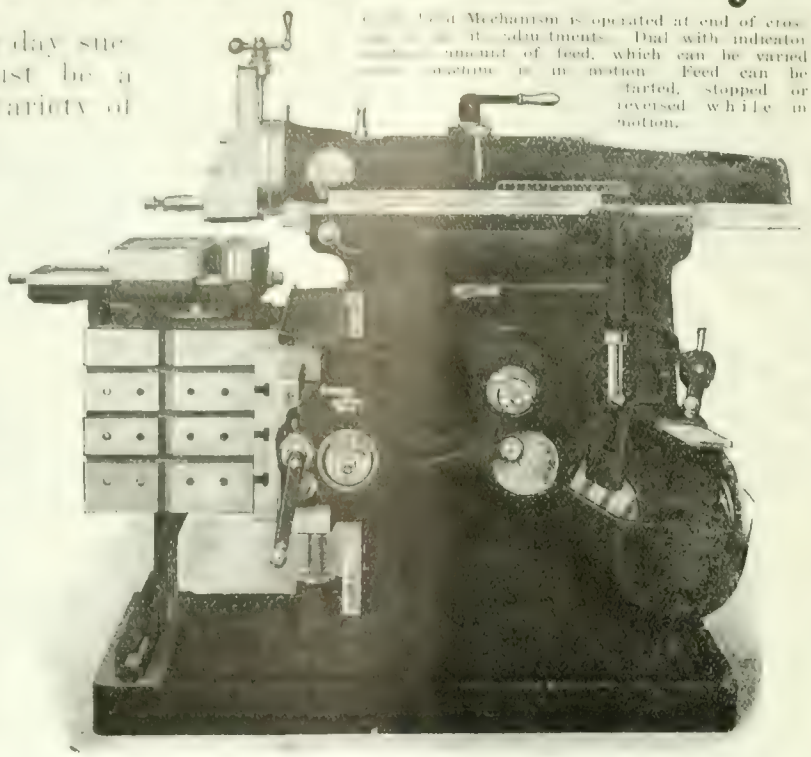

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# Corrosion of Iron and Steel, and Its Prevention--I.

By Abe Winters

*Perhaps the most pathetic feature of man's existence on this planet is illustrated by the contrast between the enormous metallurgical and manufacturing industries based on iron ore, and the loss of finished metal due to corrosion. Sometimes obscure, sometimes prominently noticeable, the ravages of rust are the most relentless of all handicaps which man lives under, undoing with hitherto unpreventable certainty that which he has done.*

AS the various sulphur compounds act upon silver, covering the surface of it with a film of sulphide of silver which is black, so the oxygen of air acts upon iron, especially when moisture is present. Sulphur which is usually present in the air in some form or other, acts upon a great many metals to some extent when the latter are exposed to the air. Gold is not affected by sulphur or oxygen and is therefore referred to as one of the noble metals.

Sulphur emitted through the pores of the skin will discolor silver ornaments worn by many persons; this fact is particularly noticeable when sulphur is used for medical purposes. Sulphur causes a decided discoloration on silver surfaces but does not necessarily corrode the metal as in the case of oxygen and its effect on iron or steel. Moisture assists the action of oxygen on iron—the surface of the iron being burnt or oxidized and an oxide of iron formed—this we term rust.

John Ruskin is credited with a very beautiful reference to iron as a metal which breathes the air and so gives life to every living thing. If iron could not be oxidized, or rusted we should not exist on the earth. It is the rusted or oxidized iron that gives color to various soils and minerals, it is this rust, which, when dissolved by water forms food for plants and gives the foliage its green color. It is this rust also by which we get iron into the blood and which gives it its red color. With this consideration of iron rust we may be permitted to regard iron as indeed a noble metal. Generally speaking we consider iron rust as a nuisance, it ruins the most magnificent structure of iron or steel as well as the most trivial toy: yet, because iron can rust by action of the air, the metal deserves a place among the noble metals. When the surface of iron rusts, a certain amount of the oxygen of the air is added to the iron. This oxygen has weight and its weight is added to the weight of the iron when the iron is rusty. This oxide of iron, or rust, is easily reduced to powder form and will crumble away under the action of wind or water or any friction against the iron, therefore the iron will lose, not only the oxygen tht it has taken into itself, but also the part of the iron which has combined with e oxygen.

### Relative Corrosion of Iron and Steel

The difference in the rate of corrosion between iron and steel as given by acknowledged authorities varies greatly. The reason for this is plain: the conditions of each reported rate of corrosion, whether the result of laboratory or commercial tests, such as exposure to weather or other corroding influences, not being similar in all respects, are therefore comparable only in a general way.

Experiments conducted by the English Admiralty, various research bodies, international boards of trade and European shipbuilding concerns prove that steel corrodes much more rapidly than iron when exposed to the action of salt water, also that the commoner brands or iron corrode less rapidly than the better grades when exposed to the same influences. No tests of modern rust proofing processes can be considered complete unless the tests include practical application of the salt water action on iron or steel.

Another point to bear in mind is that corrosion tests should not in general be carried out to the limit. The severity with which such tests are carried out should depend upon the stage at which the metals are to be discarded in practice or the condition of the protective coating after reasonable service under usual circumstances.

It cannot be too strongly emphasized that the task of satisfactorily determining the relative corrodibilities of iron and steel is one of immense difficulty in view of the numerous factors involved. The more important factors are as follows:

### Necessity for Representative Samples

(1) Since the metals are made in such a variety of ways and with such varying chemical compositions, it is essential that a very large number of samples be taken. This is where the majority of the investigations are at fault, with the result that the conclusions, although excellent for the field they cover, are not based upon sufficient data to render them of very great practical value.

### Standard of Corrodibility

(2) A method that is adopted very largely at the present time is based upon the loss of weight undergone by the metals when the rust produced by varying media has been removed. In the absence of pitting the results are thoroughly trustworthy and of great valve. But certain kinds of corroding media favor the development of serious pitting, and in these cases the mere determination of total superficial loss in weight may not prove particularly helpful. For example, it is conceivable that a grey iron casting might loose several pounds in weight through uniform superficial corrosion, and yet not be much the worse. On the other hand, a single ounce removed as a result of pitting might be sufficient to perforate the metal and lead to very disastrous consequences. A determination of the depth of the pitting is of the utmost importance.

### Corroding Media

(3) No one type of metal must be expected to resist equally well all kinds of corroding media.

One metal may prove most suitable for resisting neutral corroding agencies, such as tap water or fresh air, whilst another excels in its resistance to the effects of salt water. Two steels may yield amost identical corrosion factors when subjected to various neutral influences, but in 0.5 per cent. sulphuric acid one sample may corrode two and a half times faster than the other sample. It is therefore evident that the nature of the corroding medium must be known before a reliable opinion can be expressed as to the best metal to resist the same.

### Composition of the Metal

(4) Steels offer a very wide range for variation of composition, but for the present we are only concerned with those more common types that are used for such purposes as will bear commercial competition with wrought or cast iron. The main chemical differences are thus confined to variations in the carbon and manganese contents. At the present time the influence exerted by these two eliments, both singly and together, upon the corrodibility of iron has not been thoroughly investigated. Extensive researches on this problem are being carried out but it is too early to discuss the results in detail. It has been observed however that small variations in the manganese content of the metal influence to a very appreciable extent the resistance toward corroding media.

### Physical Condition of the Metal

(5) Iron and steel are, from the nature of their manufacture, particularly liable to segregation and to variation in physical conditions. Modern improvements have tended to minimize the differences between wrought iron and steel, but its doubtful whether the variations in the physical condition of steel will ever be completely corrected.

### Results of Experiment and Experience

More work has been carried out along these lines than the average reader realizes, and a few references to some important cases may prove useful:

Howe and Stroughton in 1908 exposed samples of American iron and steel to various corroding media. Consideration

American railroad.

W. H.

that:

Steel corroded more than iron. 18 cases
corroded equally 9 cases

On the whole therefore there was no

**Conclusion**

The results of many other investigations bear a similar interpretation. We may therefore conclude that, whilst the mean result of examining a large number of samples of iron and steel after exposure to corroding influences indicates that the two metals are practically equally resistant, yet a very wide divergence exists between the different irons and steels in individual cases. This is not necessarily due to any irregularity in the metals themselves but in the majority
is the fact that no one metal can be expected to offer an equal resistance to all types of corroding media.

The question to be considered when contemplating the manufacture of durable iron or steel products is not so much as to whether iron is better than steel or vice versa, but rather—which is the best variety of iron or steel for a specific purpose.

## AERONAUTICS AFTER THE WAR

THE war has forced the pace of aeronautical development to such an extent that we may well wonder what will be the position of artificial flight when the impetus of the present conflict is removed. Aeronautics when the war started was as a young child suddenly caught up out of proper season into the full swing of life. It has been brought to maturity long before its time, and if it now appears a sturdy youth, we cannot help feeling that, like all forced growths, it will sooner or later show signs of its unnatural development. In treating the matter editorially, the *Engineer* states that to-day, no one fails to realise the
ise, what the very circumstances of to-day almost prevent our realising, is the
as applied to peace-time conditions. To-day the aeroplane holds a high position in warfare.

To-morrow, when peace returns, is it to become nothing more important than a carrier of express letters, is it to remain first and foremost nothing more valuable to humanity than a potential weapon of war, or has it the promise of a future in which it will exercise a direct beneficent effect on civil life as far-reaching as its present effect on war? The matter is really one of great practical consequence, for with each day our facilities for building aeroplanes are being increased, more and more interests are being bound up with their production, and the number of those looking directly to aeronautics as a means of livelihood is becoming ever larger.

We can, we think, safely say that as a potential weapon of war the aeroplane will always retain importance, and so far as this aspect is concerned, the future of aeronautics and of aeronautical production is comparatively clear and certain. As such a weapon, the aeroplane will be much on the same level as the gun, the shell, the torpedo, the submarine, and the warship generally. Its development will be subject to similar influences, and its production to similar restrictions.

The prime factor in the matter, however, will not be the actual production of aeroplanes in large numbers, but the provision of means whereby production in large numbers can be speedily undertaken. It would be folly to think that the country's peace-time aeronautical programme can be best carried through on the lines of its naval programme. Ships remain serviceable for a fair number of years after they have been built, so that each year's output represents an addition to those already possessed. Aeroplanes, or at least aeroplanes as we know them to-day, on the other hand, do not "keep." They deteriorate swiftly if used, and only less quickly if not used. Further—although they may in the natural course of things not always remain so ephemeral—the evolution of the aeroplane with all the resources of pre-established industries and accumulated knowledge behind it, seems likely to maintain for a considerable time to come so rapid a pace that the latest design of to-day will be antiquated before the year is out.

Again, the rate of wastage in aeroplanes during war is so heavy that the peace-time provision of large numbers, however great, could never be made to take the place of active production on an intense scale after the outbreak of war. The accumulation of a reserve of aeroplanes during peace is therefore impossible, or, if not impossible, undesirable. The country which the outbreak of war would find best equipped with aeroplanes in being would not necessarily be the best equipped to win the war. The country which had at its immediate command the best and most extensive resources for the production of aeroplanes in large numbers would have the decision in the end. But, as a practical question, is it in any way possible to encourage the creation of resources for aeronautical production without actual production in peace-time?

Is it reasonable to expect that engineering and other firms will be willing to lay down and maintain extensive and expensive plant for aeroplane manufacture, knowing that only in war time would such plant be employed to more than a tenth of its capacity? Even though they were so willing, with the aid, perhaps, of a Government subsidy, the vital question of workpeople would remain. Some scheme might, of course, be adopted whereby the sudden demand for areoplane workers on the outbreak of war could be met by drawing upon certain non-essential industries of a cognate character for labor, which in peace-time had been trained for a period in the aeroplane factories and then returned to its own proper industries. Such a scheme, for what we may call an industrial militia, would, however, involve a degree of Government interference with natural trade conditions that would hardly be tolerated in a time of profound peace, when the emotions and inspirations of the present moment were forgotten. The natural solution of the problem is that the peace-time employment of the aeroplane should be so fostered as to create a demand for aeroplanes for peaceful purposes equal or very nearly so to the numbers required in war time. Then when war came the factories and the workers would be there ready to hand to take up the production of war machines on the scale necessary.

When we look at the matter in this light, we see clearly the evil of the present forced development of aeronautics. It is entirely a one-sided development, a development of the aeroplane as a war machine. Practically nothing has been done since the war started with the aeroplane as a peace-time machine. It is hopeless to suggest that the sporting use of the aeroplane in peace-time will ever supply the demand necessary to keep the required aeroplane factories even partially employed, nor will the Government's peace-time requirements perceptibly ease the situation. Without a strong commercial demand for aeroplanes, it will, we feel convinced, be impossible to keep the factories running on the extensive scale that the situation requires. Where such commercial demand is to come from, we must confess we cannot at present see.

HARDENED work usually requires a larger allowance than unhardened work to enable the grinding machine to take care of the distortion produced in hardening. Bushings which are made with thin walls are especially liable to distortion in the hardening process and require liberal allowance for grinding.

# Inspection and Testing of Spur, Helical and Worm Gears *

By Benjamin F. Waterman

*The author deals with the practical aspects of gear inspection and testing, the methods described being those in use by the Brown & Sharpe Mfg. Co. Close final inspection is of no avail if not preceded by exacting tests between operations and the more exacting the gear requirements, the more exacting must be all the inspections between operations.*

THE inspection of gears requires as much attention as the making. If the requirements are not severe, the inspection need not be; but if the gears must work at high speeds and under severe stresses with quietness an essential factor, the inspection must be strict. In other words, the more exacting the gear requirements, the more exacting must be the inspection, not only the final examination, but also the tests between the various operations, to make sure that the gear is not spoiled, and that other operations will not be performed on a gear that will not pass the final inspection. These inspections are also necessary to insure that one department does not do poor work, with the expectation that some other department will correct the error. The methods given here apply principally to gears of the smaller sizes and are those used by the Brown & Sharpe Mfg. Co.

It is the practice of this company in the case of all gears made to a customer's specifications to first inspect the gear blank. Then after cutting the teeth, the gear is inspected for the running or rolling qualities of the teeth on a hand testing machine, unless the specifications state that the gear must run quietly at some given speed. In this case, the gear is mounted on a power-testing or speeding machine, and run as nearly as possible at the speed at which it will run in practice. When the gears are to be used in the company's machine tools, some of the intermediate inspections, such as the blank inspection, are not necessary. It has been found that any error in the blank that will affect the running of the machine will be discovered at some time before the final inspection of the machine, which is always made under the belt.

It is also the practice of the Brown & Sharpe Mfg. Co. to mark the drawings of gears that will have a speed of over 400 feet per minute with a note to that effect, the note stating simply "Speed 600 feet," or whatever the speed may be. This shows the man responsible for the cutting that he must take the necessary precautions to cut quiet gears and also shows the inspector that he should inspect the gears carefully. It has been found that this practice eliminates misunderstandings as to how carefully the gears should be cut and inspected, and has considerable influence on the time consumed in the cutting operation and the inspection.

### Testing Spur Gears

The method of testing the average spur gears used by the Brown & Sharpe Mfg. Co. is the usual one of mounting the gears on studs at the correct center distance. The most satisfactory way, in most cases, is to have adjustable studs where one fixture or machine will take care of a wide range of center distances; there are several such machines on the market. Where gears are too large for such a machine, a gear-tooth caliper set to chordal figures is a satisfactory way to get the pitch diameter correct. This test consists of callipering the teeth for size and variation; although very large gears may be cut to the correct depth, as the center distance is usually adjustable. In testing the gears used on the company's variable spindle speed and variable feed cases, stud plates are used, where the various gears can be tested at the correct center distance and with each gear it may have to run with. But for general work, standard spur-gear testing machines are used with what is called a spur-gear indicating attachment, which has been found useful for testing the run-out and also the rolling qualities of the gears. In using this attachment the gears are pressed together by springs while a dial indicator presses against a square stud in the slide, so that any tendency of the gears or slide to move away from the mating gear, due either to run-out or poorly shaped teeth is shown on the dial. It has been found that when the indicator pointer vibrates from tooth to tooth not over 0.0001 inch, the gears are usually satisfactory; and when no vibration is shown, the shape of the gear teeth is perfect. Even in the case of spur gears that are hardened and then ground in the hole, it is good policy to see that they are cut true, for then the inspectors need not make allowances for run-out in testing; besides, this practice keeps up the quality, or tone, of the gear-cutting in general.

Transmissions are run off in a test stand of some kind and tested with a light load or without any load. Usually, if a pair of gears or a transmission running dry does not rattle, the gears will run quietly under load.

### Testing the Run-out

A test used in connection with the grinding of the holes in spur gears, for the so-called "run out" in gears is that known as the ball test. The apparatus consists of a pair of centers under a spring-plunger block. A ball on the end of the plunger fits between the teeth of the gears at about the pitch line, and the point of a dial indicator rests on the top of the plunger. The punger block, which is fitted with quite a stiff spring, is used between the indicator and the work to rotate the gear into position while the indicator shows the "run-out," or variation in the pitch line. The final run-out in the gear is tested with this apparatus. The number of spaces the plunger is set into depends on the requirements of the gear.

A gear with a run-out sound, usually causes trouble, no matter how nicely the teeth may be cut or shaped. There can be, and often is, cause for a difference of opinion as to the degree of quietness of a pair of gears, but there is not much chance of this in the case of a run-out, for anyone can detect a run-out sound, and for this reason it is very objectionable.

In the case of cones built up of a number of gears keyed and pressed on a shaft, the inspection for run-out should be made after assembling. Index change-gears and lead change-gears must be cut true, as they are usually meshed closely, and a bad run-out in an index gear might prevent the machine indexing properly.

### Inspection of Bevel Gears

The bevel gears that require the closest inspection are probably the driving bevel gear and pinion for automobiles. It is necessary to hold these closely to figures in the blank, and an effort is made to cut them dead true. It is not good practice to let gears of this type with run-out in the teeth go to the fire, expecting that the grinding department will overcome it. An out-of-round sound is usually fatal to these gears.

After the teeth are cut in driving bevel gears, the soft gears are tested in the hand testing machine with a hardened master gear, to determine the bearing between the teeth and the feel of the gears. They are then tested on a speeding machine with the same master gear and under some load. After they have been hardened and the holes and webs have been ground for the final inspection, they are tested in pairs as they will be shipped, but not in the particular order in which they will be used on the axle. The procedure is as follows: A gear is mounted and several (four or five) pinions are run with it; then the gear is removed and four or five gears are run with these pinions, so that every gear and pinion sent out has been run or tested with one or more pinions or gears. In this way the gears are kept interchangeable as nearly as possible. It can be seen that if the final product were tested with the master gears only, should an error appear in the cutting, the master gears might lend themselves very slowly perhaps to this error and fail to show it; but when the product is run together, an error that might not show with the master gears will appear, and it may be

* A paper read before the Chicago convention of the American Gear Manufacturers' Association.

the inspectors have tested the gears just

amount of run out, the ball-testing fixture is used. This fixture makes it pos-

spindle, and, with the spring plunger block; to bring the space of the gear centrally under the plunger, the dial indi-

The bevel pinion can be tested in this way for run-out by adjusting the plunger block to the suitable angle and setting the pinion on a stud. These run-out tests are not made in the final inspection unless the gears have shown a run-out in the running test. In this case, an effort is made to find the exact amount of the run-out and the possible remedy.

The average bevel gears are tested by hand on a bevel-gear testing machine. Care is taken to have a full length bearing along the teeth; if the bearing falls short of being full, as it may do owing to the need of some working limit, it is expected that it will bear heaviest on the inside or small end, as the bearing will pull in or extend full length with the least wear and the spring of the bearings or shafts.

### Testing Spiral Gears, Helical Gears, and Worm-gears

In testing spiral gears that run at right angles, about the only thing that can be done is to see that the center distance is correct, with some backlash for oil space, and that the surfaces of the teeth are as smooth as possible. Any test of spiral gears other than under actual working conditions is rather unsatisfactory, for they are unreliable to use except where the pressures are light.

This is also true of helical spur gears, as they are made only for high speed, although it may be possible to develop a running test at some speed that will serve to show the defects in the gears, if there are any. The Brown & Sharpe Mfg. Co. has decided that there is no test that can be satisfactorily used in testing helical timing gears by anyone else but the user, and for this reason it has hesitated to cut these gears, as it feels that the user or motor manufacturer should assume the responsibility of cutting them.

Worm-gears, as they are being used to-day, require closer inspection than ever before, as more is expected of them. It was only a short time ago that the worm gear had a poor reputation for service-

of the worm-gear, greater care

Worm-gear cutting equipment, it

the profiles of the hobbing machine are the correct distance apart when the gear is finish-cut. The worm and wheel should be mounted at the correct center distance and in proper alignment to be sure that the bearing between the worm threads and the wheel teeth is correct, a point that increases in importance as the service to which the gears are to be put increases in severity. On large gears, where a testing machine would be out of the question, the worm can be laid in the wheel and measurements taken from a straightedge (laid across the rim of the wheel) to a bar in the hole in the worm or to the worm-shaft. If the measurements taken on one side or end of the worm differ from those taken on the other, it is evident that the shafts are not at right angles with each other. If these gears are mounted in a gear-case in which the shaft bearings have been bored square, the bearing between the teeth will be a cross-corner one, and the amount of this bearing will depend on what the wheels have to do. When the pressures carried by the teeth of worm gears are taken into consideration, it is evident that the bearing should be as full, or broad, as possible.

When testing the average small worm-gear, this company uses bevel-gear testing machine, which is also a worm- and spiral-gear testing machine. But for automobile-truck driving gears, it has fitted up a special machine, where the gears can be run under some pressure. This machine is fitted with a scale and a vernier for reading the center distance.

### Hardening Inspection

Probably no inspection operation depends more for its success on the very operation it professes to inspect than the hardening inspection. When inspecting the machine operations performed on a gear, the mechanical errors can be determined with the measuring tools, and it is possible to feel and hear how smoothly and quietly the gears run. It is therefore possible to pass judgment on them without considering what equipment or methods were used in producing the results obtained. When it comes to testing the gear for the quality of its hardness, however, we find we cannot do more than give it a superficial test, which may mean a great deal if we are sure the hardening was done properly, but which means very little if the hardening was done improperly.

Assuming that the proper treatment for a given gear is known, it is essential that the men in charge of the hardening operation should supervise it closely so that no deviation from the best treatments is made, for the slightest lack of attention produces unsatisfactory or weakened gears which cannot be discovered until they break in service. This satisfactory treatment must be determined by measured breaking tests of gears and an examination of the fracture, to determine not only the depth of case but the condition of the grain of both the core and the case. From a gear having undergone this test, the desired scleroscope and Brinell readings may be found.

This breaking test cannot be carried on indiscriminately, of course, owing to the expense of making test gears, but it is so good a check on the work that it should be done as often as possible or as often as the job will warrant. If gears that have been spoiled are hardened with the good gears and then the teeth are broken, either under a drop or with a hammer, and the fracture is examined, the quality of the hardening may be checked under the best conditions with the least expense.

As a rule, the Brown & Sharpe Mfg Co. also tests every hardened gear with a ball-peen hammer for depth of case and with a file for hardness. The scleroscope and Brinell machines are used as auxiliaries, except where a customer may demand a given reading from either machine when it becomes the decision test.

Besides these tests for hardness, on driving bevel gears, this company tests for flatness on a surface plate and for any disturbance of the web in the direction of the axis of the gear. This test is a hardening-room test, for if it is found that gears are becoming distorted in hardening, it is necessary to change the hardening fixtures.

At times, after all these tests have been made, and probably after any other possible test, there is always the question as to whether the gears will run satisfactorily under actual service conditions. As a result, it is sometimes advisable to have gears tested under these conditions before proceeding at full speed to manufacture. When the gears are satisfactory, it is a good plan to have a pair or set that has been tested out in actual service to hold as master gears, with which the future product can be compared. In closing, it should be said that the amount or severity of the inspection of any gear depends entirely on the purpose for which it is used, although at all times that quality which represents your product should be maintained.

## FUEL RESEARCH IN BRITAIN—II.*

As an illustration of the complicated inquiries which will have to be conducted before an answer can be given to what seems a simple question, the report refers to the suggestion that the cost of producing electric power from coal in this country would be substantially reduced if the coal, instead of being burned directly under the steam boilers, were first subjected to carbonization and gasification processes which in addition to fuel gas would yield valuable by-products. Plausible statements, it is remarked, have been issued showing the enormous savings or profits which would accrue if schemes of this sort were adopted. Unfortunately these estimates have been been made on a very slender foundation of knowledge and experience. On the other hand, those who by experience and practice are best qualified to judge hesitate to prophesy as to what the economic result of a combined carbonization and power-generating scheme would be, but they agree that the in-

*Part I. appeared Jan. 17.

terests at stake are so great that the question ought to be authoritatively answered once for all. But no answer can be accepted which is not founded on the complete working out of the scheme, no important step in the series of operations being omitted or slurred over. This series of operations will start from the mechanical preparation of the coal and its conversion into solid, liquid, and gaseous products by carbonization. It will end with the delivery of a known weight of high pressure steam under the conditions most favorable for power production by turbo-generators. In the proposed scheme of research the investigation of each of the steps involved in the above inquiry is provided for. Three, at least, of these steps involve pioneering work on an industrial scale, and the work may occupy a considerable time. It is possible that the net result of this particular inquiry may be to show that purely as a means of cheapening the cost of electric power the use of carbonization methods has not much to commend it, but will be justified by incidental advantages in particular cases.

### The Experimental Station

The scheme of research outlined in the report cannot be efficiently conducted, it is declared, except in a fuel research station designed and equipped for the purpose, in which operations on an industrial scale can be carried out under proper working conditions. It being realized that the conditions required for such a station could be fulfilled only by a site in the neighborhood of a large gas works, the Director of Fuel Research approached Dr. Charles Carpenter, the chairman of the South Metropolitan Gas Company, some months ago, and subsequently Dr. Carpenter, on behalf of the directors of his company, made the following very generous offer:—

(1) To lease to the Government at a peppercorn rent sufficient land at the East Greenwich Gas Works for the erection of the research station.

(2) To prepare drawings and specifications for the station on lines laid down by the Board and to make contracts for its erection.

(3) To give every facility for the transport of coal and other supplies to the station and to take over at market prices the surplus products, gas, tar, liquor, and coke, resulting from the operations of the station.

The site consists of a strip of level ground, about 250 ft. wide by 700 ft. to 800 ft. long, situated on the main siding which connects the gas works with the South-Eastern Railway and possessing access to an existing road.

### Proposed Equipment

The following description is given of the equipment which will be required for the research work at present in view:—A railway siding will pass through or by the side of the station, and the coal to be used in tests will be received in railway wagons at an unloading platform provided with a sampling floor, a coal breaker and screens, a weighing machine, an elevator, and high-level bunkers. From this the coal will be passed on to the retort house, where ample space will be provided for the erection of the various forms of carbonizing apparatus which are under investigation. Facilities will be provided for quickly carrying out the necessary changes and improvements in the apparatus as the experimental work proceeds. The hot gases will be led from the retort house into the condenser and exhauster house, which will be equipped with condensers, washers, scrubbers, exhausters, compressors, meters, pressure regulators, gauges, pumps, motors, and tanks. For the collection and examination of the gases in bulk gas holders will be provided. The hot coke from the retort house will be elevated to high-level bunkers, from which it can be supplied to gas producers, steam boilers, briquetting plant, or railway wagons. The gas producer house will be provided with one or more gas producers, with heat exchangers, washers, scrubbers, and liquor tanks; the steam boiler house with one or more water-tube boilers of modern type, and with feed water tanks, water and steam meters, pumps, etc.; and the briquetting house with grinding, mixing, and briquetting machines. Tar and oil stills and condensers will be provided for dealing with the liquid products, and the gas furnace house will be equipped for the testing of gas muffles, annealing ovens, and melting furnaces. The station, as planned, will be capable of any extensions required for future researches.

### Scope of Scheme

The scheme of research described is not intended to cover the whole of the territory open for exploration to-day. Still less ought it to be regarded as setting any limits to the exploration of new territories in the future. The root idea of the scheme is that certain fundamental changes in the preparation and use of fuel which have been proposed are of such far-reaching importance that the solution of the technical and economic problems involved ought to take precedence of all other matters. This does not mean that other lines of research will be ignored, but only that the larger issues must be kept well to the front till definite solutions of those technical and economic problems can be given.

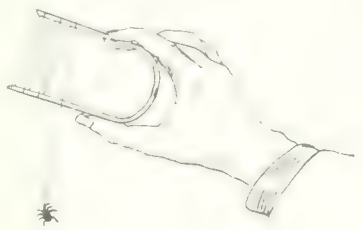
## REPLACING SURVEYOR'S TELESCOPE WEBS

By L. E.

THE spider lines used to mark the optical axis in surveyor's telescopes sometimes break, an accident that renders the instrument useless until the lines are replaced. The job is usually given to an optician to undertake, but the possessor of the instrument may make this repair himself. If the webs of a surveyor's level telescope are to be replaced, proceed by removing the eyepiece and then the focusing-tube, taking out the screws holding the parts that carry the milled head and pinion connected with the rack fixed to the tube.

On withdrawing the collimating screws, the eye-piece and wire plate holder will come apart. The wire plate works in a slide, and to remove it one side of the slide must be taken out. Before proceeding to do this the parts should be examined for dots or similar marks which mark the relative places of the parts when put together. On the side of the eye-piece wire plate next the eyepiece fine marks or lines indicate the places for the spider lines, and to these the new lines are to be applied. With a pen-knife remove the small dots of varnish that have held the old webs in position, but avoid scratching or damaging the marks and the plate will then be ready for the new webs.

Bend a piece of stiff wire to a U form. If a hard steel is used, the temper must be taken out where the bend is to be made by heating in the flame of a spirit lamp or similar means, so that it can be shaped without breaking. The opening



between the prongs should somewhat exceed the width of the wire plate. The fork is for the purpose of straining the spider web so that it can be applied to the wire plate.

A spider that produces geometric webs—the garden spider—as it is sometimes called should be used. On being captured spiders have a habit of drawing their limbs together and feigning death, but if left undisturbed for a short time they resume their activity, and in most cases endeavor to escape by attaching a web to the hand and dropping downwards. When it does this the line suspending the spider must be picked up with the wire fork, and as the web is delivered it should be wrapped on the fork by turning it over, keeping each coil separate as shown in the figure. Of course to ensure even wrapping, the spider shoulld be farther from the fork than illustrated.

When the fork is filled a very small quantity of varnish—shellac dissolved in spirit will answer—is put on the marks that indicate the places on the wire plate for the spider lines, and a length of web as stretched between the prongs is applied. This is a somewhat delicate matter and no specific directions can be given. A good light is necessary and a magnifying glass is very helpful, as is also a small pointed chip of wood to adjust the web in position. When the line is affixed a minute drop of varnish is applied to secure it in place. In the present case there are three lines to be fixed—two vertical lines which are scarcely one-thirtieth of an inch apart and the horizontal line crossing the others. As soon as the varnish is dry enough for handling of the wire plate, the several parts are put together again. Finally the telescope must be adjusted for collimation by the usual methods before the instruments can be used.

# Fundamentals of Apprenticeship: National Interest Grows-.-I

Special Correspondence

*... the principal educational theme ... this country. Employ ... economists, social ... attention with grow ... proposals and the most real and practical experi ... the growing stress of our industrial life.*

... time

... tion; in national, State, ... legislation; in industrial ... conferences; in the establish- ... the growing number of pub- ... lic, and semi-public industrial schools; in the establishment of apprenticeship and industrial education committees by trade associations; by frequent articles in the public press and trade press, and in many other ways.

Raise the standard of skill in the workman. Improve the tone of industrial morality. Give the greatest number of individuals the opportunity to "live a full and ample life." These are some of the urgent demands of the time.

### Neglect of Old-Time Apprenticeship

Up to within a few years apprenticeship, that is, a type of the old-world guild apprenticeship with its indenture covering a specified time, was little practiced, and the propagandism for industrial education largely ignored it. The beginning of its decline dated from the industrial revolution which took place during the latter part of the eighteenth century, resulting from the introduction of labor-saving machinery and the subdivision of labor.

Before our modern factory system came into vogue most workmen were artisans, masters of their craft; they knew how to perform and could perform the successive stages in the production of a given article. The old labor guilds ... through all stages of development. In ... the laws and customs of Western ... especially required that any per- ... to exercise certain branches ... and trade custom formerly governing the apprentice became largely inoperative and obsolete.

The new industrial system developed the specialist,—he who could do but one thing and must perform this one operation day after day and year after year. It separated by a strong line of demarcation, the skilled worker from the unskilled, and so re-arranged the processes of manufacture that the various stages of production became distinct vocations, the workers in a given department of manufacture being quite ignorant of the work performed in other departments. In consequence of this factory system, and the division and sub-division of processes, the great body of workers of necessity became unskilled machine tenders. To overcome this lack of industrial mastery in the great mass of industrial workers, modern employers resorted to many devices, most of which have centered around the employment of skilled supervisors to plan and direct the work and movements of groups of employees. But all of these devices simply emphasize the fact that machinery without trained intelligence to guide it cannot be fully productive, nor the quality of its product raised to the highest standard.

### Trained Help Necessary

This condition of affairs has not been overlooked by intelligent employers, nor have the serious aspects of a nation containing large bodies of untrained men and women been lost sight of. For some years the growing seriousness of this situation has been receiving the careful thought and study of progressive employers and far-seeing educators, and out of the many hundreds of ideas, plans, and systems which have been discussed and tried out, in whole or in part, certain basic things are making themselves manifest.

It is agreed that no matter how complex the machine, nor how automatic it may be, the worker is the essential factor.

A leading manufacturer expressed the situation in a nutshell, recently, when he said that manufacturers are coming to the conclusion that "the man at the machine is the most important asset, who spells success or failure for any business."

Employers also are now realizing that economical production consists of much more than the mere repetition of machine operations—that it requires a measure of skilled guidance plus the machine operations.

This conclusion has caused a search for a remedy, and out of all the discussions and studies upon this subject there has gradually grown up a demand for a revival of apprenticeship in practically all industries.

As the late Carroll D. Wright well said in his bulletin, "The Apprenticeship System," prepared for the United States Bureau of Education, "It is unwarrantable to argue that the apprenticeship system answers the whole demand for industrial education—but it may do so to a large degree. It is also needless to argue that the industrial schools furnish everything in the way of vocational equipment that can be gained by a thorough apprenticeship system. What is needed is . . . some co-ordination that shall secure all that can be gained from the apprenticeship system and much that can be gained from modern schools for trade and industrial education generally."

The above is the basis of the work attempted by this conference board, and because of the great interest employers are now taking in this subject and the insistent demand that has grown up in all industries for data and information that can be used in applying the apprenticeship principle to industry, the following is offered as a result of the deliberations of this board.

### Personal Interest of Employer

No apprenticeship system nor any scheme of industrial training can be successful without the active interest of the employer. As stated in Bulletin No. 1 of this series, "The employer is the key to the situation." And note that it says "active interest," because the problem of creating an industrial intelligence in the workers who shall man the employers' shops is essentially an employer's problem and cannot be wholly left to pedagogic guidance. There must be a point of live contact between employer and apprentice.

What is an apprentice? The dictionaries give the answer very clearly. Webster says, "One who is bound by indentures to serve a mechanic, or other person, for a certain time, with a view to learning his art, mystery, or occupation, in which his master is bound to instruct him."

Worcester says: "A person bound by indenture for a certain time, to perform services for a master, and receiving in return instruction in his trade or occupation."

The Century Dictionary says: "One who is bound by indenture to serve some par-

ticular individual or company for a specified time, in order to learn some art, trade, profession, manufacture, etc., in which his master or masters become bound to instruct him."

And the Standard Dictionary says: "A person, usually a minor, who serves another in order to learn a trade, art, or profession, especially when bound by indentures for a term of years."

In view of the foregoing it is incumbent upon the employer to exercise a personal interest in his apprentices, and this duty no employer can escape.

Many employers flatter themselves that they are too busy to assume any responsibility for apprentice training, and defer their attention to suit their convenience. On the other hand, employees seek to restrict the number of apprentices in order that they may control the situation. Also many employers have practically no apprentices, depending upon "the market" for their labor supply. They seek the men whom some one else has trained. This method of obtaining a competent worker is akin to stealing him from another employer who, in turn, will do likewise.

### Some Employers' Attitudes

Years ago employers heeded their responsibilities when each journeyman master initiated an apprentice into the trade, but as specialization became more pronounced and individual responsibility became merged into corporate management, apprenticeship training received very slight attention upon the part of employers or corporation officials.

If one will but study the history of juvenile labor he will find that old-time laws laid emphasis on the obligation of the master to the young person employed. It was a two-fold responsibility; the master was answerable for the health and moral development of the lad while in his employment, and for his service to the State and career as an adult since his service and his career depended on his physical, moral, and technical training as a boy.

The interest of the employer in his apprentices will foster and develop a spirit of loyalty and integrity possible in no other way. It will assure the young worker of a "square deal" and prevent favoritism or other unhappy circumstances standing in the way of his advancement. It will do much to dissipate the feeling that the only interest an employer has in his workers is the money gained from their labor. It will develop a wholesome spirit of productive rivalry and build up a type of efficiency which cannot be obtained otherwise.

Of course, it is not to be expected that every employer can personally interview all applicants for apprentice situations in his works, nor that he can personally instruct his apprentices, but he can keep close to the situation by personal supervision of his apprentice department.

Boys are impressionable, and if "the boss" evinces a frequent personal interest in their progress and well-being, they will repay it many times in a quickened interest in their work, in loyalty, in steadfastness, and even in affection.

The Greek philosopher, Epictetus, in his discourse upon citizenship, pointed the way for modern employers when he said, "You will do the greatest good to the State if you shall raise not the roofs of the houses, but the souls of the citizens. For it is better that great souls should dwell in small houses than for mean slaves to lurk in great houses."

### Apprentice Training Under Competent Supervision

Apprenticeship instruction as applied to modern conditions seeks to train for higher efficiency, not simply to train raw recruits to perform the operations now being done by the average workman. To obtain this higher efficiency apprentice instructors must be specially selected for—

(a) Knowledge of the trade, including its historical, theoretical, and practical aspects;
(b) Ability to teach.
(c) Interest in teaching by constant study to add to their knowledge.
(d) Moral character.

Inefficient workmen, who have to deal with inanimate materials, are never retained in a shop. Therefore, how much more important it is that those selected to deal with a material vastly more precious than wood, metal, leather, or stone, namely, the human material, be chosen for their proven capabilities!

It is in the selection of competent teachers or supervisors, that the employers' interest, as previously discussed, should be first manifested. While the small shop employer cannot afford nor be expected to employ a high-salaried apprentice instructor, the large shop employers should seek out the best available teaching talent that will combine thorough knowledge of the industry with pedagogical qualities. It is rare that these combined qualifications can be found in any one individual and consequently, the large shop employer may find it necessary to employ several teachers. Whenever a workman is selected to supervise the apprentice training he should be chosen for his special skill, and, before undertaking to instruct, should receive a course of instruction himself, so that he may know how to correctly classify the theories and practices of his trade in such a way that the young mind may absorb the successive steps of manufacture.

### Cross Ideals

Without [illegible] apprentice is very apt to be exploited to the disadvantage of himself and his employer. For instance, if the boy is left to the care of the average shop foreman it will quickly become evident that the ideals of foreman and apprentice are at cross purposes. The apprentice is intent upon learning the trade. The foreman understands his job to be that of keeping down the cost of producing. Consequently he will look upon the boy either as an unwise burden on his department, or, accepting him as a necessary evil, will compel him to perform certain duties that have no relation to trade instruction. He may even keep the boy constantly employed at some given operation because of a special acquired proficiency instead of advancing him through the various stages.

A similar condition generally results when the boy is turned over to a journeyman worker. In this case the most the boy can hope to acquire is the limited knowledge possessed by the journeyman, and the latter is apt to do one of two things: either use the boy as a helper without regard to progressive instruction, or deliberately prevent the acquirement of knowledge because of ignorance or prejudice.

Employers will find that it will be quite necessary to educate their foremen to give apprenticeship its rightful place in the plant, as well as to impress upon journeymen workers that the boys under training are to receive special consideration.

Large employers of labor can prevent exploitation of the boy by the employment of supervisors, who have special competency for this work, and by the establishment of [illegible] successfully in a number of shops, namely [illegible] the jurisdiction of the supervisor rather than the foreman, and the shop work selected for the apprentice must be of an educative nature, an industrial curriculum over which the supervisor has full control.

In small shops the employer himself can and should supervise the work and study of his apprentices, directing fore[illegible] teach and how the instruction is to be given.

## ENGINEERS FORM NEW ORGANIZATION.

THE Kootenay branch of the Engineering and Technical Institute of British Columbia was formed at a recent meeting in Nelson, B.C., the headquarters of the branch.

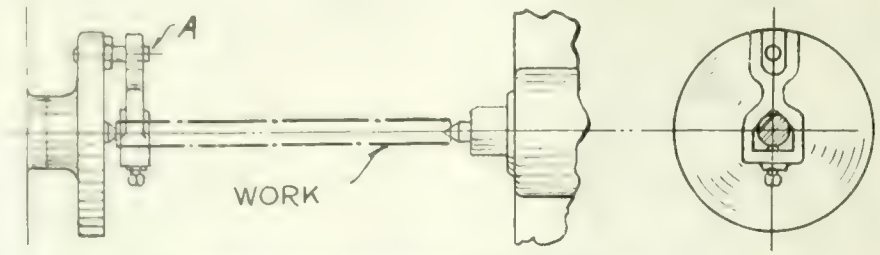
The institute, which is applying to the legislature at the forthcoming session for a charter, will be an organization composed of civil and mining engineers, architects and members of the allied professions.

The following provisional officers were appointed: Wm. Cunliffe, chairman; A. E. Pickford, secretary-treasurer and A. E. Thompson, assistant secretary-treasurer.

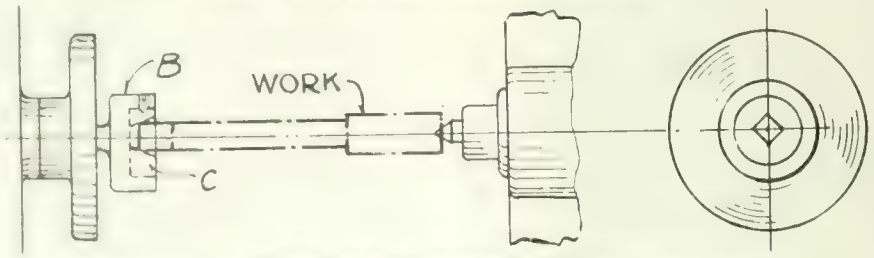
**British Trade Inquiry.**—Particulars concerning the following inquiry may be obtained from the British Trade Commissioner in Canada, 363 Beaver Hall Square, Montreal. A London, England, manufacturer of glaziers' diamonds, diamond turning tools, glaziers' lead vises, etc., desires to get in touch with Canadian buyers.

# PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience




Method of driving with dog and pin in face plate.




Squared center in headstock spindle.

FIG. TWO TYPES OF DRIVES FOR WORK BETWEEN CENTERS.

[illegible] evidence of its convenience on the lathe for holding and driving work, some of which are of standard [illegible] chuck and two types of lathe need no extensive description as their place as part of a lathe equipment is well known and fully taken advantage of, even to the exclusion of some tools which might be more profitably used in specific [illegible] by means of a pin or screw A in the face plate. The purpose of this dog is obvious as the method of handling it is similar to that in use for the various types of dogs. In the lower view of Fig 2 a method for driving work which has a square on the end of it is shown, this consists of a center B held in the head-stock square bush C in it, made in various sizes to suit different diameters of work. These bushings with the square hole in them are beveled, the front end being larger than the back. In using this center the squared end of the work is simply pushed into it and held in place by the tail-stock center in the other end; working in the usual manner, light operations may be performed.

In operation this method of driving work is quite fast where it can be applied satisfactorily. The driving centers may be made in other shapes besides the square, such as hexagon, rectangular, etc. A center which answers the same purpose as that described above as used for driving work where the end is not shaped is illustrated in Fig. 3. The difference between this center and the square center consists of corrugations in the beveled hole at A, these corrugations acting in the nature of a number of teeth which grip the work when it is forced in by the tailstock center. In putting work into this holder it is not necessary to stop the machine, and such operations as chamfering and necking are thus rapidly performed.

Another method of driving from a squared end is shown in the lower view of Fig. 3. This is a more accurate method of holding the work, inasmuch as the same is held between centers, the driving, in this case, is done by a bent plate B which has a slot cut in the end to receive the work. This plate is held on the face plate of the lathe by means of a screw C.

In instances where there is no square on the work the driving may be done as in Fig. 4 upper view, provided there is no objection to slightly marring the work. This device consists of a lever A which has teeth cut in the gripping surface of the same at B, this gripping surface is machiner eccentric with the center hole C on which it pivots, the radius at Y being about 1/16 inch less than the radius at X. With this arrangement the lever is forced into the work when a cut is taken, thereby driving same. In some instances the teeth on these levers are omitted and the wedging of the eccentric surface is sufficient to drive the work.

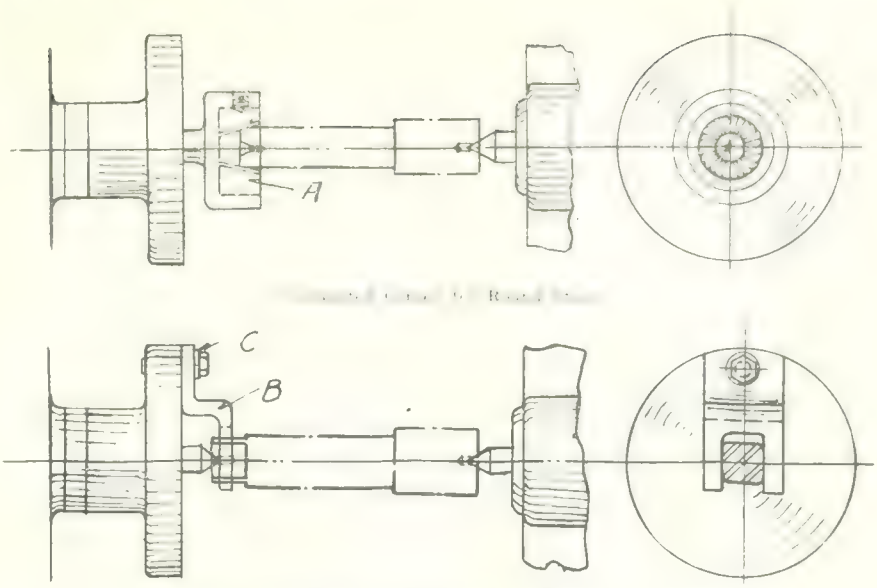
In driving work by this method considerable strain is placed upon the headstock center and if an attempt is made to take a heavy cut the center hole is quite apt to be forced out of round there-by making poor work. When taking heavy cuts upon a lathe considerable difficulty is often encountered by the dog slipping, or in other words one screw is not enough to take the whole strain of the cut. In such cases two dogs can be used as shown in the lower view of Fig 4 to good advantage and it will be found that this arrangement is sufficiently powerful to drive under almost any cut. In this illustration the tail of the dog D lays against the tail of the dog E, this dog in turn being driven by the face plate in the usual manner. What actually happens in this instance is that the strain of the cut is divided between the two dog screws.

[illegible] TOOLS

Having reviewed in general various dog methods of driving which are doubtless familiar to many although probably suggestive to some, reference is made to Fig. 5, which shows a group of lathe face plates. The two upper face plates shown are of the plain slotted and plain drilled type which screw on the spindle nose. In the center of this illustration at the left is shown a chuck or face plate; this is held in the lathe spindle and has different diameters bored in it, thus work corresponding to any one of these diameters may be held. These chucks have a tapered shank on them and are drawn back into the spindle nose which causes them to collapse and grip the work, three slots being cut for collapsing purposes.

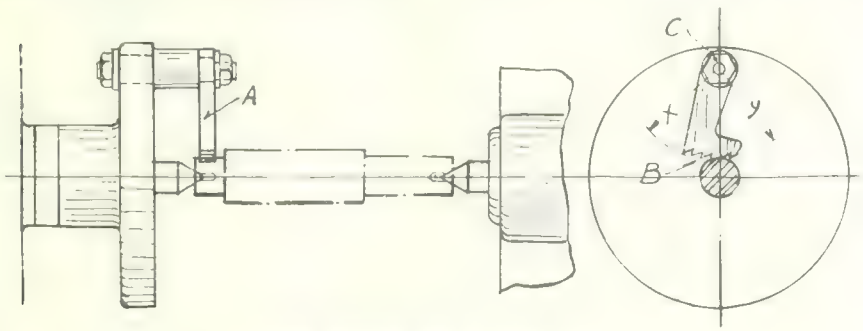
The illustration to the right of this shows a face plate which has two vee grooves cut transversely at right angles across its face; this is a convenient face-plate for gripping round work and drilling cross holes through the diameter. In the lower left hand corner of this illustration a face plate provided with four clamps for holding work is shown. On some of these face plates it will be noticed that lines are cut around the face plate and these are convenient for locating work approximately.

A description of work holding devices which did not include the chuck shown in the upper view of Fig 6 would be far from complete. This is a small drill chuck and these chucks are made in quite a number of sizes and varieties by various makers. In the lower view of Fig. 6 an arbor is shown, this arbor being of the split bushing type, a nut A being used to expand it by forcing the bushing over a tapered shank. For removing the work from this arbor the nut B is used to push the split bushing back.

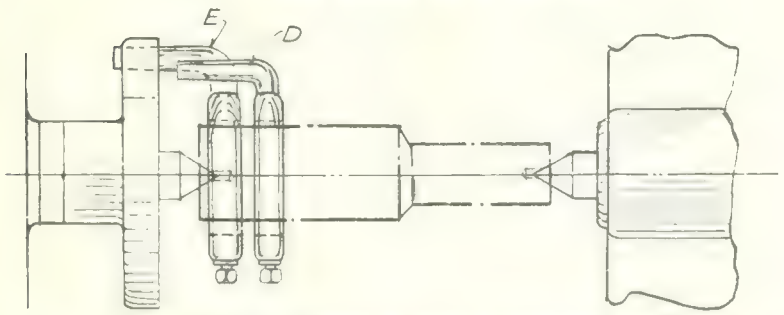



Method of driving from spiral driving plate bolted to face plate

FIG. [illegible] TWO ADDITIONAL TYPES OF DRIVES BETWEEN CENTERS




Method [illegible] used on light cut




[illegible]

FIG. 4. EXAMPLES OF LIGHT AND HEAVY DRIVES BETWEEN CENTERS

Usual Type of Face Plate

[illegible]

Clamp Type of [illegible]

[illegible]

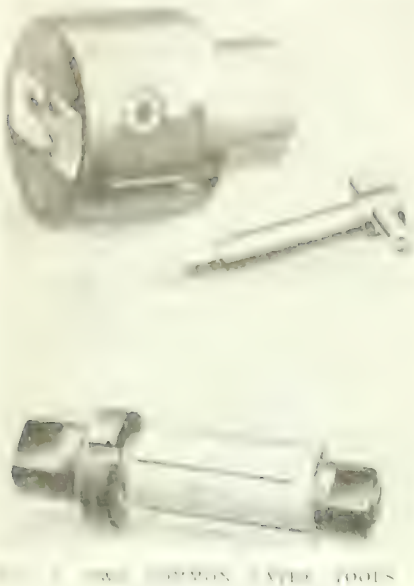
FIG. [illegible] A GROUP OF [illegible] FACE PLATES

## AN IMPROVED STOCK RECORD FORM

By D. O. Barrett.

THE accompanying stock record had been worked out after using various other standard forms with varying success. It may be used either as a card record or in book form without impairing its usefulness in any way, though in general the card record is probably the most convenient. It will be noticed that there are three main columns—RAW STOCK, STOCK IN WORKS AND FINISHED STOCK. The use of this record does away with the necessity of employing any form of tickler to care for orders, either for material or for work in process, as this information is all self-contained and entered the same as if other forms were used.

Following up the entries, we see that 16 rough castings were ordered 9-16 on order No. 138. All orders, whether for castings made directly in the plant or for outside purchased material, are made out in triplicate, the third copy being sent to the stock room or to the cost clerk, provided the records are kept directly in the stock room. He enters the information on the form and returns the copy to the office, as this is the only information which interests him, and enables him to



by col. 8. On 9-23, 3 of the finished castings were received in the stock room, giving a "Total" of 3 (col. 14). Two of these were issued 9-23 on order A59, leaving a "Total on Hand" of finished stock of 1. Eleven rough castings were received 9-21, completing the orders, as shown by col. 6, and giving a total of 12 "On Hand," col. 7. Col. 8, line b, is left blank, and col. 7 indicates the amount of stock. When material is issued to the shop the amount is subtracted from col. 7 and entered in col. 8 on the same line, so that it is easy to determine which represents the "Total."

Ten more castings were ordered on order No. 157, dated 9-25, these being received on 9-28, completing the order and giving a total of 22 rough castings "On Hand." Order No. 9238, dated 9-30, sent 20 of these into the works, leaving 2 castings "On Hand," as shown by col 8. These finished castings were received 9-30, and with the 1 "On Hand," as shown by col. 18, gives a "Total" of 21 (col. 14), 14 of these being issued on order No. 378, dated 10-2, leaving 7 "On Hand."

The remaining 7 castings were sent into the works on 10-5, order No. 9296, leaving the raw stock entirely depleted with 2 and 9. The finished pieces were received 10-6 and with the 7 "On Hand" gives a "Total" of 9 (col. 14). The total of finished stock is indicated either by Col. 14 or col. 18, depending on whether the latter column is filled.

It will be noticed that this form allows the use of every line entirely across, and these would be entirely filled were the entire stock handled on each order. The next order entry will now be made on line (e). The card is, of course, made longer than the one shown to suit the conditions. Practically all the information regarding any one piece is contained on the form, and its use greatly facilitates the taking of inventory, as it is unnecessary to look up several records to get the requisite information. The same form is used both for purchased and for manufactured material, though for the former some of the columns are not used.

Part No A39 Name Piston Row H
Max 60 Material C I Bin 15
Min 5

| Raw Stock | | | | | | | | | | | In Works. | | | Finished Stock | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ordered | | | Rec'd | | | On Hand | Total | | | | Order No | Date | No | Received | | | Issued | | | Total on Hand | |
| Order No | Date | No | Date | No | Total | | | | | | | | | Date | No. | Total | Order No | Date | No | | |
| 157 | | | 9-21 | 5 | | 5 | | | | | 9193 | 9-20 | 4 | 9-21 | 3 | 3 | A59 | 9-23 | 2 | 1 | |
| | | | | | | 12 | | | | | | | | | | | | | | | |
| | | | 9-28 | 10 | | 2 | 2 | | | | 9238 | 9-30 | 20 | 9-30 | 20 | 21 | 378 | 10-2 | 14 | 7 | |
| | | | | | | — | | | | | 9296 | 10-5 | 2 | 10-6 | 2 | 9 | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | 2 | | | | | 3 | 5 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | |

## TIGHTENING A LOOSE HANDLE

J. E. McCormack.

A type of tool handle made of wood with a socketed clamping nut proved to be a difficult thing to tighten up on occasions when it became loose. There was no opportunity for using a wrench or screw driver on the nut and the handle would not turn by hand. The difficulty was overcome by wrapping a piece of leather around the wool, and then applying a pipe wrench to the leather protected part which on the removal of the leather showed no scratches or dinges.

As tools of this and similar classes are common in machine shops, this may be of interest to others and the idea can be applied to any wooden object of similar size and nature.

## A CHART FOR FINDING THE LENGTH OF COILED PIPE, ETC.

By N. G. Near.

WITH the aid of the acompanying chart it is a simple matter to determine the length of a coil of rope, the length of a pipe so familiar to the plumber, the length fo a coil of rope, the length of a coil of wire, or a coil of almost anything as a matter of fact. This chart, however, was made primarily for pipe. The size limits of this chart, it will be noted, range from 1 to 30 inches in diameter (column A) and from one to 60 turns (column C). This limits the charts to a bit over 400 feet.

To use the chart, measure the "average" diameter of the coils as indicated by the sketch on the chart itself. That is, measure from the "mid-point" of one side to the mid-point of the other side in inches. Then count the number of coils. Then connect the diameter (column A) with the number of turns (column C) and the intersection with column B immediately gives the total length in feet.

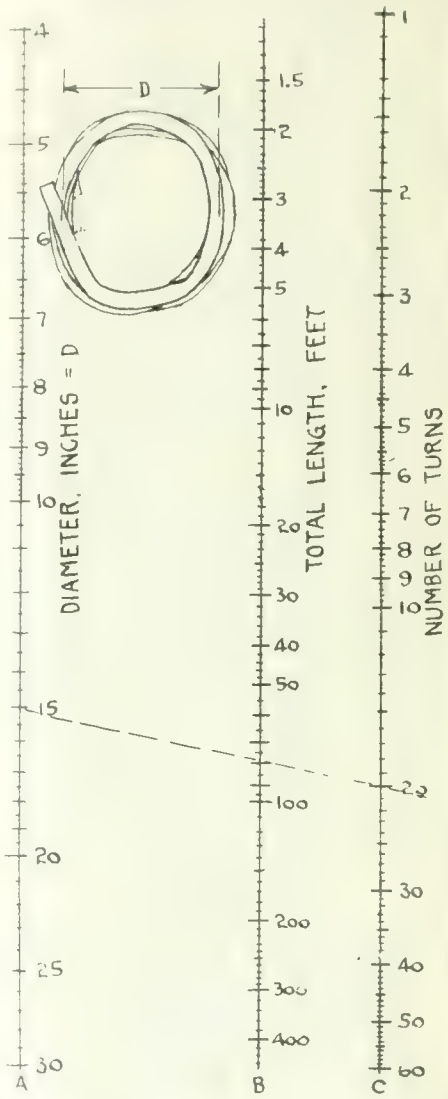



CHART FOR DETERMINING THE LENGTH OF COILED PIPE, ETC.

For example. What is the approximate length in feet where the diameter is 15 inches and the number of turns is 20?

Connect the 15 (column A) with the 20 (column C), as indicated by means of the dotted line drawn across the chart and the intersection with column B immediately shows the length of the coil of lead pipe or whatever else it might be as very close to 79 feet.

It is evident that it is much quicker to use this chart than to unroll the pipe and measure it, or even to compute it, knowing that to compute one must divide the

diameter in inches by 12 and multiply by 3.1416 and then by the number of turns in arriving at the result. Besides, this method is just as accurate anyway because of the judgment that must be used in measuring the diameter.

This method is much quicker and easier than to unroll a long coil and measure it with infinite care and then roll it up again. The method is not "absolutely accurate" but for most rough purposes it will do very well indeed. If it is desired to determine the "exact" length within an inch or even a foot (provided the coils are large) there is no surer method than unrolling and measuring in the longhand way. But if the answer is wanted only approximately, why do it the hard way?

## HEAT TREATMENT OF SHELLS

By G. C. White

THE heat treatment of shells has developed many new types of furnaces and methods of handling. The quenching bath has proved to be not the least important as various contrivances have been used to facilitate handling and cooling. Some of these requiring compressed air have proven very costly.

A good method for keeping the oil cool with such large bodies of metal being quenched is to partly surround the oil quenching tank with water, about 8 inches around the sides and bottom. This water is changed very gradually by running the fresh water in the bottom and having an overflow pipe on the surface.

In the bottom of the water tank are coils through which hot oil is pumped from the surface of the oil tank. These coils containing the oil are connected to an elevated tank which contains a small sized mesh diaphram which splits up the body of oil as it is allowed to fall. These drops of oil cool and fall into another tank from which the cooled oil is pumped into the bottom of the quenching tank proper.

This arrangement of piping conforms in detail to the requirements of the insurance companies except that the elevated tank should not be near the roof.

The quenching tank should have a metal elevated hood which is held above the tank by a rope. If the tank should become overheated and flash the rope would burn through and allow the hood to fall, smothering the fire.

The speed with which cooling is accomplished is as we all know very important and on it depends whether the steel breaks up into the constituents possessing extreme, intermediate or only slight hardness.

Results of tests show that for each increase of 50 degs. F. over 100 degs. F. oil temperature the cooling of the steel is retarded 5 seconds. These results are comparative for the same sized test piece made in the same sized quenching bath.

The most extreme hardness is very seldom attained in commercial practice due to the time taken to quench and the irregularities of shape would set up hardening strains of too severe a nature.

## NOSE BEVEL GRINDER FOR SHELLS

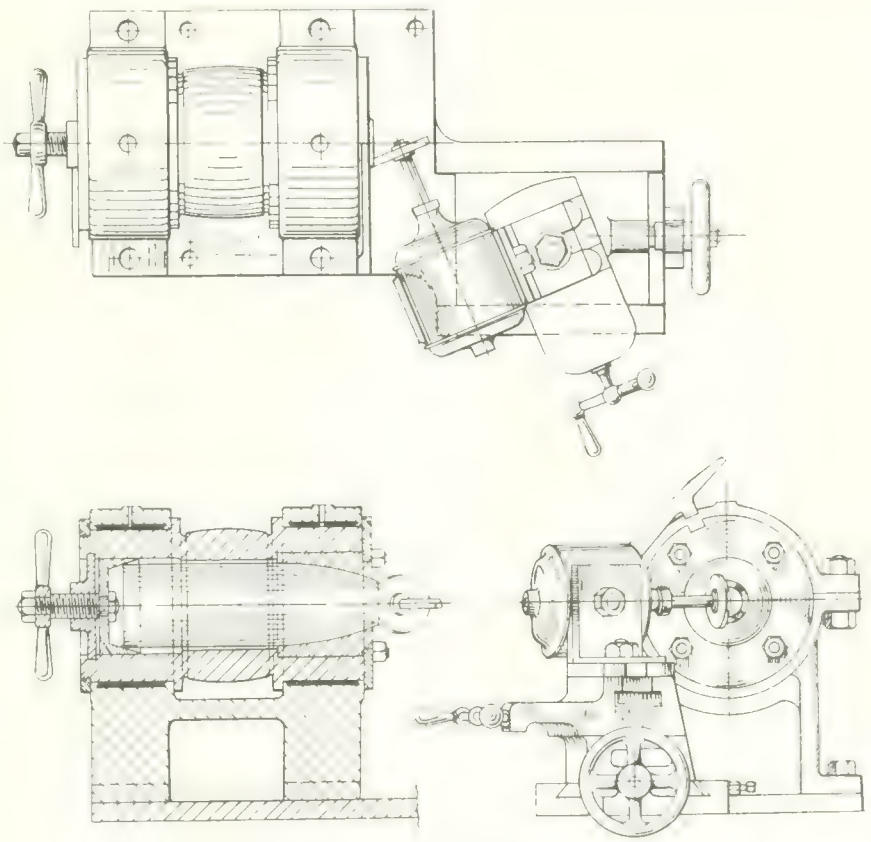
By M. C. Hemeon

MANUFACTURERS of 4.5 in. shells have experienced some difficulty in correctly machining the nose-bevel or seat angle of these shells, with respect to quality of finish and perfect alignment of seat angle with the center line of the 2 in. tapped fuse-holes. The method, generally used has been to finish with a rose reamer revolved by hand on a stud which screws into the nose of the shell, and is there expanded to insure rigidity.

This arrangement has not been entirely satisfactory and the accompanying sketch illustrates a simple power driven machine which has overcome the difficulties of alignment and finish. The shell chuck consists of a cast iron sleeve with a bearing on each end and a pulley in the center. The sleeve is bored at one end to take a hardened steel bushing, the bore of which is the shape of the shell nose. The opposite end of the sleeve is bored to take a centering cup, which is adjusted and locked by a cross-handle and screw tapped into a flange nut. The sleeve revolves in cast iron babbit lined boxes.

A [illegible] in. x ½ in. face emery wheel mounted on the spindle of a small electric grinder, made fast to a rest. As the shell revolves, this wheel is run over the face of the seat. An adjustment in line with the shells compensates for the wear of the wheel.

Firms using thread millers and milling the threads after finish turning will find this tool very satisfactory.



DEVICE FOR GRINDING NOSE THREAD [illegible] SHELLS

## WOMEN AS SMALL ARMS INSPECTORS.

THE U. S. [illegible] women to qualify [illegible] small arms, according to announcement made by the United States Civil Service Commission. The examination which the commission is receiving applications to secure persons equipped to serve as inspectors and assistant inspectors of small arms, in the plants filling contracts for the Army, is the first of its kind opened to women, it is stated.

## U. S. COAL CONTROL

ORDERS under which the United States Fuel Administration will obtain absolute control of the coal and coke output of the nation as soon as existing contracts run out were made public last Thursday at Washington. It is provided that no new contract shall be for a period longer than one year, that all contracts may be cancelled at any time by the Fuel Administration, and that all coal thus sold under contract shall always be subject to requisition by the Government.

Contracts for coal shipments involving what is known as a cross-haul are absolutely forbidden. Under this ruling industries in various sections of the country must obtain their supply of coal and coke from the fields nearest to their plants. This rule will not apply to gas coal and coal used for by-product purposes.

The new orders are the most important which have been issued by the Fuel Administration for many weeks.

# LET THE DANGER TO CANADIANS AT THE FRONT COME FROM THE GERMANS

## What Happens When a Premature Explosion Takes Place at the Front

## Campaign Being Put on Now by the Munitions Board to Arouse Workers

"Well, there's what happened to me." [illegible] a bit more lucky than many another chap who runs into the same thing. You see it was this way," he went on. "I was in charge of a couple of guns not far from the road. On the other side of that road were four other guns lobbing shells over for a throw of about four thousand yards. The one that got me didn't get over four hundred yards [illegible]

CANADIAN MACHINERY, to whom the officer in question was speaking, asked if the men [illegible] sible to do away with premature explosions by rigid care and inspection at

"No, I wouldn't care to go that far," was the reply, "we realize that there is the element of chance in war, and it simply can't be eliminated in its entirety. At the same time the people who are working in shell plants ought to have brought before them every day and every hour if possible the serious side of the business in which they are engaged. Look at it this way. When a gun crew at the front gets the word to go into action, it means action in every sense of the word. The men grab the shells from the racks, they jam them into the guns, and they fire. Never for one minute do they think that the shell is imperfect. The fact that it has been, in nearly every case, made in Canada, is enough for them. Why in many cases, they find marks on the boxes showing that the shells have been made in shops in cities from which the artillery men have themselves come. Now, get this, the gunners go into action in good faith. It's up to the people at home to [illegible] fair."

[illegible] Mean

"It depends on the location, and the [illegible] pits and the enemy lines than they do to the gunners themselves. But get my big point again," said the officer in conclusion, "remember, the [illegible] at the front expect a certain element of danger, but get the munition [illegible] at home to see to it that they reduce it to the minimum. **Let's have all the danger coming to us from the German lines, where we are looking for it.**"

### A Campaign of Caution

Fear [illegible] and blood are greater than contracts and profits is really at the bottom of the campaign that is now being put on under the auspices of the Dominion Munitions Board. It is really backing up the views expressed in the interview above. The appeal is not limited to the inspectors, nor the manufacturers, nor the workers. It is big enough and compelling enough to take in and include pointedly and directly every individual who in any way touches the production in any phase.

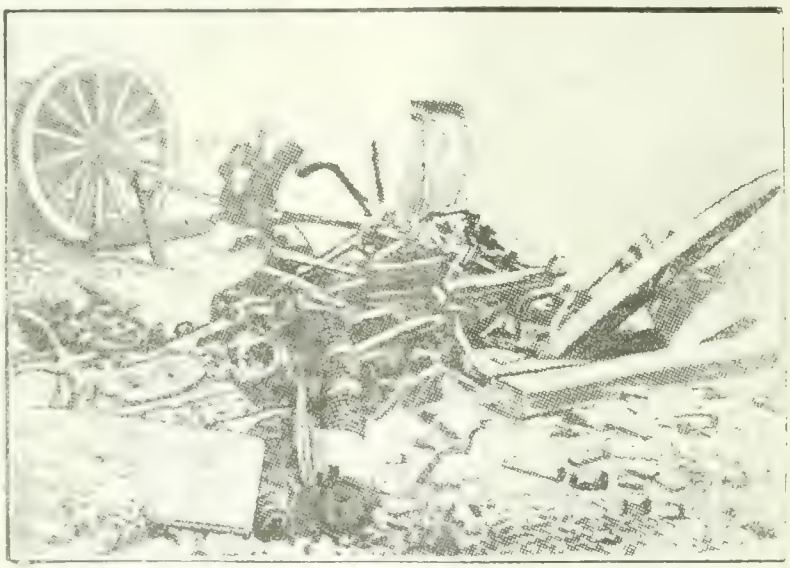
### The View of the Board

CANADIAN MACHINERY has in its possession the views of a very prominent member of the Munitions Board. This member has the right slant to his view. He insists that the man at the front who has to use the shell, and who is in danger from a faulty product, is the chap who must continually be kept on the mental horizon of every person engaged in the production of munitions.

The matter of inspection is one that has raised a very great deal of controversy. It will probably continue to do so. The position, in short is this. The manufacturers say "This product in which the process of machining brings out a defect and causes a rejection was sent on to us from the rolling mills. It was not originated in our plant. We have no control over it in any way. Why, then, should we be called upon to absorb or bear the loss incurred in the employment of the labor that is necessary to bring these defects to the surface?" And on the face of it it looks as though they were able to make out a pretty fair case.

### At the Other End

Then the men in charge of the forge plants where the first operation takes place assume this attitude: "We took the billets and turned out the rough shell. The government have inspectors at our plant, and they pass on every piece of work that goes through. So if the product is not good when it comes to be machined, we don't see how you can turn it back on us." And here, again, it must be admitted that the forge men have a fairly respectable looking alibi when it comes to the matter of placing the responsibility.



GUNS ONLY FIRE ONE DEFECTIVE SHELL

### The Middle Course

The Munitions Board are apparently willing to meet the manufacturers and the steel men on a fair basis in regard to this work. In fact it is known that only a few days ago claims were allowed by which the Munitions Board absorbed a large amount of losses incurred in this way. One Toronto firm, now working on the 4.5 shell, explained to this paper the basis on which their losses were adjusted. It is all based on the amount of labor that the manufacturers have put on the shell before it reaches the point where it is called defective and rejected on that account. For instance, it would not take nearly as much labor cost were the defect found in the first or second operation in the plant as if the shell

had gone well on toward the finished product before the weakness were found in it. This basis will probably be the one on which a very equitable solution to the whole vexed problem can be worked out.

### No "Average Goodness"

"Here's something," remarked a high official to CANADIAN MACHINERY, "that people are apt to overlook in the making of shells. There is no such thing as an average. Each shell, on its own merit, is either good or bad. That hardly applies to any other business with the same force. You can turn out 999 shells and make them all good, and the one that would raise the number to the thousand mark might be bad. The perfection of the 999 would not help that last one—not a bit. It would be bad. You can take a man, and throw all his qualities, good, bad and indifferent, in a heap, and after sizing up the pile conclude that he's not a half bad chap, taking him all in all. You can't do that in the shell business," concluded the official. "Each shell is either good or bad on its own merits."

### Looking to the Future

The man who could tell you how long the shell business will last in Canada could probably tell you in the next breath when the war was going to end. Some of the makers, especially those working on the 4.5 and 6 inch shell, are beginning to see the end of their business, and in some cases they have not yet had a sufficient turnover to justify their capital investment. Although it has not been definitely announced, this paper has it on good authority that Canadian shell-makers will probably have a chance to work on orders for the American government in the near future. At least they are being urged to adopt in a sense the policy of watchful waiting in their business. One Toronto concern, with a Buffalo branch, is already handling a certain amount of the work here. In many other cases, British orders are being renewed regularly.

### A Great Service

The official to whom CANADIAN MACHINERY was speaking was enthusiastic over the accomplishments of the Canadian manufacturers since they went into the manufacture of shells. He urged that the whole field be surveyed from the start, and the run-down conditions of Canadian plants at the start of the war be considered.

"Look at the thing fairly," he said. "We have made millions upon millions of shells, billions of parts; we have established a record in the making of shell boxes—we are doing all sorts of things we never did before. We are bringing untrained men and women into the shops and training them to the stage where they can, in many cases, work accurately to the thousandth part of an inch. Records show that on the whole we are putting more conscience into our work than the American mills. The great overwhelming body of the work has been well done. The accomplishment of the Canadian manufacturers in meeting the demand for shells is nothing short of an industrial romance."

# Industrial World Must Realize Waste is Greatest Enemy

By Wm. C. Redfield, U. S. Secretary of Commerce

*United States offered some up-to-date lessons. Can be something of advantage from the Germans. Go into the industrial contest the same as through prepared for war*

AMERICAN manufacturers will have a vital part to play in the future of the country. This part will be more important than it has ever been before.

It will not be merely that of securing their own prosperity but of assuring the prosperity of the country as well in a sense that has never been true before.

Our power to grant credits at home and abroad depends on maintaining our gold reserve, which is the basis for those credits. If that gold reserve is greatly diminished there will be less credit available at home. We shall not be able to look abroad as before the war for a supply of credit. We must furnish it ourselves. I know of but four ways to protect the reserve on which these credits depend. These are loans abroad, investments abroad, sales abroad or services abroad. Our ability to keep a supply of credits sufficient for our domestic business depends upon these four things.

[illegible] American manufacturer must fight in protecting our domestic credits by selling goods abroad are chiefly domestic. Four are of especial importance. First, I should put the failure to apply science to industry. Germany did this more than any one and prospered thereby. The use of science in industry has greatly grown during the past three years. It must grow more. Unless we are as competent to apply science to trade as others we must not expect to lead them successfully. We shall not deserve to win in the future industrial field unless we apply knowledge to industry as well as others.

A second enemy is the lack of industrial training for workers. In German factories before the war men of science led forces of trained workers. We have made a great start in this direction through the law providing Federal aid to vocational education, of which every State in the Union has now taken advantage. This act will, in my judgment, be found to be more helpful to American industry in coming years than many things that have been more visible to the public eye. When we have trained minds leading trained workers two great steps forward will have been taken in American industry.

A third enemy is ignorance of costs. This has prevailed to an appalling extent. It must go, and with it must go the rule of thumb and all guess-work in industry if we are to deserve the place we hope to gain and keep. We cannot compete with men who know what every process costs them if we have not like knowledge ourselves.

A fourth enemy—and a bad one—is waste. We have thrown away fortunes in the wastes of industry. Take, for a simple illustration, the whaling industry. This is one of our oldest, carried on for over a century with what we have been pleased to call great success. Now we know that most of the values of the whale have been wasted. Fine leather is now made from the whale's skin, from the intestines, the stomach and from other parts. Several tons of good meat are now taken from each whale and find regular consumption. These and similar things may soon come to be the chief products of an industry which for long decades has thrown them away.

If we will waste we must expect to want. Waste in one or another form has been, and, though greatly reduced, still remains one of the great characteristics of American industry and life. We have learned much and are feeding nations from what we now save, but there is much yet to learn.

There are many fine examples in our industry of science applied to business, of trained workers, of clear knowledge, of watchful saving. An indirect good from the war has been the lessons we have learned on these subjects. On the extent to which we learn them and apply them will chiefly depend the future of American business. That future must be one in foreign fields, for the output of our factories is too large for our domestic markets continuously to take it all. Nor can we maintain our domestic credits under the altered conditions by sales in the domestic market alone.

Let us go to the industrial contest then as we go to the field of war, with trained men, led by trained leaders, knowing the job and stripped of all wasteful encumbrances. This done, America has little to fear. The business of the country will find the Government ready to go hand in hand with it in securing its full share of the commerce of the world.

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THE saving effected by increasing the vacuum one-tenth of an inch of mercury will amount to approximately one-tenth of a pound of steam per kilowatt hour at full load.

# PROGRESS IN NEW EQUIPMENT

## A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

[illegible] the methods employed in their production.

[illegible] during the past three years and its de- [illegible] Wadkin & Co. [illegible], [illegible] ng" for the following description and [illegible]ustration:

The general character of the tool is [illegible] will, however, be best understood by reference to Figs. 2 to 11, which show the work in place on the machine. The blank is built up in the usual way by gluing together several layers of wood, as indicated in Figs. 2 and 3. The only change made, as compared with what is usual with hand-shaped propellers, is that the bottom lamina is left with a 4¾-in. projection at each end. In each of these projections and on the centre line a 1-in. diameter hole is drilled to a template.

The hole at the hub, which is put through at the same time, may either be bored out 1½ in. to suit the mandrel of the machine or bored out the finished size. If the latter method is adopted it is necessary to use a bush to fit the bore with a 1½-in. diameter hole for the mandrel. The propeller block is placed over the mandrel of the machine, and sits on a faceplate, and is locked by a screwed nut as shown in Figs. 2 and

[illegible] The [illegible] over a steady [illegible] locked by a hand nut.

The principle upon which the machine is based consists in forming a propeller blade by causing a roller to pass over the surface of an "original" (see Fig. 11), the path followed by this roller imparting a similar motion to the cutter arm as it passes over the work so as to cause the cutter itself to follow an exactly similar path.

Referring to Fig. 1, the bed consists of a long casting with machined ways, upon which a carriage is mounted. This carriage supports upon ways machined upon its upper face a reciprocating headstock. Upon this headstock are pivoted the cutter block and copy roller arms. These are connected at their ends remote from the cutting tool by an adjustable link. The arms are balanced by a spring, so that just sufficient weight is on the "original" as to keep the cutters in contact with the work.

The cutter block comprises 12 cutters of special shape, six cutters being on the front face of the cutter block and six on the opposite face, so that the machine will cut with equal facility in either direction. The designed speed of the cutter block is 4,200 r.p.m., and the spindle on which it is mounted runs in ball bearings. It is driven by a flat belt running over a two-step pulley, mounted on ball bearings and carried by a bracket fixed to the sliding headstock. A second flat belt running vertically downwards over guide pulleys couples the two-step pulley with the driving

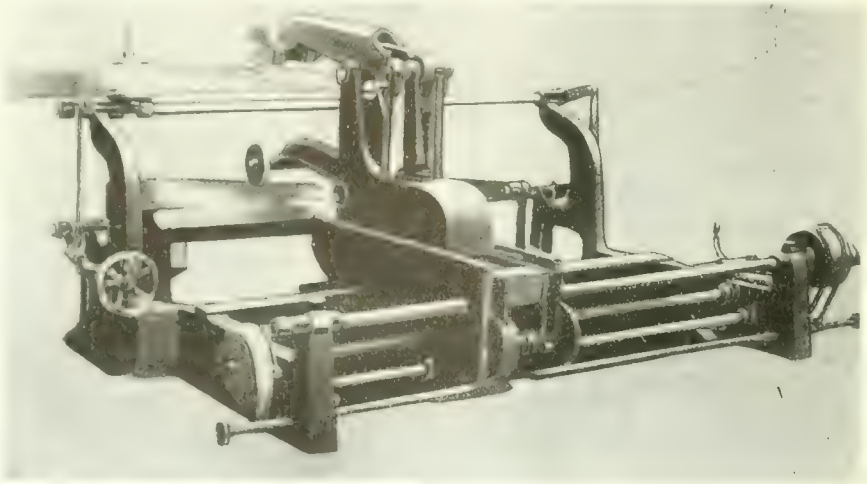

FIG. 2. AUTOMATIC SHAPING MACHINE FOR FINISHING AEROPLANE PROPELLERS

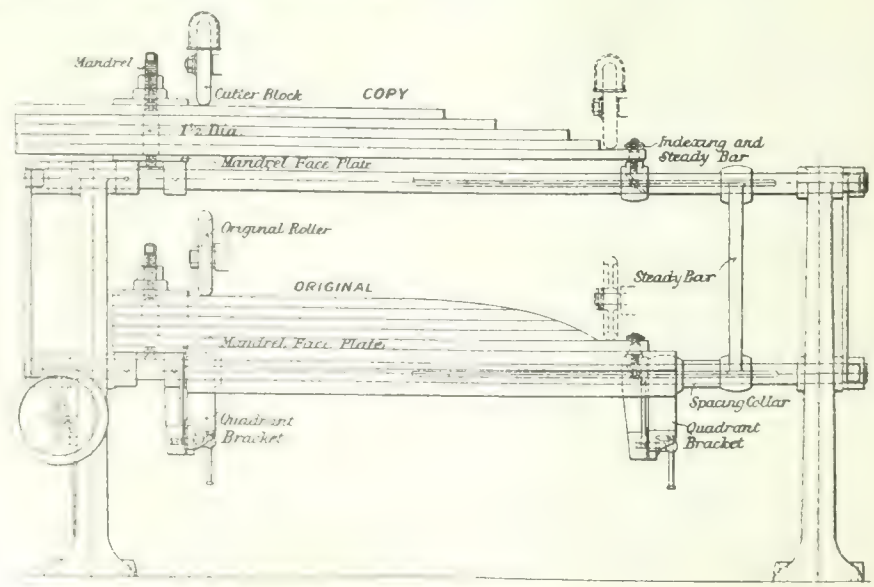


FIG. 3. FRONT ELEVATION.

pulley, which is fixed and traverses with the carriage along a splined shaft. This shaft carries at one end a pair of fast-and-loose pulleys, and also a pulley for driving by means of crossed and open belts the carriage-feed mechanism.

Steel reduction gearing contained in a gear-case connects the driven pulleys of this feed mechanism with a driving shaft for giving the reciprocating motion to the headstock on the carriage, and also for giving the longitudinal traverse to the carriage by means of a screw. Two stout horizontal turned bars, mounted in a pair of brackets, are used to carry the mandrels and faceplate for supporting the work and the "original" or copy. The method of mounting the propeller block upon the mandrel and the steady-pin at its opposite end has already been explained, and the "original" is mounted in exactly the same manner. It will be noticed that wooden guides (Figs. 6 and 7) are provided at each side of the "original" so as to provide a support for the roller on leaving the surface of the "original."

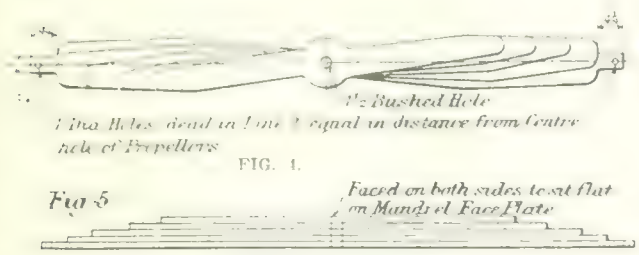

FIG. 4.



FIG. 5.

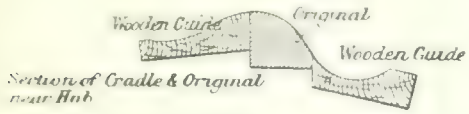

FIG. 6.

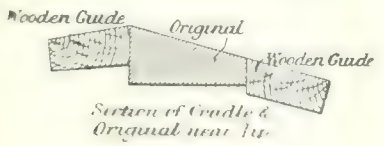

FIG. 7.

The "original" consists of a wooden block shaped on one side only, exactly as the finished blade for the face side, and a similar block for the back side. These are shown separately in Figs. 6 and 7 and Figs. 9 and 11. By adopting this method a very stiff "original" is obtained, which can be quickly made by the manufacturer in his own shop. The wooden guides are fixed to quadrant brackets mounted on the "original" supporting bar, and can be locked in any suitable position. These platforms are easy motion to the roller arm as it passes backwards and forwards over the "original."

Owing to the variable shape of the propellers a motion is provided so that the "original" and the propeller block are tilted simultaneously by means of parallel links and a worm and worm-wheel motion, operated by hand wheel (best seen in Fig. 2), in order to facilitate the passage of the "original" roller in its traverse.

It is claimed that a 10-ft. two-bladed propeller may be cut in 1¾ hours by this machine at a [illegible]

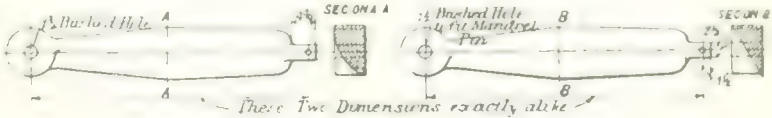

FIG. 8.



FIG. 10.

FIG. 9.

FIG.

which gives a very good finish to the work. Other rates of feed may be fitted to the machine if desired, which will enable a propeller to be shaped in 70 minutes with a slightly coarser finish. A four-bladed propeller is cut in exactly double these times. The amount of attendance required is small, and in some shops one man runs three machines, since they are entirely automatic, and merely require starting and stopping as each blade is cut, in addition to placing the work in and out of the machine.

The machine is made in two sizes, siz., to take propellers up to 12 ft. and 14 ft. diameter, both of which will take work 9½ in. through the hub and 16-in. width of blade. The actual amount of time saved depends, of course, upon the size of the propeller, but taking the various figures given the propeller makers, the average is said to be well over 10 hours on a two-bladed propeller, and is in some cases as much as 14 hours.

## SEXTUPLE AUTOMATIC BAR MACHINE

THE sextuple automatic bar machine, illustrated above, is a recent product of the New Britain Machine Co., New Britain, Conn., and, while similar in many respects to the multiple spindle chucking machine described recently in these columns, differs in that it does not index, but is designed to feed, drill, chamfer, and cut off in each position, on simple work such as rolls, sleeves, couplings, etc., this makes six-fold production possible, as compared to single spindle automatics.

As in the multiple spindle chucking machine, the spindles (six in number) are of liberal diameter, hammer-forged from chrome nickel steel, heat treated, hardened and ground and run in bronze bearings of ample proportions, ground straight inside and taper outside, thus providing means for taking up wear without disturbing the alignment of the machine. Ball thrust collars are also provided on all six spindles for taking care of the end thrust due to tool pressure, this arrangement resulting in a thirty per cent. reduction in the power required to drive the spindles.

The change gears provide six rates of spindle speeds, while a separate system of change gears is provided for effecting changes in feed by varying the speed of the cam shaft.

The spindle cylinder is heavy in design

[illegible] BAR MACHINE

am is laminated in a simi- leaf spring, which con- ine. The cam shaft is driven through a large internal gear on the inner circumference of the feed cam steel roller fixed to the frame

A quiet, smooth-running machine re- gears by the generating process and from the absence of all chains and bevel gears.

Hand control levers on each side within easy reach of the operator enable the power feed to be instantly stopped or started. These, in conjunction with a hand feed crank for testing all feed movements and tool positions are valuable features, avoiding breakage in setting up, testing, and adjusting tools.

The oil distributing system is designed to avoid as much exterior piping as possible. This is accomplished by conveying the oil through the underside of the tool slide into a chamber at the center surrounding the driving shaft bushing, from which it is tapped off at the circumference through short tubes to the individual tools. The oil pump is driven at constant speed.

The base, forming the chip pan, extends to the floor, thus dispensing with legs, and the broad foundation thus obtained, together with the stiff construction and ample weight of the machine, tends to prevent vibration and to insure smooth, accurate work. That portion of the bed directly beneath the work has a 45 degree slant toward the rear of the machine so that the chips are carried to the side as they are cut off. The chip pan is widest on the rear side, and slopes toward the rear end where there is an oil well and strainer, from which the oil is pumped and distributed to the work. This construction permits the draining off of the oil before the chips are removed and makes it possible to rake out the chip pan without stopping the machine or removing the splash apron.

Armagh, Que.—The Town Council will ... The engineers are Gouvin & ... Quebec.

## TO PROTECT WORKERS AGAINST POISONS.

SECRETARY McAdoo announces that the United States Public Health Service, of the Treasury Department, has begun the collection and dissemination of information aimed to protect the lives of workers engaged in war industries.

One of the greatest dangers to the workers in the highly developed munitions industry is from the nitro and amido compounds of benzol and toluol, one of which, trinitrotoluol, is very generally used as a powerful explosive. Workers are exposed to this substance in its manufacture and in shell loading.

### Guarding Against Poison.

It is readily absorbed through the skin and respiratory tract. Although such absorption cannot be prevented altogether, it can be made so slight that no workers, except, perhaps, those especially susceptible, will have symptoms of chronic poisoning.

The Public Health Service has published an article giving practical points in the safe handling of trinitrotoluol and dealing primarily with the shell-loading processes. The shells are loaded in two ways. The compound is either pressed into the shell by power presses while in powdered form, or is poured into them while in molten form. In the former method, used only in the case of large shells, simple measures will prevent poisoning. The article, therefore, deals principally with precautions to be taken where the latter method is used. The various stages of the process are considered in detail and many suggestions made as to how the hazard can be minimized.

It is also recommended that workrooms be constructed to secure complete segregation of each stage in the process of loading; that long, narrow, one-storey buildings be used; that a conveyer system be adopted to avoid unnecessary handling of the substance; that workers be instructed as to the danger of poisoning; that they secure as complete protection of the person as possible by overalls, caps and gloves; that they avoid all alcoholic beverages; that they take milk or milk products with their breakfast previous to starting work; that they observe the strictest personal cleanliness; that persons under 21 be kept from handling the compound, as they are especially susceptible to the poison; that men be employed for only 8 hours a day when working with trinitrotoluol; that those employed in the most hazardous parts of the work be rotated to less hazardous processes at least every two weeks; and that an efficient system of medical supervision be established.

## AUTOMOBILE DEVELOPMENTS IN ITALY

By B. L. E.

TURIN, Italy's most important automobile center, is a bustling place in these days. Unlike the motor car firms of England and France, the various Italian motor car firms have been allowed to ... on the class of work for which they were originally designed. The Italian factories have, we learn, not only a greater car output than at any period of their history, but they have increased at a greater ratio than those of other allied nations.

It is not possible to predict now far this progression will continue in the future, for the demands of the war may make it necessary to change the nature of the output of the motor car factories. Already, however, the Italian factories are reaping the benefit of the settled policy of the Government when they joined in the war, and they will continue to benefit.

It is not possible to obtain, or advisable to publish, absolutely accurate figures regarding the number of workers and the output of the Italian factories. By far the biggest concern, we are told, is Fiat, with a staff of 23,000 workpeople, compared with 5,000 in 1914. The other important factories are Lancia, Spa, Itala, Scat, and Diatto, with Bianchi, Isotta-Fraschini, and Zust at Milan, the combined staffs of which barely exceed that of the Fiat Co.

While all the factories have increased their area, that of the Fiat Co. is enormous. From 83,000 square yards in 1914, the factory buildings have grown to 600,000 square yards at the present date. At a time when much attention is being paid to the value or otherwise of specialised shop and assembly plants, it is interesting to note that Fiat is developing in the opposite direction, so that at no distant date every part of the Fiat cars, with the exception of the tires, will be built in the Fiat establishments. At the present time the whole of the forgings are made by the Fiat Co. Electrical equipment, which is generally considered an outside branch, is now an important and integral part of the factory. For a considerable time now the firm has been making all its own dynamos, starting motors, coils, etc. The same applies to radiators and lorry driving chains, which are entirely built up from the raw material by the Fiat Co. All foundry work, whether it be steel, cast iron, aluminum, or bronze, is Fiat produced. The same is true of all forgings, such as crankshafts, connecting rods, valves, etc. Further than this, the firm is making itself independent of outside control by producing a very large number of its own machine tools. Development on these lines is only possible with an immense output.

**Arthur Surveyer** and **R. DeL. French** have formed a partnership as Arthur Surveyer & Co., consulting engineers, with offices at 274 Beaver Hall Hill, Montreal. Mr. Surveyer, who is a member of the Honorary Advisory Council for Scientific and Industrial Research, has been engaged in consulting practice for many years past. Since 1911 Mr. French has been principal assistant engineer with R. S. and W. S. Lea, consulting engineers, Montreal, and at the same time served on the staff of McGill University as lecturer in civil engineering.

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## WESTERN CANADA'S COAL

THE Alberta coal interests see in the present situation in Eastern Canada and United States a pretty likely looking peg on which to hang a new campaign. This particular campaign seeks to fence off the coal buyers of Western Canada for the Alberta coal fields.

There's nothing particularly new in this. As a matter of fact the Alberta fields have been lacking the stability that a good, steady market would give.

There must be a dead-line some place in Western Canada, east of which it will not pay to ship Alberta coal, and west of which it is not practicable or advisable to send the product of the Pennsylvania mines.

The publicity campaign carried on by the West this year has its point in trying to shove this coal dead-line as far East as possible

Westerners are not quick to tie up entirely to the Alberta or British Columbia supply. They don't like to store Alberta coal in large quantities, claiming it burns better and has more volatile matter when fresh from the mines. The coal men meet this with the claim that under proper conditions summer storing can be adopted.

No person is going to quarrel with the Alberta people if from present shivering conditions they can work out a plan that will increase the Pennsylvania anthracite coal supply for Eastern Canada, and at the same time add a degree of stability to Western Canada mining that does not now and never has existed.

## CLOCK TINKERING COMING

ALTHOUGH no person has got up to say so, the general impression is that daylight saving will be brought into Canadian life this year.

Sir George Foster wished the matter on the Federal House the last time D.S. came officially to life. It had a short, inglorious career, a terrific bombardment, a sudden death, and if mourners there were, they failed to turn up on the day of the funeral.

It was a Union affair as far as opinion in the House was concerned. Grits who were broad enough to be called Reformers, and Tories with the edges rubbed off sufficiently to pass as Liberal-Conservatives, all joined in heaving bricks at Sir George's D.S. measure. He dragged it out of no-man's land and laid it away.

It has been laid away ever since.

But we're acquiring quite a habit of doing things here because they do them at Washington. Some folks don't like this, but we're dealing with conditions and not theories.

Not long ago Garfield spoke to the republic. In effect he said "Shiver," and for five days in a row, and a procession of Mondays following, they shivered. And so it came that Magrath, the Canadian Fuel Controller, gave the Canadian people a three-day shivering sentence, whereupon we fell in line and shivered.

Washington has ordered a general tinkering with the clocks, and it begins to look as though some person were ready, despite Sir George Foster's experience, to start the machinery in operation that will result in clock tinkering in Canada.

If tinker we must, let's go it together. Anything less than Dominion-wide or nation-wide action will simply mean the 1918 chapter of Confusion Worse Confounded.

## BRINGING THE WAR HOME

SOME of the apologists for heatless days in United States claimed that it was high time the people of the republic were having a few object lessons that would make them realize that the republic was at war.

They reckoned that heatless and workless days would have this effect. So the first order was for five heatless days, and then an intermittent series, making in all thirteen of them.

From official sources it was suggested that employers should make an effort to pay wages as usual.

It would be quite an object lesson of the horrors of war to have a string of holidays with the pay days coming and going as usual.

If the proportion of employers and employees is 95 to 5, it means that the object lesson is for the five per cent.

Taking a few days off with wages as usual is rather a vague way of feeling the horrors of war.

## WAR AS A TEACHER

WILLIAM C. REDFIELD, United States Secretary of Commerce, is making an effort to cause United States manufacturers to realize that they have got to get their house in shape for the aftermath of war. Apart from the question of maintaining credits, Mr. Redfield sees something bigger than the financial element in the case.

In brief he advocates: (1) overcoming past failures in applying science to industry, the United States official holding that this was the secret of Germany's tremendous development; (2) a greater application of the principle of technical training for industrial workers, to bring about the happy co-operation of trained minds leading trained workers; (3) greater knowledge of costs, and (4) the elimination of industrial and commercial waste.

The war is teaching individuals, firms and nations more lessons in the matter of stopping leaks than they ever learned before.

When war teaches a lesson it does not stop to ask if the pupil is willing or otherwise.

The willing one learns and comes out on top of the heap.

The man or firm who will not learn or bend goes on and goes down. The bailiff or the assignee conducts the rest of the obsequies.

# Increased Outputs and General Activity Looked For

Conditions at the steel plants have improved and operating conditions are in the meantime more favorable which should result in an increase in output. Supplies of coke are moving in steadier volume which also benefits the steel plants and foundries. There is a good demand for pig-iron but the furnaces are having considerable difficulty in filling orders as promptly as required owing to the deficient supplies of coke. Prices of steel products are generally holding firm and are unchanged except for black and galvanized sheets which have declined. Conditions in the iron and steel trade in the United States have improved and production has recently shown a slight increase. The demand for steel continues very heavy and the mills are still falling behind on deliveries. The scrap metal market is dull and business very quiet. Dealers report a shortage of most kinds of scrap and no change in prices. In the non-ferrous metal markets, tin continues to be the outstanding feature and the price has again advanced. Tin is getting scarcer than ever, there being practically no spot metal obtainable. Copper supplies are heavier and prices continue firm. Castor oil is off the market and prices have been withdrawn. A sharp advance has been made in the price of linseed oil due to the scarcity of flaxseed. Some manufacturers of cotton waste have advanced their prices in line with higher prices prevailing on other makes. The machine tool market is quiet and devoid of any outstanding feature. Indications point to an improvement in deliveries but prices will likely remain high owing to the high cost of labor and materials.

MONTREAL, Que., Feb. 25, 1918.—The demoralization of industry that has been so pronounced during the past two months is gradually being eliminated, but a continued spell of favorable weather will be necessary before the operations of the railroads will again be normal. The coal situation is not so acute and it is anticipated that conditions will slowly adjust themselves to the permanent relief of the country and permit the resumption of activity to the maximum requirements for war purposes. Favorable progress is being made on the contracts for the vessels being constructed for the Dominion Government; the necessary steel being delivered with reasonable promptness. The manufacture of shell has been backward, particularly those being made for the American Government, as the delivery of the necessary steel and forgings has been delayed, greatly inconveniencing those firms having contracts for these shells.

### Steel

Favorable weather conditions have been the means of reducing the pressure that has been felt on all the railroads during the past couple of months, with the result that the congestion is steadily being relieved and the movement of freight is becoming more normal. It will require considerable time to move the accumulation of materials that have been piling up at many points. Efforts have been made to confine the manufacture of iron and steel in the United States to those commodities that are absolutely necessary for existing requirements. To a great extent this has been successful, as the bulk of the steel produced at the discriminate on the present consumption of iron or steel, as many of the activities when properly analyzed, are found to be indispensable in the important work of carrying on the war. With the exception of the Government construction of buildings for war purposes, the output of domestic steel for structural work has been reduced to the minimum. Shipments from the mills are much better, indicating some relief in railroad congestion, so that with the moderation of the weather the improvement from now on should show a marked increase. The export of material has been made very difficult during the past several weeks not so much by the shortage of available space on ocean going vessels as owing to the inability to deliver the gods to the seaboard. This condition has, however, been greatly improved recently and a continuance of the present favorable weather will in a short time eliminate the difficulties under which the railroads have been operating. Canadan conditions are relatively unchanged and are practically reflected by those existing in the States. Developments for the improvement of the Canadian steel situation are apparently meeting with success. A factor that has materially affected the manufacture of shells in Canada has been the inability to secure sufficient steel to carry on at maximum capacity. This is particularly noticeable in connection with the production of the American 75 mm. shells, as those firms here that have obtained contracts for these shells are experiencing considerable difficulty in obtaining steel and also forgings. The market generally is very firm and dealers here report no change in quotations.

### Metals

The general metal situation is not marked with any special feature and conditions are relatively normal. Copper is steady and unchanged. Tin has developed a slightly easier undertone. Spelter is quiet on poor demand. Lead is inactive and inclined to weaken. Antimony and aluminum are quiet and unchanged.

**Copper.**—Activity in the copper market is not pronounced but the demand is steady and the production ample to meet the requirements of all essential industries. Some domestic users are suffering under the restriction at present prevailing, but operating conditions are generally of a satisfactory character. The increased facilities that have been developed for the refining of copper may this year enable sufficient metal to be produced to provide ample metal for all requirements. At present the need for essential war purposes receives priority over all other demands. Business locally is of a very encouraging character and dealers report a steady market with quotations firm at last week's price of 31 and 32c per lb.

**Tin.**—Despite the fact that tin is very difficult to obtain, consumers apparently are able to carry on operations but often under considerable difficulty. The British regulations regarding the shipment of tin are still the chief factor in the problem of obtaining sufficient metal for consumers here and in the States, but during the past week the tension has not been so pronounced and reports are current that early relief may be expected. The easier tone reported from London has relieved the tension in New York and the market has developed a quieter tone, but all quotations are still of a nominal character. Dealers here are asking 82c on a quiet market, but the situation has an undertone of weakness.

**Spelter.**—Activity is light and the market is quiet. The demand is not

heavy and the available metal prevents the situation from taking on the strength that producers think should be shown under present conditions. The market is firm both here and in New York. Dealers here report unchanged quotations, the price asked being 11c per lb.

**Lead.**—The market is inactive and consequently prices are inclined to be easier. The demand indicates no exceptional activity and business is apparently comparatively dull, but quotations are nevertheless well maintained. Local dealers continue to ask 10c on spot. Supplies are adequate to meet all requirements.

**Antimony.**—The market is quiet and unsettled with quotations weakening. The demand is light and supplies are ample for present needs. Dealers here continue to quote 18c, but anticipate a slight decline.

**Aluminum.**—The situation is devoid of feature and the demand is normal. The market is steady with an easier tone, price asked being 55c per lb.

### Machine Tools and Supplies

The demand for machine tools has been comparatively quiet during the past week, especially for new equipment. Inquiries for shipbuilding machinery have not been so active although some business has been done. The abnormal demand for all classes of tools in the States has made it increasingly difficult to obtain delivery of machinery from this source; this applies mostly to such equipment as is urgently needed for war purposes. The pressure of business is so excessive in some connections that makers are reluctant to accept orders for specified delivery; this is partly due to the uncertainty that surrounds the activities in the States, as the placing of government contracts must receive precedence over other business. Inquiries for used machinery is the feature of the present market as dealers report considerable activity in this connection. Requirements for supplies are of a normal character, the demand being particularly active in connection with the shell and shipbuilding industries.

### Scrap

A better tone is apparent in the old metal situation as a result of the relief that has been evident in the movement on the various railroads, which has enabled the freer transportation of scrap to the consumers. The market is not exceptionally active but the nervousness has been largely removed by the recent fixing of prices by the American Government. The New York market is firm and unchanged with the exception of tin scrap, which has taken an a much stronger tone owing to the abnormal conditions prevailing in the pig tin situation. Local dealers report a steady but inactive market with all quotations on the basis of those quoted last week.

## Toronto

TORONTO, Ont., Feb. 26.—The coal situation is brighter as a result of a freer movement of cars on account of the milder weather. It is understood that dealers in the city received 12,000 tons of coal over the week-end, and that the total for the past two weeks has been well up to normal demand. It is hoped that supplies will be adequate for the balance of the winter. It is reported that by April production at the mines will be showing an increase of at least 20 per cent., and an endeavor will be made during April and May to accumulate reserve stocks.

### Iron and Steel

The situation in the iron and steel trade has improved on account of the more favorable weather now prevailing and a more optimistic feeling prevails in the market. Although some cold weather may still be expected, the worst part of the winter has passed, and it is hoped that the production of iron and steel will begin to show steady and continuous increase. Traffic conditions are easier, and there has been an increase in volume of freight moved from the border, thus relieving the shortage of fuel to some extent. The scarcity of coke, however, is due principally to the car shortage, and it will likely be some considerable time before conditions in this respect are greatly improved owing to the difficulty in obtaining cars. Car supplies at the ovens this week have improved. While shipments this week will show an improvement over those of last week the movements will be below normal requirements. The Steel Company of Canada has blown in the furnace at the Hamilton works, which had been out of commission for several weeks on account of the coke shortage. Hamilton foundry pig iron will be on the market again very shortly.

The bulk of the business in steel continues to be for war orders, although there has been some improvement recently in demand from concerns not engaged on war contracts. Canadian steel plants are supplying considerable of this class of material, and deliveries are fairly good considering prevailing conditions. The new regulations now in force in the United States have given the American Government more control over the exportation of steel, and consequently it is improbable that much material will come in except in connection with war contracts. In the States a license to manufacture has now to be obtained in addition to a shipping license on export business. Available supplies of steel in the States for Canadian consumers have for some time been restricted on account of the serious decline in production. Conditions, however, have recently improved and a heavier tonnage is now obtainable.

Prices of iron and steel products generally are holding firm, but there has been another decline in black and galvanized sheets. The decline is due more to conditions surrounding these particular products than to any general weakness in the market. Black sheets No. 28 gauge are now quoted at $8.25 and No. 10 gauge $10 per 100 lbs. Premier galvanized No. 28 are now quoted at $9.20 and 10¾-oz. at $9.50 per 100 lbs. Chequered floor plate, 3/16-inch, is now $12.20, and ¼-inch $12 per 100 lbs., representing a decline of $1 per 100 lbs.

### CANADIAN GOVERNMENT WAR PURCHASING COMMISSION

**The following gentlemen constitute the new war Purchasing Commission. Sir George Foster, Minister of Trade and Commerce; Frank P. Jones, Montreal; J. W. McConnell, Montreal; James H. Gundy, Toronto; Charles McNaught, Toronto, and Joseph Gibbons, Toronto. C. A. Magrath, as Fuel Controller, and Hon. H. Laporte, as chairman of the War Purchasing Commission, are members of the board ex-officio. Sir George Foster is Chairman of the Board.**

### Scrap

There has been no improvement in the scrap market this week and business continues dull, with quotations unchanged. Dealers' stocks continue low, which is tending to keep prices firm in spite of the slow demand. The railway congestion continues to interfere with shipments, although in this respect conditions are improving. Some interest is being shown locally in the situation in the States. A revised schedule of prices of iron and steel scrap will, it is reported, be announced shortly by the committee on steel and steel products of the American Iron and Steel Institute. The new prices and scrap classification, it is believed, will meet with the approval of consumers and dealers generally.

### Machine Tools

Conditions in the machine tool trade are much the same as last week—that is to say, the market is quiet. The demand for equipment for munitions manufacture, while comprising most of the business offering, has fallen off considerably, as the plants, with few exceptions, are fully equipped. In the States deliveries of machine tools are improving, but there is apparently little prospect of prices being reduced. The high cost of labor and materials will militate against price declines for some time to come. The Dominion Shipbuilding Co. are proceeding with their new plant here. It is expected that construction of the shops will begin shortly.

### Supplies

[illegible] supplies continues fairly active, with prices for the most part holding firm. Castor oil being off the market, prices have been withdrawn. Although crude oil advanced recently, there has been no change in gasoline or coal oil. Linseed oil is higher on account of a sharp ad-

demand for waste within recent weeks. through the strong situation in the cotton market.

### Metals

In the non-ferrous metals the feature of the week has been a sharp advance in tin, due to the continued scarcity of spot lies. Spot tin is scarcer than ever, and no relief is expected for some time. The copper market continues a routine affair, with local prices holding firm. is holding steady, and spelter is r, with no change in prices in either case. Aluminum is firmer, but antimony is dull, with a weaker tendency. Business locally continues good.

**Copper.**—The primary market is steady and firm at the established price of 23½c per pound. Production at the mines and refineries is far from capacity, but the situation is improving, and it is expected to make progress under better weather conditions. War requirements are concerning the greater part of the output, the available supply for non-essential trades being consequently curtailed. Lake and electrolytic are quoted at 29c and casting at 28c per pound.

**Tin.**—There is no improvement in the tin situation and prices are still advancing. No relief is expected until supplies come in from the Far East via the Paci- Spot tin is scarcer than ever, and entirely nominal. Locally tin at 85c per pound.

**Spelter.**—The market is dull, with consumers showing little inclination to start any new buying this month. There has recently been a considerable falling off in demand for brass spelter. Local price,

**Lead.**—The market is firm and steady, and situation unchanged. The trust is quoting 7c New York for spot lead.

## Washington

WASHINGTON, Feb. 23.—The United Officials of the Government responsible for the production of the war material deniably worried over the prospect of a proper steel supply to insure the carrying shortage is caused by two factors largely—the problem of transportation and labor. According to officials here, the transportation problem is causing many steel mills to run on short time because they are unable to secure either coal or the pig iron necessary. On the other hand, the finished product is often stacked in their storehouses for weeks at a time because of a lack of cars to carry it away, and when the storehouses become filled and all available storage space occupied it becomes necessary to curtail production. This has affected an already short labor supply. Because many steel mills are forced to close or work on short time labor is turning to other lines of industry, according to the reports received by officials here.

Word has been received here that efforts will be made to relieve this situation by the establishment of a string of steel mills on the Pacific Coast. A syndicate of Pacific Coast manufacturers is being formed, and it is understood that several plants are planned for British Columbia and Alaska.

### Labor Problem Improving

The labor situation in the shipping industry in the United States is considerably relieved. Strikers who left their work last week and threatened a tie-up of the industry along the entire Atlantic Coast have for the most part returned to their work and the matter of wages has been left largely to adjustment. Work has been resumed in all shipyards and the work of shipbuilding is progressing now on schedule, and officials declare that early spring will see the work so well organized that the future will be far brighter than it has been at any time for the past few months.

Federal investigators of the Department of Justice are at present engaged in securing evidence concerning the building of the Hog Island shipyards with a view to determining whether the Government has grounds for civil or criminal action on charges of reckless expenditure of Government funds. The Senate Commerce Committee, which started the investigation of the Hog Island yard, and the American International Corporation, the builders, went to the yard on Monday and made a personal investigation of conditions.

### Canadian Trade Preference

The War Trade Board has issued a blanket license for all imports from the United States to Canada, as it was predicted in this letter last week. Despite the embargo upon all imports laid last week by the President of the United States in order to conserve the shipping space of the nation, Canadian manufacturers will be allowed to import their products into the United States without ...ce for an individual license to import.

The United States Senate has passed the Railroad Bill, which provides for the Federal control of all American railroads until eighteen months after the end of the war. The bill as passed by the Senate is substantially the bill prepared by the Administration, with the exception of the time limit placed upon Federal control and the limitation of the power of the President to make rates. An amendment has also been added to the bill, which provides that the Government must take over all short line railroads. It is expected that the House will act accordingly.

Industries in the United States, which have been pressed financially since the outbreak of the war, are to be afforded relief by the Government. Secretary McAdoo's War Finance Corporation will be enacted in the laws within a week, and the Government will then be in a position to make direct loans to railroads, public utilities, and industries which are necessary to the conduct of the war. With these broad powers the Government is now in a position to finance any industry, necessary to the war, which has been unable to weather the financial strain.

### Contractors' Identity

American industry has been the gainer in an order issued by Secretary of War Baker this week instructing all purchasing agents of the army to make public the names of all contract holders. This point has long been an issue between the industrial men of the country and the War Department. Industrial leaders claim that unless they know to whom contracts are awarded they are laid liable to unfairness on the part of officials. As yet no order has gone forth from Secretary Baker for a general call for bids for supplies, however. This is another point which business men are striving to make.

The fuel situation in the United States is such now that Federal Fuel Administrator Garfield has allowed predictions that a reduction in prices generally is soon to be made. No official announcement of this has been made, but it is understood that a draft of proposed new prices is now before Dr. Garfield. The shortage which was created by a car shortage is about over. Production is still short, however, and particularly in bituminous coal.

### Crop Precautions

An embargo on corn to the Dominion of Canada has been laid by the United States. This has been caused by the general shortage of corn seed in the United States, and it is hoped that it will preserve enough so that the crop for next season will not be endangered.

Increased traffic rates, particularly passenger rates, by the Railroad Administration is now expected. It is understood that rates on passenger fares and freight on non-essential classes will be raised in order that room may be made for necessary freight.

## New York

NEW YORK, Feb. 23.—It is estimated that steel manufacturers have suffered losses of $100,000,000 to $150,000,000 in the last month because of reduced plant operations made necessary by the shortage of fuel and inadequate railroad service which resulted in great congestion of rolled products at the finishing mills. The worst is now over, however, output of both iron and steel having been increased from 20 per cent. to 25 per cent. of capacity in the last ten days. There is much irregularity in plant operations in various sections of the country and the manufacture of poor quality of steel resulting from the necessity of using low grades of coke and high sulphur coal will long be felt through rejections of plates and other finished forms.

Eight or ten manufacturers who have received shell orders from the Government have been buying shop equipment and a much larger number are negotiating for tools to be purchased when Government contracts pending are released. There is a lack of forging capacity at present but when plants now in course of construction are completed many Government shell contracts will be closed. Although the machining equipment of the country is large and in excess of the forging capacity some manufacturers who have recently received orders for projectiles are finding difficulty in sub-letting contracts for machining. It is estimated that the shell contracts now pending will require the expenditure of about $200,000,000 by the government and negotiations with ordnance manufacturers will also result in contracts, mainly for field pieces and big guns for the army, which will cost approximately $200,000,000.

### Machine Tool Demand

One of the most interesting developments is the active demand for machine tools and for cranes by the Worthington Pump & Machinery Corp. which has taken the contract to build pumps for the submarine destroyers now being constructed at the Detroit work of the Ford Motor Co. These pumps will be manufactured at the Dean Pump Works, Holyoke, Mass. The Bartlett & Hayward Co. of Baltimore has placed an order for 300 more tools for the making of 155 mm. shells. The Otis Elevator Co. will make recoil cylinders for 9.5-inch guns at its Western plant and has made additional purchases of shop equipment. It will also manufacture 175 boring lathes at its own plant. The American Brake Shoe & Foundry Co. wants 40 lathes for work on 6-inch shells. The Defiance Machine Works, Defiance, Ohio, wants to buy 25 machine tools and the Salisbury Wheel & Manufacturing Co., Jamestown, N.Y., is in the market for 25 turret lathes.

Manufacturers of war munitions, notably makers of large guns, gun lathes and gun carriages, are actively in the market for metal working planers. Ship yards are also buying planers. The Westinghouse Electric & Manufacturing Co., which makes reversing electrical motors for planers, has recently taken heavy orders for equipment aggregating 2,600 h.p. Among manufacturers who have placed contract, for electrically driven machines are the Baldwin Locomotive Works, the Federal Shipbuilding, Newark, and the New York Shipbuilding Co., Camden, New Jersey. The Hanlon Drydock & Shipbuilding Co., San Francisco, has recently purchased $200,000 worth of machinery in this market including a number of second hand tools.

Structural work is more active, orders for 20,000 tons being placed in the last few days, mainly by manufacturers engaged on Government work. It is estimated that the War Department will spend $125,000,000 for war plant of various kinds, including $46,000,000 for aviation work, $37,000,000 for a gas making plant in this vicinity, 40 storage depots in the interior and others along the Atlantic coast. The E. W. Bliss Co., Brooklyn, and the Western Electric Co., making war muntions, have placed contracts for plant extensions calling for 5,500 tons of steel shapes.

## Pittsburg

PITTSBURG, Pa., Feb. 23.—While the weather has been colder the past few days, it has, on the whole, been relatively favorable for railroad operation, and it may be said in general that there has now been favorable railroad weather since February 6. It continues to be the case, however, that the chief effort of the railroads is in the direction of moving loaded cars to destination so as to clear the congestion, and relatively little has been done thus far towards furnishing the furnaces and mills with more cars for loading. The result is more coke at blast furnaces, resulting in more pig iron being produced, while the shipments of finished steel are only slightly increased.

There is no doubt that the railroads are making excellent progress in their clean-up and that congestion is being reduced as rapidly as could be expected. Large shippers, familiar with the situation, seem to be well satisfied even though definite results, in heavier shipments of finished steel, have been small thus far. They are quite ready to give the railroads two or three weeks more time in which to get into really fair operating condition.

### Coke Shipments Light

Supplies of cars in the Connellsville coke region in the past week have been altogether disappointing, as they certainly showed no material improvement over those of last week, and may even have been lighter. The Connellsville *Courier* reports last week's shipments from the Connellsville and lower Connellsville region, at 282,359 tons, against 275,907 tons the week preceding. It may be estimated that shipments of about 375,000 tons a week at least are required to meet the requirements of furnaces depending upon this region, including certain stacks in Canada. At the moment, position as to coke than would be indicated by the shipments for the reason that in the railroad clean-up a great deal of coke that was stalled en route was moved forward to furnaces, and, with the furnaces depending upon their by-product, the ovens were fairly well supplied; it may be estimated that the furnaces are operating at 75 to 80 per cent. of capacity. This rate cannot be maintained, however, unless shipments are heavier than as just reported.

Shipments of finished steel from mills have averaged in the past week a trifle more than 60 per cent. of capacity, against a previous average this year of between 55 and 60 per cent., but with some weeks showing barely 50 per cent. As blast furnace operations show a much higher percentage than finished steel shipments, there must be accumulation at some point. In some cases pig iron is accumulating, while in the case of many steel works with furnaces attached the production of steel has been increased, the steel accumulating in ingot or billet form. Some erroneous reports have been published, referring to much better mill operations, and these may be based upon increased ingot production, sight being lost of the fact that the steel is not all carried through the finishing processes and actually shipped. The mills, indeed, are indisposed to finish more steel than they can ship, as yards and warehouses are already well filled, and it is more economical to reduce stocks as car supplies increase.

### Purchases For Railroads

Reports from Washington are that the United States Railroad Administration expects in the very near future to place large orders for the purpose of rehabilitating the railroads now that the Senate has passed the railroad control bill, and the House will pass its bill within a few days. It has been known to the steel trade for quite a while past that the authorities at Washington had carefully studied the situation, and formulated plans for the placing of large orders for equipment, and probably also for additional terminal facilities, and perhaps some trackage. Reports from Washington are that as much as $500,000,000 to $750,000,000 may be spent on the program. One-half the smaller amount would cover, or nearly cover, 2,000 locomotives and 100,000 cars, leaving a large amount for other work, and orders of the size mentioned would mean a great deal to the [illegible]

### Curtailing in Unessentials

It appears that the authorities at Washington are making a fresh study of the matter of curtailing the unessential consumption of steel in view of the continued scarcity. The steel producers are inclined to believe that the effort will lead nowhere. They are quite familiar with the character of the orders on their books, and the character of the material that has been shipped in recent weeks, and their conclusion is that at the present time there is very little steel that [illegible]

of supply to furnish it.

consumption as is disposed to continue. Some steel producers feel that in such circumstances there would be a surplus

Actual market transactions continue extremely light. Buyers are indisposed to plan ahead as conditions are all so uncertain, and as to immediate requirements, their orders are already in, and have been for a long time. What they want is shipments. Fully two-thirds of the steel being shipped is for war purposes, directly or indirectly. With the practical certainty that there will be no legislation by Congress in the near future to empower the Government to fix iron and steel prices, the question is whether the authorities at Washington will make an effort to revise the agreed prices, which late in December were pronounced as effective to Mar. 31. Producers insist that there should be no revision at this time. As production has been greatly curtailed, with a consequent increase in costs, and is likely to increase very considerably in the next few weeks, Washington will hardly press the matter of price revision for a while.

## CANADA'S RECORD IN MUNITIONS PRODUCTION

HON. NEWTON ROWELL, speaking at the Toronto Y.M.C.A. on Saturday before a number of business men from Detroit, gave some interesting figures in connection with Canada's effort in the war in the production of munitions and war material. Mr. Rowell said that "Through the Imperial Munitions Board orders have been placed in Canada for

the sum of $875,000,000 already has been expended in respect of these orders in plants established in every province of Canada outside of Prince Edward

He said there were between 500 and

of the total number used by Great Brit-

### Fuse Output

When Canada first commenced making shells the fuses were made in the United States, because it was thought the manufacturers in the Republic were in a better position to produce them, but later on orders were placed in the Dominion, and in a short time Canada was turning out fuses at the rate of 2,750,000 per month of such a high degree of excellence that the Imperial authorities went out of their way to congratulate the Imperial Munitions Board. Canada had also manufactured 16,500,000 wooden boxes in which to ship munitions overseas. She had also been steadily producing explosives, such as cordite, "T.N.T.," acetone, methyl-ethyl and nitric acid, in order to keep the forces of the British Empire supplied. The refining of zinc, copper and molybdenite had been going on steadily, and the capacity for refining lead had been largely increased. We were also shipping overseas large quantities of asbestos.

### Making Munitions for U.S.A.

Another statement was the announcement by Mr. Rowell that Canada is now rendering assistance to the United States in the production of munitions, and is at present engaged on orders for 7,000,000 shells, 10,000,000 forgings and 2,000,000 cartridge cases for the United States Government.

### 300 Airplanes a Month

"We have had phenomenal success in the airplane industry," said Mr. Rowell, "and we are now producing more than 300 airplanes a month. We are supplying all the planes used by the Royal Flying Corps in 500 encampments, and also supplying planes to the United States Government to a large extent. Also 1,000 high-grade airplane engines are at present being constructed in Canada. The sum of $10,000,000 has been spent in airplane plants and aerodromes in Canada. When the Camp Borden aerodrome was constructed the aviators were flying two months after the workmen started to clear the land of tree stumps.

### 350 Million Tons of Ships

"Orders have been placed in Canada for 350,000,000 tons of steel and wooden ships, at a cost of $64,000,000, and the Union Government is now developing a large shipbuilding programme. Many of the ships being built will be owned by the Government of Canada. We will produce in Canada this year more than one-quarter of the commercial tonnage built in the United States, and more than one-fifth of the commercial tonnage built in Great Britain last year.

### Munitions Board Effort

"In addition to these remarkable results for munitions we have sent hundreds of thousands of men to the fighting line, and have been engaged in the production of food. We have done this by a combination of great organizing skill and remarkable administrative ability by the Imperial Munitions Board, which is composed of great Canadians, by the manufacturers, and by the sturdy, honest toil of the working men of Canada."

## DOMINION STEEL CORPORATION PRODUCTION.

THE output of the Dominion Steel Corporation for the year ending December 31, 1917, is estimated as follows:

Pig iron, 341,000 tons; steel ingots, 353,000 tons; blooms, billets, etc., for sale, 154,000 tons; rails, 16,000 tons; wire rods, 100,000 tons; merchant bars, 1,300 tons; wire and product of wire, 35,700 tons; ore, 651 gross tons; stone, 524,000 tons.

During the past year the reconstruction of a 400-ton blast furnace was undertaken and practically completed; this should be ready for operation during March, 1918, at about which date there will also be completed the construction of 120 latest design Koppers By-Product Coke Ovens. The company has recently undertaken extensive improvements to the electrical power and water supply equipment of the plant, and this work will be pushed to completion as rapidly as possible.

According to the president, Mark Workman, the 1917 output of coal will fall at least 500,000 tons below that of 1916, and 1,250,000 tons below normal. The record for 1917 probably will be below 4,000,000 tons, as compared with 5,200,000 tons in 1914, which was itself below the average year. The cause of this rests in a serious scarcity of labor. Since the war broke out 4,500 men have enlisted from the workers in the Dominion Coal Company's mines, and of these a bare 1,000 have been replaced, and much of the substitute labor is much below the former standard.

The falling off in the coal output is being felt seriously in Montreal, as ordinarily 2,000 tons are shipped up the River St. Lawrence, and very little has come up this past season. The Dominion Government is alive to the situation and efforts are being made through Senator Robertson, a member of the Cabinet, to provide these men. An increase of wages may be the result, although very recently some action was taken in this direction. The yearly output has not fallen below 4,000,000 tons since 1909.

The record for the past twelve years has been:

| Year. | Tons. |
|---|---|
| 1917 ..... (under) | 4,000,000 |
| 1916 ..... | 5,261,198 |
| 1915 ..... | 4,550,510 |
| 1914 ..... | 5,047,682 |
| 1913 ..... | 5,053,163 |
| 1912 ..... | 4,406,263 |
| 1911 ..... | 4,412,629 |
| 1909 ..... | 2,734,774 |
| 1908 ..... | 3,555,068 |
| 1907 ..... | 3,541,253 |

However, for all the decline in coal, the recent increase in the dividend was not brought into effect on falling earnings.

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago | 37 50 |
| Standard low phos., Philadelphia | ..... |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 33 00 |

Government prices.

| | Toronto |
|---|---|
| Victoria | 50 00 |

## FINISHED IRON AND STEEL

| Per lb. to Large Buyers. | Cents |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 5 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 5 75 |
| Chequered floor plate, 3-16 in. | 12 20 |
| Chequered floor plate, ¼ in. | 12 00 |
| Staybolt iron | 8 50 |
| Bessemer rails, heavy, at mill | .... |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | *3 50 |

F.O.B., Toronto Warehouse

| | |
|---|---|
| Steel bars | 5 50 |
| Small shapes | 5 75 |

F.O.B. Chicago Warehouse

| | |
|---|---|
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

## FREIGHT RATES

Pittsburgh to Following Points

| Per 100 lbs. | C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 35.1 | 45.5 |
| Halifax | 35.1 | 45.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

## METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $32 00 | $29 00 |
| Electro copper | 32 00 | 29 00 |
| Castings, copper | 31 00 | 28 00 |
| Tin | 82 00 | 86 00 |
| Spelter | 11 00 | 9 50 |
| Lead | 10 00 | 9 00 |
| Antimony | 18 00 | 17 00 |
| Aluminum | 55 00 | 52 00 |

Prices per 100 lbs.

## PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¼ to ½ | $10 00 | $10 00 |
| Heads | 10 30 | 10 25 |
| Tank plates, 3-16 in. | 10 10 | 10 10 |

## WROUGHT PIPE

Effective Feb. 5, 1918.

Standard Buttweld

| | Per 100 feet | |
|---|---|---|
| ⅛ in. | $ 6 00 | $ 8 00 |
| ¼ in. | 5 16 | 7 29 |
| ⅜ in. | 5 16 | 7 29 |
| ½ in. | 6 55 | 8 12 |
| ¾ in. | 8 28 | 10 41 |
| 1 in. | 12 24 | 15 39 |
| 1¼ in. | 16 56 | 20 82 |
| 1½ in. | 19 80 | 24 89 |
| 2 in. | 26 64 | 33 49 |
| 2½ in. | 42 [illegible] | 53 [illegible] |
| 3 in. | 55 85 | 70 00 |
| 3½ in. | 70 84 | 87 [illegible] |
| 4 in. | 83 93 | 104 10 |

Standard Lapweld

| | | |
|---|---|---|
| 2 in. | $ 29 60 | $ 36 [illegible] |
| 2½ in. | 44 46 | 54 [illegible] |
| 3 in. | 58 14 | 71 53 |
| 3½ in. | 72 68 | 90 62 |
| 4 in. | 86 11 | 107 37 |
| 4½ in. | 97 79 | 122 56 |
| 5 in. | 114 00 | 142 82 |
| 6 in. | 147 80 | 185 28 |
| 7 in. | 192 80 | 241 57 |
| 8 L in. | 202 50 | 253 75 |
| 8 in. | 233 30 | 292 32 |
| 9 in. | 279 50 | 350 18 |
| 10 L in. | 259 20 | 324 80 |
| 10 in. | 333 70 | 418 18 |

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES

1" and under, 45%.
1¼" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

## OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 22 50 |
| Copper, heavy | 22 50 | 22 50 |
| Copper wire | 22 50 | 22 50 |
| No. 1 machine composition | 21 00 | 20 50 |
| New brass cuttings | 16 00 | 14 00 |
| Red brass turnings | 17 00 | 17 00 |
| Yellow brass turnings | 12 50 | 12 50 |
| Light brass | 10 00 | 9 50 |
| Medium brass | 14 00 | 12 00 |
| Heavy brass | 15 00 | 14 00 |
| Heavy melting steel | 21 00 | 21 00 |
| Steel turnings | 12 00 | 12 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 23 00 | 18 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 23 00 |
| No. 1 machine cast iron | 27 00 | 25 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 17 00 | 13 00 |
| Car wheels, iron | 26 00 | 25 00 |
| Steel axles | 38 00 | 35 00 |
| Mach. shop turn'gs | 9 00 | 8 50 |
| Cast borings | 12 00 | 12 00 |
| Stove plate | 19 00 | 19 00 |
| Scrap zinc | 6 50 | 6 50 |
| Heavy lead | 7 50 | 7 00 |
| Tea lead | 5 00 | 5 75 |
| Aluminum | 25 00 | 20 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent |
|---|---|
| Carriage bolts, ⅜" and less | 10 |
| Carriage bolts, 7-16 and up | net |
| Coach and lag screws | 25 |
| Stove bolts | 55 |
| Plate washers | List plus 20 |
| Elevator bolts | 5 |
| Machine bolts, 7-16 and over | net |
| Machine bolts, ⅜ and less | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | 10 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | [illegible] |
| Nuts, square blank | add $1 50 |
| Nuts, square, tapped | add 1 75 |
| Nuts, hex., blank | add 1 75 |
| Nuts, hex., tapped | add 2 00 |
| Copper rivets and burrs, list plus | 30 |
| Burrs only, list plus | 50 |
| Iron rivets and burrs | 15 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 37½ |
| Wood screws, O. & R., brass | 32½ |
| Wood screws, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

## MILLED PRODUCTS

| | |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil. Head Cap Screws | net |
| Flat But. Hd. Cap Screws | plus net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. & Semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2 in. | plus 10 |
| Studs | net |
| Taper pins | 40 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | list plus 20 |
| Collar screws | list plus 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | 65 |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add 7 00 |

## BILLETS

| | Per Gross Ton |
|---|---|
| Bessemer billets | $47 50 |
| Open-hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.

F.O.B. Pittsburgh.

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails | $5 25 |
| Cut nails | 5 70 |
| Miscellaneous wire nails | 60% |
| Spikes, ⅜ in. and larger | $7 50 |
| Spikes, ¼ and 5-16 in. | 8 00 |

| | |
|---|---|
| | $5 20 |
| | 5 [illegible] |

## ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 41 |
| Plumbers' oakum, per lb. | 0 09 |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila rope | 0 33 |
| New Zealand hemp | 0 33 |
| Transmission rope, Manila | 0 45 |
| Cotton rope, ¼-in. and up | 0 47 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | net |

### MISCELLANEOUS

| | |
|---|---|
| [illegible] | 0 30½ |
| [illegible] | 0 44½ |
| [illegible] | ½ to 70 |
| Soldering coppers, lb. | 0 53 |
| Lead wool, per lb. | 0 16 |
| Putty, 100-lb. drums | 4 75 |
| White lead, pure, cwt. | 16 05 |
| Red dry lead, 100-lb. kegs, per [illegible] | 15 50 |
| Glue, English | 0 35 |
| Tarred slater's paper, roll | 0 95 |
| [illegible] | 0 31½ |
| Benzine, per gal., bulk | 0 30½ |
| Pure turpentine, single bbls., gal. | 0 73 |
| Linseed oil, raw, single bbls. | 1 65 |
| Linseed oil, boiled, single bbls. | 1 68 |
| Plaster of Paris, per bbl. | 2 50 |
| Sandpaper, B. & A. | list plus 20 |
| Emery cloth | list plus 20 |
| [illegible] | 0 03½ |
| Sulphur, rolls | 0 05 |
| Sulphur, commercial | 0 04½ |
| Rosin "D," per lb. | 0 03 |
| Rosin "G," per lb. | 0 03½ |
| Borax crystal and granular | 0 12 |
| Wood alcohol, per gallon | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

### CARBON DRILLS AND REAMERS

| | Per Cent |
|---|---|
| S.S. drills, wire sizes up to 52 | 30 |
| S.S. drills, wire sizes, No. 53 to 80 | 30 |
| Standard drills to 1½ in. | 30 |
| Standard drills, over 1½ in. | 30 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 20 |
| Bit stock | 25 |
| Ratchet drills | 15 |
| S.S. drills for wood | 30 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 40 |
| Sleeves | 40 |
| Taper pin reamers | net |
| Drills and countersinks | list plus 30 |
| Bridge reamers | 52½ |
| Centre reamers | 10 |
| Chucking reamers | net |
| Hand reamers | 10 |

### COLD ROLLED SHAFTING

| | |
|---|---|
| At mill | list plus 40% |
| At warehouse | list plus 50% |

**Discounts off new list. Warehouse price at Montreal and Toronto**

### IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 9 50 | $ 8 25 |
| Sheets, black, No. 10 | 12 00 | 10 00 |
| Canada plates, dull, 52 sheets | 9 00 | 9 00 |
| Can. plates, all bright | 9 50 | 9 50 |
| Apollo brand, 10¾ oz. galvanized | ..... | ..... |
| Queen's Head, 28 B.W.G. | ..... | ..... |
| Fleur-de-Lis, 28 B.W.G. | ..... | ..... |
| Gorbal's Best, No. 28 | ..... | ..... |
| Colborne Crown, No. 28 | ..... | ..... |
| Premier, No. 28 U.S. | 9 45 | 9 20 |
| Premier, 10¾ oz. | 9 75 | 9 50 |
| Zinc sheets | 20 00 | 20 00 |

### PROOF COIL CHAIN

B

¼ in., $12.35; 5-16 in., $11.85; ⅜ in., $11.50; 7-16 in., $10.90; ½ in., $11.20; 9-16 in., $11.20; ⅝ in., $11.10; ¾ in., $11.00; ⅞ in., $10.90; 1 inch, $10.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

**ELECTRIC WELD COIL CHAIN B.B.**

⅛ in., $15.50; 3-16 in., $11.70; ¼ in., $8.40; 5-16 in., $7.40; ⅜ in., $6.35; 7-16 in., $6.35; ½ in., $6.35; ⅝ in., $6.35; ¾ in., $6.35.

**Prices per 100 lbs.**

### FILES AND RASPS.

| | Per cent |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 40 |
| Black Diamond | 40 |
| J. Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 37½ |
| Disston | 50 |
| Whitman & Barnes | 50 |

### COAL AND COKE

| | |
|---|---|
| Solvay Foundry Coke | |
| Connelsville Foundry Coke | |
| Steam Lump Coal | |
| Best Slack | |

**Net f.o.b. Toronto.**

### BOILER TUBES.

| Size | Seamless | Lapwelded |
|---|---|---|
| 1 in. | $36 00 | $..... |
| 1¼ in. | 40 00 | ..... |
| 1½ in. | 43 00 | 36 00 |
| 1¾ in. | 43 00 | 36 00 |
| 2 in. | 50 00 | 36 00 |
| 2¼ in. | 53 00 | 38 00 |
| 2½ in. | 55 00 | 42 00 |
| 3 in. | 64 00 | 50 00 |
| 3¼ in. | ..... | 58 00 |
| 3½ in. | 77 00 | 60 00 |
| 4 in. | 90 00 | 75 00 |

Prices per 100 ft., Montreal and Toronto.

### OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | |
| Royalite, per gal., bulk | 17 |
| Palacine | 20 |
| Machine oil, per gal. | 26½ |
| Black oil, per gal. | 15 |
| Cylinder oil, Capital | 45½ |
| Cylinder oil, Acme | 36½ |
| Standard cutting compound, per lb. | 0 06 |
| Lard oil, per gal. | $2 50 |
| Union thread cutting oil antiseptic | 88 |
| Acme cutting oil, antiseptic | 37½ |
| Imperial quenching oil | 39½ |
| Petroleum fuel oil | 13½ |

### BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30-5% |
| Standard | 40% |
| Cut leather lacing, No. 1 | 1 95 |
| Leather in sides | 1 75 |

### TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 06 |
| Emery glue | 15 to 20 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 35 |

**Prices Per Lb.**

### BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 38 |
| Brass sheets, 24 gauge and heavier, base | 0 43 |
| Brass tubing, seamless | 0 46 |
| Copper tubing, seamless | 0 48 |

### WASTE.

| White. | Cts. per lb. | | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 18½ |
| Peerless | 21 | X Empire | 17¼ |
| Grand | 19¾ | Ideal | 17¼ |
| Superior | 19¾ | X press | 16 |
| X L C R | 18½ | | |

**Colored.**

| | | | |
|---|---|---|---|
| Lion | 15 | Popular | 12 |
| Standard | 13½ | Keen | 10½ |
| No. 1 | 13½ | | |

**Wool Packing.**

| | | | |
|---|---|---|---|
| Arrow | 25 | Anvil | 15 |
| Axle | 20 | Anchor | 11 |

**Washed Wipers.**

| | | | |
|---|---|---|---|
| Select White | 11 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING.

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

### ANODES.

| | |
|---|---|
| Nickel | .50 to .54 |
| Cobalt | 1.75 to 2.00 |
| Copper | .44 to .46 |
| Tin | .49 to .56 |
| Zinc | .23 to .25 |

**Prices Per Lb.**

### COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | 42 50 | 43 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 46 00 | 44 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 48 00 | 48 00 |
| Copper sheet, planished, 16 oz. base | 57 00 | 45 00 |
| Braziers,' in sheets, 6x4 base | 45 00 | 44 00 |

### LEAD SHEETS.

| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $13 25 | $13 25 |
| Sheets, 3½ lbs. sq. ft. | 13 25 | 13 25 |
| Sheets, 4 to 6 lbs. sq. ft. | 12 50 | 12 50 |

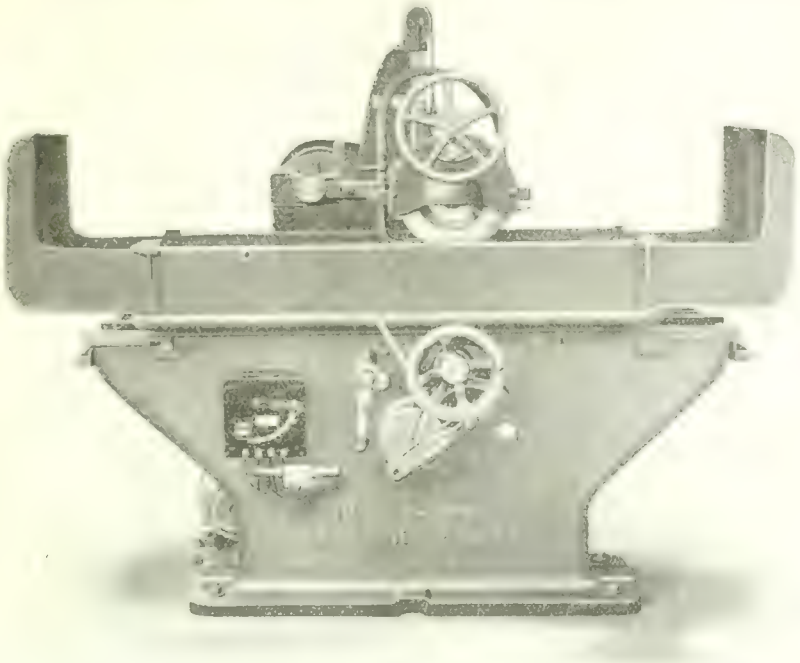
Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS.

| | |
|---|---|
| Acid, boracic | $ .15 |
| Acid, hydrochloric | .05 |
| Acid, hydrofluoric | .14½ |
| Acid, nitric | .10 |
| Acid, sulphuric | .05 |
| Ammonia, aqua | .08 |
| Ammonium carbonate | .15 |
| Ammonium, chloride | .11 |
| Ammonium hydrosulphuret | .40 |
| Ammonium sulphate | .07 |
| Arsenic, white | .12 |
| Copper, carbonate, anhy | .35 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .70 |
| Iron perchloride | .20 |
| Lead acetate | .16 |
| Nickel ammonium sulphate | .12 |
| Nickel carbonate | .35 |
| Nickel sulphate | .15 |
| Potassium carbonate | .75 |
| Potassium sulphide (substitute) | .20 |
| Silver chloride (per oz.) | .65 |
| Silver nitrate (per oz.) | .55 |
| Sodium bisulphite | .10 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .41 |
| Sodium hydrate | .04 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | .14 |
| Tin chloride | .60 |
| Zinc chloride | .60 |
| Zinc sulphate | .09 |

**Prices per lb. unless otherwise stated.**

## DIAMOND HEAVY-DUTY SURFACE GRINDERS



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[illegible] the M E C illustrated catalog. It describes minutely the most dependable labor saving devices including those deservedly famed

M E C Air Cylinders, Air-Operated 2 and 3 Jaw Chucks, M.E.C. Master Hinge Collet Chucks and Collapsible Taps.

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# NOSING DIES

## *For All Sizes of Shells*

Recently we told in this space of a Nosing Die in use in our own shops which had nosed 35,000 shells, and was still working. This die is still in use, and doing good work.

We now publish the following letter from one of our customers as a further proof of the long life of our CHILLED IRON NOSING DIES.

Messrs. Marsh & Henthorn,
Belleville, Ont.

Gentlemen:—

We have been using your chilled cast iron dies for six months past and they have given us better satisfaction than anything we have yet tried. The die which we are now using has [illegible] to one month and is in as [illegible] as when we first put it in use and we think will last [illegible] more.

We have yet to find [illegible] that we are not willing to pay several times the price, which will give us the same satisfaction.

Yours truly,

[illegible]

We make these Chilled Iron Nosing Dies for the various sizes of Shrapnel and High Explosive Shells, and also for the .75 Millimeter French Shell.

We also make Chilled Iron Sleeves for Forging Billets for the .75 Millimeter Shells.

**MARSH & HENTHORN, Ltd.**

BELLEVILLE ONTARIO

*If any advertisement interests you, tear it out and put it with letter to be answered*

# INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

## ENGINEERING

main building and the whole eastern wall and roof of the gas house. The boilers and machinery will have to be replaced.

**Brantford, Ont.**—The Massey Tractor Co., of Watertown, Wis., will establish a factory here. The Farmers' Binder Twine Co's. old plant has been secured and will be equipped with machinery for making tractors.

**Kingston, Ont.**—A. MacKinnon, of the Kingston Smelting Co. and E. Chaplin, chemical engineer, of New York, are about to establish a chemical industry in Kingston, in company with several well-known local men. This new Kingston industry will first make barium and soda compounds, such as blanc fixe, which is largely used by paper and paint manufacturers, sal soda, caustic soda, carbonate of soda, and will later go into the manufacture of fertilizer and the extraction of potash.

**Owen Sound, Ont.**—The three large [illegible] Imperial Cement Co.'s plant have been disposed of to a Syracuse soda manufacturing concern, and are being cut in sections for shipment to the company's plant in New York State. The Imperial Cement Co. was the first of the three big cement plants erected here, and large sums were spent in experimenting in various processes. It was taken over by one of the leading bondholders after the town had advanced $20,000 as a loan on a second mortgage. All the other machinery in the plant is included in the sale to the Syracuse concern.

**Bridgeburg, Ont.**—The first steel for the four ships to be built at the yard of the Canadian Allis-Chalmers Co. at Bridgeburg, Ont., has arrived. Practically all the machinery is at hand and is being installed rapidly. It is expected that all four ships will be launched in less than a year. The ships will be of the standard 2,500-ton design of the British Admiralty, 260 feet long over all, just short enough to get through [illegible] to the United States as the result of

**Vancouver, B.C.**—H. T. Tudhope, of [illegible], and W. J. Reece, of Windsor, Ont., are in Vancouver in connection with a scheme to establish an electric smelting plant and steel plate mill in this district. The Hon. William Sloan, Provincial Minister of Mines, will appoint a metallurgical expert to investigate the proposition. The Tudhope interests are behind both the Pacific Steel Co. at Eburne and the Aetna Steel Works at Port Moody, both of which plants are now undergoing change from oil-burning furnaces to electrical furnaces and other improvements to increase their production of steel. Pending the opening up of iron ore deposits which the new furnaces being installed are said to be capable of handling, the two plants are working on scrap material, which is melted and rolled into rods, angle irons and other forms of iron and steel needed in ship work.

## MUNICIPAL

**Guelph, Ont.**—The City Council [illegible] template purchasing additional fire-fighting equipment.

**Midland, Ont.**—Fire Chief John Toole is urging the council to purchase additional fire-fighting equipment, including a motor truck, extension ladders, an electric gong and helmets, etc.

**Hamilton, Ont.**—The United Gas & Fuel Co. has again approached the City Council in connection with the scheme for installing a coke oven plant. It is estimated that the cost would be over $3,000,000.

**Windsor, Ont.**—Local civic officials, backed by the Windsor Gas Co., will send another protest to the Ontario Municipal and Railway Board regarding Wallaceburg and Chatham manufacturers using natural gas in unlimited quantities during the cold weather. They allege that the recent order of the board was violated, and claim that the low pressure in this district during the recent cold snap was due to the drain on the supply caused by the factories.

## TENDERS

**Ottawa, Ont.**—Tenders for telegraph wire will be received until Tuesday, March 5, 1918, for the supply of 30,000 lbs. of galvanized iron telegraph wire delivered at Nelson, B.C.; early dates of delivery desired. Specifications and forms of tender can be obtained on application to the General Superintendent of the Government Telegraph Service, Ottawa, also at the office of the Superintendent of Government Telegraphs at Vancouver, B.C.

**Hamilton, Ont.**—Tenders will be received by the Board of Control up to Monday, March 4, 1918, for supplying the city with the following materials: Castings (ordinary and special), iron pipe, hydrants, valves, extension boxes, hardware, lead pipe, pig lead, road oil, lubricating oil, flux, fuel oil, lumber, gasoline, brass work, including ordinary and special brass castings for the Water Department. Specifications and form of tender for all of the above can be obtained at the office of the City Engineer, Hamilton, Ont.

**Melbourne, Australia.**—Tenders for the following may be addressed to the Director of Navy Contracts, Navy Office, Melbourne: Supply, delivery and erection at Garden Island, of one (1) 200 horse-power prime mover set of either semi-Diesel type or other heavy oil engine direct coupled to 2-65 K.W. 240 volt D.C. electric generating set. All accessories, tank and fittings to be supplied by tenders as per specification. Date of closing, June 7, 1918. Tender forms are open for inspection at the Department of Trade and Commerce, Ottawa. File No. 20117.

**Ottawa, Ont.**—Tenders will be received until March 18, 1918, for heating and ventilating equipment required in the reconstruction of the Parliament Buildings. All tenders to be based on the execution, erection, and completion, together with the furnishing of all materials, tools, appliances, scaffolding, apparatus and labor required for the installation of the heating and ventilating equipment as called for in the plans and specifications. All information can be obtained at the office of the general contractors, P. Lyall & Sons Construction Co., Ottawa. A set of plans and specifications may be had by depositing an accepted bank cheque for twenty-five ($25.00) dollars, made payable to the Honorable the Minister of Public Works, which will be returned if the intending bidder submits a regular bid.

**Ottawa, Ont.**—Tenders will be received until March 18, 1918, for rolled steel casements and bronze-covered frames and sash for the Parliament Buildings. All tenders to be based on the execution, erection and completion; together with the furnishing of all materials, tools, appliances, labor, etc., as required and described by the plans and specifications for (a) rolled steel casement; (b) bronze covered frames and sash. Separate tenders to be submitted for "a" and "b." The work included under this contract shall be commenced immediately on the signing of the same, or at such time as may be directed, and be carried out in such a manner as to insure the completion thereof by Sept. 30, 1918. Plans and specifications and any other infor-

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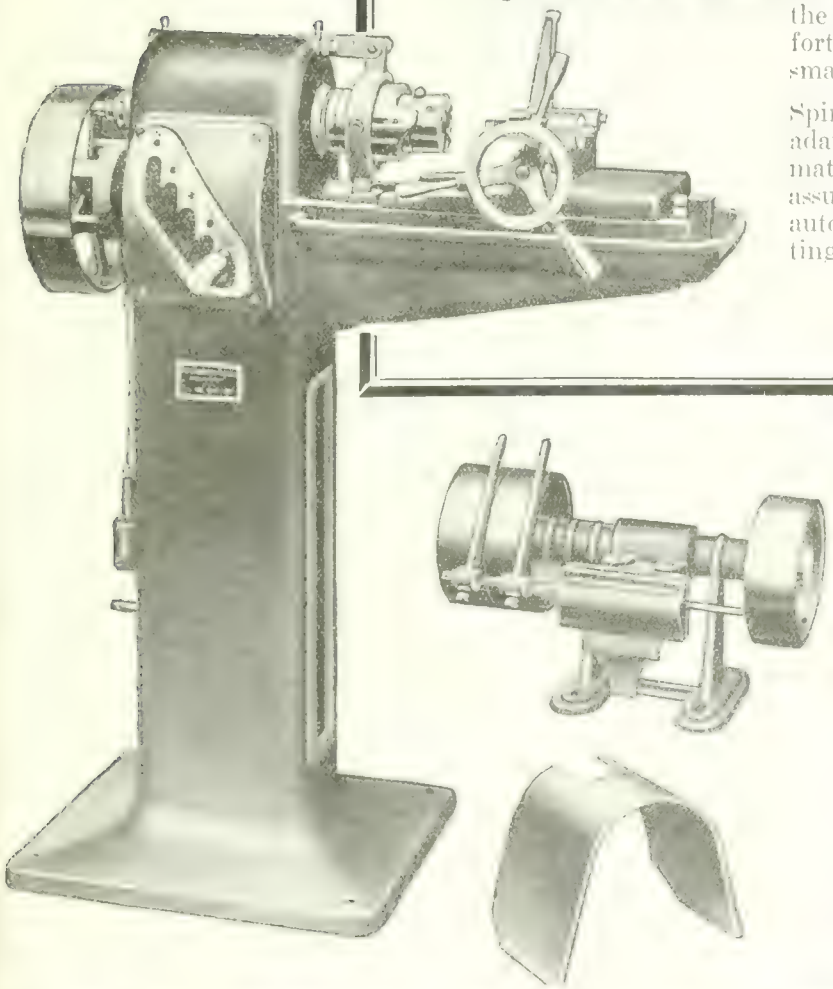





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[illegible] required can be obtained at the office of the general contractors, P. Lyall & Sons Construction Co., Ottawa.

## GENERAL

**Omemee, Ont.** Charles Parsons & Sons, Ltd., 79 Front Street E., Toronto, consulting engineers to their plant here, will cost $100,000.

**Woodstock, Ont.** Henry Bowman, [illegible] Alta., [illegible] to have discovered some valuable beds of marl in Oxford County, and is taking steps to obtain expert examination of them. If they turn out favorably efforts will be made to form a stock company for the purpose of developing the discovery.

**Vancouver, B.C.** The Sidney Rubber Roofing Co., a concern which applied to the city council for a free water supply for ten years, in return for which a factory, involving an initial outlay of $125,000, would be established here, has decided to locate at Port Moody. The company already has an establishment at Sidney, Vancouver Island, where building papers are manufactured from waste paper and other material. In the new factory it is proposed to manufacture tar felt and similar products from old rags and other waste.

## PERSONAL

**Sidney J. Jennings**, vice-president of the U. S. Smelting, Refining and Mining Co., has been elected president of the American Institute of Mining Engineers.

**Fred W. Field**, the newly-appointed Trade Commissioner for Great Britain in Ontario, has received a cable from the British authorities requesting him to take over the duties of his office on April 2 next.

**Capt. Andrew Dunlop**, aged eighty-seven, who was a marine captain from 1854 till 1908, died at Kingston, Ont., on Feb. 20. He was born in Kingston. For many years he commanded steamers of the Richelieu & Ontario Navigation Co.

**E. A. Seath**, formerly with the Montreal office of the Canada Wire and Cable Co., and the Moloney Electric Co. of Canada, has been appointed manager for the Maritime Provinces of these companies, and has opened an office at 674 Barrington Street, Halifax. He is succeeded in Montreal by Harry Riley, formerly of the Toronto office of the Canada Wire and Cable Co.

**S. H. Lunt**, who has been assistant to R. J. Young, general manager at Montreal of the Export Association of Canada for the past eighteen months, is now acting as manager in the temporary absence of Mr. Young, who has been appointed as a member of the Canadian War Board, with headquarters in Washington.

**Major David Seath**, for nineteen years secretary-treasurer of the Montreal Harbor Commission, died at his home, 380 Lansdowne Avenue, Westmount, on Saturday morning. Major Seath was in his seventy-first year and had been a lifelong resident of Montreal. He resigned from the Harbor Board last autumn.

**Capt. James Young**, who went overseas as second in command of the 1st Reinforcing Company, 5th Royal Highlanders, has been wounded in the head and hand, but is doing well. Before enlisting, Capt. Young was employed as manager of the Montreal office for John Bertram & Sons, Ltd., and of the Pratt & Whitney Co. of Canada.

**A. E. Warren**, chief operating officer of the Department of Railways and Canals, has been added to the membership of the administrative committee of the Canadian Railway Association for National Defence. Before his appointment he was assistant general manager of the Canadian Northern Railway, and is described as a railway man of broad experience and marked ability.

**W. J. Sergent**, who, for about eighteen years has been associated with the Allan Line and the Canadian Pacific Ocean services, is retiring from active duty as chief superintending engineer. He remains associated with the company in a consultative capacity. Kenneth MacKenzie, who has been his chief assistant, has now been appointed chief superintendent engineer of all the company's fleets, with headquarters in Liverpool.

**Ross H. McMaster**, assistant general manager of the Steel Co. of Canada, will join the Canadian War Board at Washington, which is being organized by Lloyd Harris to handle Canada's business with United States until the close of the war. Mr. McMaster was connected with the management of the Montreal Rolling Mills prior to the inclusion of that plant in the Hamilton steel combination. He is a director of the Bank of Montreal.

## TRADE GOSSIP

**The Herbert Morris Crane & Hoist Co.** has increased its capital stock from $100,000 to $250,000. The factory is situated at Niagara Falls, Ont.

**The Dominion Bridge Co.**, Lachine, Que., has obtained a large contract for machinery for the British America Nickel Corporation, Toronto. This company is equipping an extensive plant near Sudbury, Ont. The contract includes turbines, turbine blowers, and turbo alternators.

**Bringing Cardiff Coal into Boston.**—Five thousand tons of Cardiff coal was brought to Boston, Mass., last week by a British steamer. The coal, consigned to the British Embassy at Washington, for bunker purposes, was diverted by the British Government to relieve the acute shortage here after it was learned that the British ships held up in New York had been supplied with fuel.

**The Canadian S.K.F. Co.**, of Toronto, announce that they have opened an office in the Board of Trade Building, Montreal, under the direction of Harold Brown, to take care of their expanding business in that district, and also to give a more direct service to users of S. K. F. bearings. Mr. Brown was previously the manager of the J. Stone & Co., in Transportation Building, Montreal, who handle the Stone railway lighting system.

**Dominion Marine Association Meet.**—At the annual meeting of the Dominion Marine Association held in Toronto re-

cently the following officers were elected:—President, J. T. Mathews, Toronto; 1st vice-president, W. J. McCormack, Ste. Marie; 2nd vice-president, G. E. Fair, Toronto; general counsel, Francis King, Kingston. Committee:—A. A. Wright, W. E. Burke, A. E. Mathews, C. E. Harris, J. F. M. Stewart (Toronto), L. Henderson, J. Waller (Montreal), J Sowards (Kingston).

**Ottawa, Ont.**—C. A. Magrath, Dominion Fuel Controller, has returned from the Maritime Provinces, where, in company with J. C. Watters, President of the Trade and Labor Congress, he had been in conference with mine operators and mine workers. The result is a promise from the miners to increase the production of coal in Nova Scotia by at least 12,000 tons per week. An effort will be made to secure 1,000 men from Newfoundland to work in the coal mines of Nova Scotia.

**Tungsten Ore From China.**—U. S. Consul General George E. Anderson, at Hong Kong, reports that shipments of wolframite from the South China field are now proceeding regularly, about 120 tons a month to the United States and about 130 tons a month to Europe. New deposits of the ore are being found in various portions of Kwangtung and Kwangsi provinces, and a deposit covering considerable area has been located in the "New Territory" or mainland portion of the colony of Hong Kong, which is now being developed.

**Secret of the Crucible.**—Another blow to German manufacturers was disclosed in London at the Society of Arts, when Prof. C. R. Darling, expounding high temperature processes and their products, said that the crucibles used had to be lined with special material in order to withstand so great a heat as 3,000 degrees. Formerly all the necessary metals used were produced in Germany and imported, but since the war, owing to the research of our scientists, we had become independent of them. As the result of experiments, 30 metals and alloys of a very useful character were now manufactured in this country.

**Fuel From Garbage.**—The City Council of Guelph has closed a contract with L. R. Long, of the Ontario Oakoal Co., for the construction of a plant in that city. The garbage of the place, with the exception of such non-combustible matter as crockery, glassware, etc., is to provide the raw material, and the plant is to turn out a fuel in briquette form to retail at $7 a ton. The city provides a free site, water and exemption from taxes, excepting for local improvement and patriotic purposes. Mr. Long guarantees to have a capacity of 50 tons per day of his new product.

**Shortage of Pilots At Port of Halifax.** — It is announced in the Canada *Gazette* that owing to the shortage of pilots at the Port of Halifax, due partly to the recent disaster, and the fact that there are at present no apprentice pilots eligible for appointment, power has been granted to the Halifax Pilotage Commissioner to license as pilots any person holding a certificate authorizing him to act as master of a ship, or any apprentice who,

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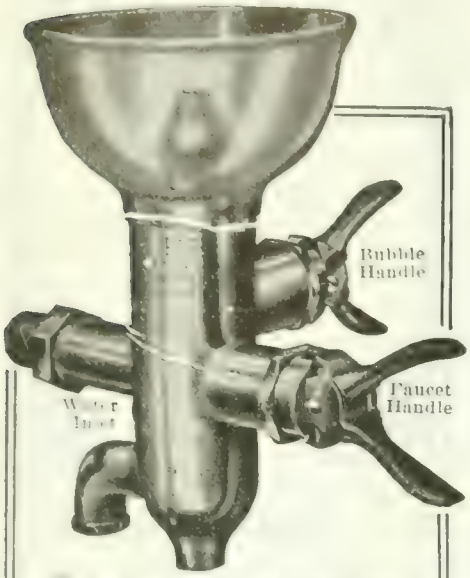


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in the opinion of the commissioners is fit and competent. Any license issued under the regulation granting this power to the commissioners shall continue in force until otherwise ordered.

**German Dye Works in England Change Hands.**—Unusual importance is attached to the purchase by Col. Brotherton of Leeds, England, of the big German dye factories at Ellesmere Port, and on the Mersey, England. The Mersey factory was erected nine years ago by the largest group of German color works, consisting of the Badische Aniline Und Sodafabrik, the Farbenfabriken Vorm fr Bayer and Co., and the Actiengesellschaft Fuer Anilinfabrikation of Berlin. It was built primarily to conform with the British patent laws and may be described as representing the most modern ideas and designs in chemical works construction.

**New Stainless Steel on Market.**—A new metal known by the registered name of Bario has been put upon the market by the Bario Metal Corporation, New York, as a heat and acid-resisting material. The manufacturers claim that this is the only commercial metal of its kind that does not rust, tarnish, corrode or deteriorate. It is, they state, non-magnetic and remains clean and bright and is not attacked by sulphuric, nitric or muriatic acids, resembling in this respect gold and platinum. The melting point of Bario is high, beginning at 3,100 deg. Fahr. and increasing according to the grade of metal mixture used. It is manufactured in nine different grades.

**First U. S. Battle-Planes Shipped to France.**—The first American-built battle-planes are en route to France, nearly five months ahead of the original schedule, according to Secretary of War Baker. "These planes," Mr. Baker said, "are equipped with the first 'Liberty' motors from machine production. One of them, in a recent test, surpassed all records for speed and climbing for planes of that type. Engine production, which began a month ago, is now on a quantity basis, and the peak of production will be reached in a few weeks. Only the 12-cylinder type is being made, as developments abroad have made it wise to concentrate on the high-powered engine instead of the 8-cylinder."

**Partial Embargo on Silver Spruce.**—Further regulations have been passed dealing with the exportation of silver spruce. It is now provided "that no railway or other transportation company shall accept any shipment of silver spruce unless the bill of lading covering such shipment is accompanied by a certificate from a well recognized lumber inspection bureau or an association approved by the Minister of Customs that such shipment contains no silver spruce suitable for use in the manufacture of airplanes; provided that this regulation shall not apply to shipment of silver spruce consigned to the Imperial Munitions Board." A railway or other transportation company which fails to comply with the regulations is liable to a penalty of $500.

**Steel Contracts for U. S. War Work.**—Upwards of 8,000 tons of steel plates have been distributed by the Emergency Fleet Corporation among the steel mills, and about 6,000 more tons are required for constructing 18 lake boats which were recently taken over by the Government for service on the Atlantic coast. Specifications are being revised on 50,000,000 bolts and nuts required by the Government, and these will be in the hands of manufacturers in a few days. The American Bridge Co. will furnish 3,000 tons of steel for a number of buildings to be constructed at Atlanta and Baltimore for the Quartermaster Department of the army. Contracts for 100,000 tons of structural steel required for hangars for the British and French as well as the United States Governments are still held in abeyance until it is determined just what time the structural mills can make deliveries.

**Ammonia Shortage Feared for Artificial Ice Making.**—The United States Food Administration issues the following statement: The attention of the Food Administration has been called to articles appearing in various New York papers by which it is indicated that plenty of ammonia will be available to make ice next summer; that there will be no commandeering of ammonia in New York; and that there will be a sufficient supply of the commodity to permit the manufacture of the customary amount of artificial ice. The Government can not give assurance that there will be a sufficient supply of ammonia, nor that the manufacture of the customary amount of artificial ice will be possible. There is danger of a serious shortage of ammonia, and steps are being taken to have as large as possible a harvest of natural ice to meet any possible shortage of artificial ice.

**Boiler Inspection Act Amendment is Proposed.**—Consideration was promised by Hon. F. G. Macdiarmid, Ontario Minister of Public Works, to a deputation headed by J. Leonard, of London, Ont., recently, asking that the Boiler Inspection Act be amended. The act now provides for the inspection of all boilers from the time the plans and specifications are submitted, but unless the boiler requires repairing it is never inspected in the interim, except by insurance companies. The inspection is made by stationary engineers. This is objected to by the manufacturers, as they claim that the stationary engineers are not competent to judge, because of his employment by a company owning the boiler.

**Can Export to U. S. Without Individual License.**—A general order by the War Trade Board, issued at Washington on Feb. 20, permits without individual import licenses, importation of all commodities from Canada, except those mentioned in President Wilson's proclamation of November 28. Importers are urged to make haste in sending in their applications for licenses to import shipments from all other countries.

**Shawinigan Falls, Que.**—The Shawinigan Water and Power Co. will erect and operate a plant for the manufacture of acetic acid for the United States Government. It is understood that work will start immediately on the new plant, which will be a duplicate of the plant owned and operated by Shawinigan

through its subsidiary, the Canadian Electro Products Co. The capital expenditure will be about $2,000,000. T. E. Aldred is president of the Shawinigan Co., and the executive offices are in the Power Building, Montreal.

**Dundas, Ont.**—The Hydro Commission may instal a pumping plant for fire protection for the local sub-station.

**Dundas, Ont.**—The machine shop which Secord and Co. have been building for John Bertram and Sons Co. is almost complete except for some interior finishing. Another contract has been let to the Secord Co. for another shop of brick and steel construction.

**Toronto, Ont.**—Permit was granted last Thursday to the Dominion Shipbuilding Co. to construct a one or two-storey main building at the foot of Bathurst street on the Harbor Commission property at a cost of $175,000. The building will be of steel throughout and faced with hollow tile. The site leased by the company covers about 16 acres, and five shipbuilding berths will be laid down.

**Elk Lake, Ont.**—Most of the machinery for the plant to be erected at the Castle property in Gowganda has reached this point, and will be transferred over the winter road to the property, a distance of about 25 miles. Already large camp buildings are being erected to accommodate the working force, and exploration of the property should be well under way early in the spring. The Trethewey Mining Co. now owns control of the Castle property.

**Cobalt, Ont.**—Plans have been completed for the installation of an oil flotation plant on the property of the Peterson Lake Mining Co. at Cobalt for the purpose of treating the tails which accumulated from the treatment of Seneca Superior. It is estimated that there are about 9,000 tons of tailings, with a silver content of about nine ounces to the ton, or about 72,000 ounces of silver are expected to be recovered from the retreatment of this ore. It is estimated that the cost of installation of the plant will be in the neighborhood of $15,000.

**Nelson, B.C.**—The Consolidated Mining and Smelting Co. is looking into the question of establishing a concentrator at Nelson, primarily for the purpose of treating Silver King ores. No definite decision has been reached, but preliminary plans are being prepared, and experiments are being carried out. If the plant is gone ahead with it will be located near the railway, so that the cost of placing the concentrates on the cars for shipment to Trail, or moving ore from cars brought in from other mines, will be kept down to a minimum. The company has a 400-ton concentrator at Trail, which is reported to be doing good work in the treatment of zinc ores.

**Vancouver, B.C.**—The formation of a $300,000 company to construct a blast furnace in or near Vancouver to test commercially the iron ores and coke of the British Columbia coast, and to produce a supply of pig iron for local markets, is a project which Hugh McLean is now placing before municipal councils, boards of trade and other public organ-


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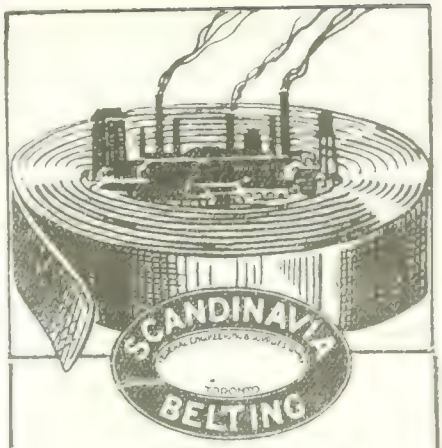

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Brass Castings,
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Machinery
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Order

...cations of Greater Vancouver. Mr McLean believes that such a blast furnace would prove a profitable investment. He suggests that it would also be a big step towards the establishment of an iron and steel plant. His proposal is that the Provincial Government and the Federal Government each subscribe $100,000, and that the remaining $100,000 be provided by business men of Greater Vancouver.

## CONTRACTS

**Halifax.**—The Standard Construction Co., Metropole Bldg., have the general contract for $16,000 and a $3,000 wharf at Lower Water Street, for the Militia.

**Regina, Sask.**—Smith Bros. and Wilson, of Regina, have been awarded the contract for the T. Eaton warehouse at a price of $395,000. Sub-contracts are not yet awarded.

**Halifax, N.S.**—Bate, McMahon & Co., Ottawa, have the general contract and will let plumbing and electrical work for military huts, costing $250,000, for the Department of Public Works, Dominion Government.

**Brantford, Ont.**—The following contracts have been awarded in connection with the erection of a boiler house, etc., costing $10,000, for the Dominion Steel Products Co.. General contract, P. H. Secord & Sons; structural steel, Hamilton Bridge Works; boilers, Waterous Engine Works, Brantford.

**Kingston, Ont.**—President J. J. Harty, of the Canadian Locomotive Co., announces that the company has received an order from the Department of Railways and Canals, Ottawa, for six six-wheel switch locomotives and four narrow gauge, 10-wheel locomotives for the Prince Edward Island Railway, delivery to be made in June next.

## MARINE

**Vancouver, B.C.**—The War Puget was launched at the Lyall shipyard, North Vancouver, on Feb. 16, the christening ceremony being performed by Mrs. E. H. Bridgeman. The vessel is being built for the Imperial Munitions Board. The War Puget is a wooden steamer, and has the following dimensions:—Length between perpendiculars, 250 feet; beam moulded, 42 ft. 6 inches; depth moulded, 25 feet; draught, 22 feet, and deadweight capacity on 21 feet maximum draught, 2,800 tons. She will be equipped with a triple expansion engine developing 1,000 i.h.p.

## INCORPORATIONS

**Aurora Foundries Ltd.**, have been incorporated at Toronto with a capital of $40,000 to manufacture iron, steel, and brass castings of all kinds at Aurora, Ont. The provisional directors are R. A. Fraser, R. H. Noble, and G. W. Johnson, all of Toronto.

**Atlas Wooden Ware, Ltd.**, has been incorporated at Ottawa with a capital of $50,000 to manufacture articles of all kinds made of wood. The head office is at Montreal, and the incorporators are P. S. and Edward Holley, and A. R. W. Plimsoll, all of Montreal.

## WOODWORKING

**Kelowna, B.C.**—S. M. Simpson has taken over the Kelowna Canning Co.'s plant, and will convert it into a sash and door factory.

**Peterborough, Ont.**—Fire last Saturday destroyed the Peterborough Planing Mill. The stock and property loss is estimated at about $10,000. Spontaneous combustion was given as the cause. The company was manufacturing shell boxes, and a considerable quantity of shell-box machinery was destroyed. Loss is covered by insurance.

## RAILWAYS

**Toronto, Ont.**—The car barns of the Scarboro' division of the Toronto & York Radial Railway, at 766 Kingston Road, were gutted by fire on Sunday, causing a loss of $70,000. Four large radial cars are included in the loss, which is fully covered by insurance.

### TRADE INQUIRIES

THE following trade inquiries have been received by the Department of Trade and Commerce, Ottawa. Further particulars may be obtained on application:

82. **Electrical equipment.**—A firm in Florence, Italy, which furnishes electrical supplies to Italian companies, wishes to get into communication with Canadian manufacturers of electric lighting equipment, contact breakers and electrical heating supplies.

83. **Caustic soda, resins, etc.**—An Italian firm in Bari, on the Adriatic Sea, makes inquiry for caustic soda, silicate of soda in crystals and resins (colophony).

84. **Manufacturers of iron and steel, chemical products, wood-pulp, men's and women's hosiery.**—A Florentine firm would be glad to hear from Canadian houses disposed to export to Italy wood-pulp, manufactures of iron and steel, chemical products and men's and women's hosiery.

85. **Chemical products.** — An Italian firm in Bologna with established connections for the sale of chemical products would be pleased to enter into negotiations with Canadian exporters of phosphates and superphosphates, sulphate of copper, potassium salts, seed oilcake, dry blood and other animal residue, etc.

86. **Grain, leather, tallows and soap-making chemicals.**—A Catania firm would be pleased to hear from Canadian shippers of grain, chrome-tanned leather and of such chemicals as the following for soap manufacture: Caustic potassium, carbonate of potassium, carbonate of soda, and caustic soda. Tallows are also asked for.

88. **Metals, wire, beams and shovels.**—A firm in Florence with Italian Government connections and branches in Bologna and Leghorn is disposed to treat with Canadian manufacturers of copper and brass in small tubes or sheets, copper wire, antimony, nickel, zinc, shovels, iron beams for construction purposes, iron wire and brass wire.

### CANADA FOUNDRIES AND FORGINGS CO.

AT the sixth annual meeting of the Canada Foundries & Forging Ltd., held in Montreal last week, the president W. M. Weir in his address said:

"Your plants have continued to operate at full capacity. The heavy expenditures of past years in improvements and enlargements have been fully justified, as evidenced by the net earnings for the year in the face of heavy rises in labor and material costs and reductions in munitions prices. Your normal business has shown favorable increases and every effort has been made by your Board to keep fully abreast the times in order to model and remodel the operations and business to meet the rapidly changing conditions arising out of the great war.

"During the past year heavy demands for marine forgings were made upon your company, and in order to take the fullest advantage of the opportunity offered, your directors purchased the total issued capital stock of the Delaney Forge and Iron Co., Incorporated, of Buffalo, one of the oldest established ship forging industries of the United States. This purchase was duly ratified at a special shareholders' meeting held at Brockville, 10th October, 1917. The acquisition of this plant materially assisted your Canadian plants in the immediate participation of this new line of industry, and further developments are now proceeding to enable your company to take still fuller advantage of this business.

"There have been booked sufficient orders to keep your company fully employed for some months ahead and, although your directors are still unable to predict the future prospects, they look with confidence to the results of 1918."

### EXPORT LICENSES TO CANADA AND NEWFOUNDLAND

TO facilitate exports from the United States to Canada and Newfoundland there has been heretofore issued through the U. S. Customs service a special license whereby goods have been permitted to enter Canada and Newfoundland without an individual license for each shipment, except in the case of commodities which the War Trade Board has heretofore found it necessary to conserve, and for whose exportation individual licenses have been required, as stated in the several announcements made by the board from time to time.

The War Trade Board announces the publication in the "War Trade Journal," No. 4, of a revised list of such commodities which will hereafter require individual export licenses when exported to Canada or Newfoundland. Any commodity appearing on this revised list which hitherto has not required an individual license when exported to those countries will be passed by the Collectors of Customs in the same manner as heretofore when the shipment is covered by ocean or railroad bill of lading marked "For export," and dated on or before January 25, 1918.


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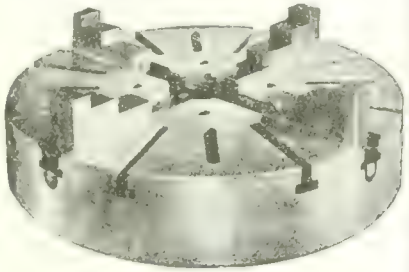

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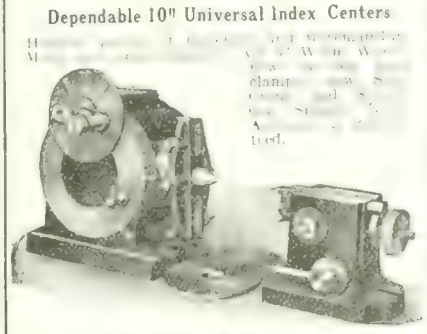

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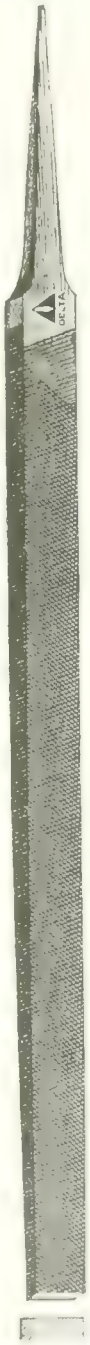


First, understand what we mean by "good." For an ordinary file may, for a time, do fast work on soft material. A file, to be what we term a *good* file, however, must do fast work on the hardest, the toughest material, and continue to do it long after the teeth of a common file would be worn smooth. A file made of

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## PATENTS

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## AND MANUFACTURING NEWS

*A weekly newspaper devoted to the machinery and manufacturing interests.*

Vol. XIX. TORONTO, MARCH 7, 1918 No. 10


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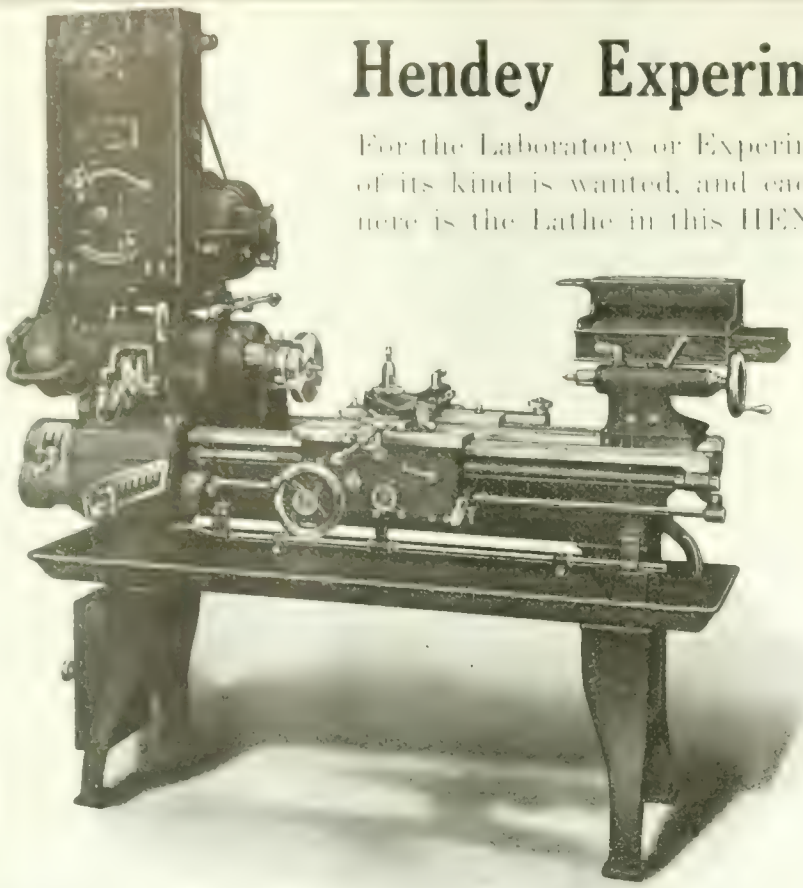

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*No better illustration of the potentiality of Canada can be offered than that of her mineral resources. While the glamour of enormous wealth will always attract attention to gold and silver deposits, the attention of students of world progress is frequently more interested in discovery and research surrounding of alchemistic mystery. The substance which has prompted this article is of the latter category.*

FROM time immemorial, the noble metals have exercised a fascination over mankind, the length of the spell being only equalled by the completeness with which it has influenced national and individual actions in all stages of the world's history.

In progress of time, however, the absolute values of metals to mankind have undergone more or less readjustment. Intrinsically and individually, gold, silver, etc., may be of more immediate monetary value, but in the industrial or utilitarian sense, iron and steel are much more indispensable to the welfare of the human race than are the previously named noble metals. The pre-eminence of gold down through the ages, while due principally to its imperishability and attractive appearance, has also been due in part to its being obtainable in the raw state without requiring much treatment in the way of refining, until the demands of modern commerce caused effort to be made to recover all of it.

### Cobalt a Canadian Metal

The developments of modern metallurgical science in allied fields soon resulted in the commercial production of certain semi-rare metals which, while not competing with gold or silver as bases of currency, still possessed a high value, although their industrial applications were more or less limited at first. Prominent among such metals is cobalt. It is semi-rare in the ordinary sense of the word, its deposits are practically confined to Canada, and, along with chromium, etc., it is destined to play an increasingly prominent part in the world's future industrial development.

Stellite, one of the marvels of modern research, is a non-ferrous alloy of cobalt and other metals. Its value as a machine shop accessory material has been well proven during recent years, it having certain qualities which adapt it for use in place of high speed steel as a cutting agent. In view of its unique properties and the fact that the humblest machine operator has frequently had his earnings largely increased through its use, more than ordinary interest attaches to the plant where this metal is produced, and the views and description of processes forming this article were obtained through the courtesy of the Deloro Smelting and Refining Co., Deloro, Ont. This company operates a smelting plant which refines silver-cobalt-nickel ore from the O'Brien mines at Cobalt and Gowganda.

### Smelting Plant

The smelter is located on the site of an abandoned gold mine, which has not been worked for the last twenty or thirty years, and, as some of the refining operations carried on at present have much in common with those by which the gold was formerly recovered, certain portions of the old plant have been retained and are incorporated into the present smelter.

Cobalt is only found in commercial quantities in Canada, and since the company, in addition to the manufacture of stellite for the Canadian and export trade, also refines the cobalt used in the manufacture of stellite in the United States, it will be of interest to [illegible]

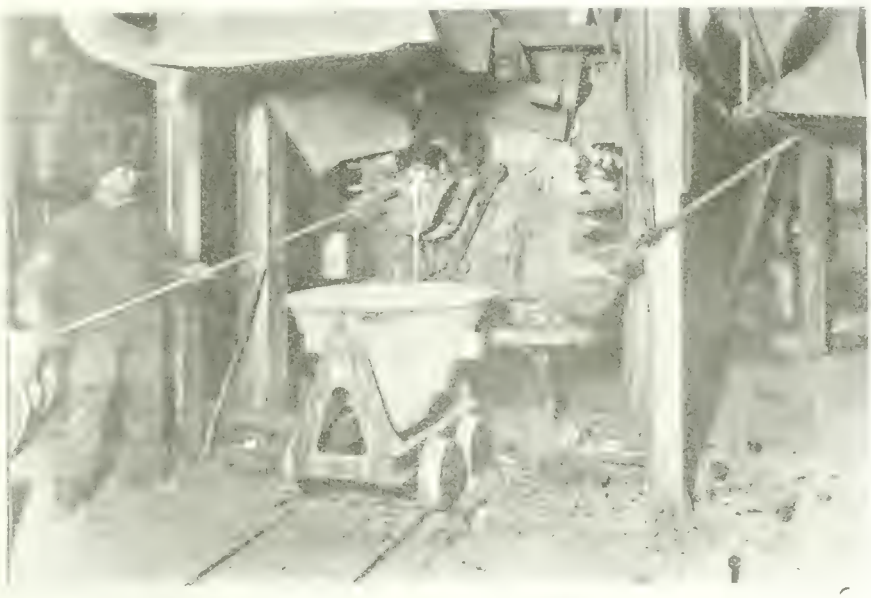


FIG. 1. SLAGGING OFF SILVER FURNACE

[illegible] nickel ore.

[illegible] above is first ground in ball mills to the [illegible] assaying and the bulk of the material going into storage bins.

From the storage bins the ore passes to blast furnaces where coke and the [illegible] are added. These furnaces are of a design suitable for the material handled and are somewhat similar to those used in the reduction of copper ores. The products of the blast furnaces are, arsenic fumes, which pass to bag-houses for collection, slag which is dumped, and speiss which contains the cobalt, nickel, silver and some iron and copper. In addition [illegible] is recovered at the blast

FIG. 1. TAPPING SILVER FURNACE

furnace as base bullion and goes direct to the silver refining furnaces. Fig. 1 shows the slagging off of the blast furnace preparatory to the tapping off of the speiss, shown in Fig. 2.

The speiss is given a further treatment of crushing and roasting to drive off the remaining arsenic; chlorodizing and cyaniding, the result of which is the freeing of silver in the precipitated state and the leaving of the other metals in the residue.

### Silver Refining

This precipitated silver is then taken to the bullion furnace room, where it is graded with the base bullion, refined, and finally melted for pouring into ingot molds, as shown in Fig. 3. This furnace is of the Swartz oil burning type, provided with trunnions and a geared tilting arrangement. In all about 150,000 troy ounces of silver are refined each week.

FIG. 3. POURING BULLION IN THE SILVER REFINING PLANT.

The arsenic fumes given off at the blast furnace are carried to cooling chambers, where the crude arsenic partially settles out, the remainder being led to bag houses, where it is completely removed from the blast furnace gases. The crude arsenic is periodically removed from the bag houses and chambers, and is charged to the arsenic refining furnaces, where it is again volatilized and passes into the white arsenic chambers in which it is condensed and from which it is packed for shipment.

The residues left after extracting the silver form the source of supply for the cobalt oxide plant. In this plant the cobalt and nickel oxides are produced and shipped to England, France, United States and Japan. The operations in this department are purely hydro-metallurgical; in other words, it is a wet plant.

The residues are first processed in such a way that the metal content is rendered soluble. The next step in the process is the removal of the copper and iron, the solution being then ready for the precipitation of the cobalt and nickel. The tanks in which these operations are carried on are shown in Fig. 4, which also shows the filter presses used for dewatering the precipitated sludge. The cobalt and nickel are precipitated separately and the clear solution finally remaining is allowed to run to waste, as it contains no values.

The press cakes of cobalt and nickel are dried and treated for the removal of sulphur, after which they are refiltered, dried again, ground and packed ready for the market. Fig. 5 shows the Raymond grinding and packing machines by which the cobalt and nickel oxides are prepared for shipment. All material is carried through these machines by a

FIG. 4. COBALT OXIDE PLANT: STRIPPING FILTER PRESS.

pneumatic system, the details of which will be understood by reference to Fig. 5.

**Stellite and Metals Department**

The metals department derives its supply of raw material from the oxide plant. The oxide is first reduced and is then charged into the electric furnaces where it is melted, the procedure for cobalt and nickel being similar. The form in which these metals are prepared for the market is similar to shot, and for cooling of the molten metal in this form an ingenious device is used which breaks up the molten stream from the pouring ladle into small particles not necessarily round. This device, which is shown in Fig. 6, consists of a circular tank 4 feet in diameter by about 6 feet deep. The 1½ in. pipe shown has two flat nozzles, above the tank waterline, through which water is forced at a high velocity. These jets serve to break up the molten metal into particles of the desired size. The metal in shot form is caught by a basket or screen in the bottom of the tank and is removed, after the melt is finished.

FIG. 5. PACKING COBALT AND NICKLE OXIDE.

Cobalt in shot form obtained in the above process forms one of the principle ingredients of stellite, and it, together with the proportions of chromium and tungsten for the different grades of stellite, is placed in the electric furnaces used for stellite manufacture. These furnaces, shown in Fig. 7, are of the Snyder type and are of 50 K.W. rating. The Snyder electric furnace has a vertical 3 in. carbon electrode mounted in the center above a magnesite hearth, with means for its manual raising or lowering to suit the depth of charge and for the adjustment of the electric current.

The furnace is started by striking an arc, and the heating takes place by the utilization of the resistance of the charge as well as by arc action. In operation these furnaces take from 80 to 100 amperes at 50 volts, single phase.

In this connection mention might be made of the furnace in which stellite was first produced in Canada. This furnace, which is still used for experimental and research work is shown in fig. 8. It is single phase and it will be noticed that two carbon electrodes are provided, the arc being struck through the material on the hearth. A double throw switch is provided, by means of which voltages of either 50 or 100 may be impressed between electrodes. This furnace is of 25 K.W. capacity and the increased demand for stellite in the past two years has necessitated the building of the two 50 K.W. furnaces now used for stellite alone.

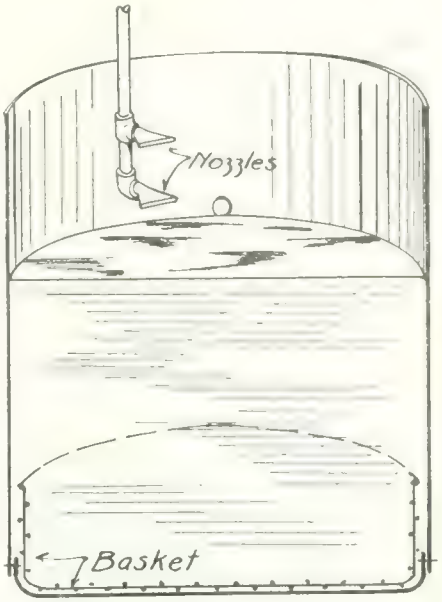



FIG. 6. METAL SHOTTING TANK.

**Pouring**

When the charge is melted the furnace is tipped forward on its trunnions, and the molten stellite is poured into a graphite crucible from which it is poured into the graphite moulds. Stellite has a high melting point, about 1,900° C (3.452° F), and considerable care must be taken to skim off all slag and foreign matter.

An interesting device, shown in Fig. 7 facilitates the pouring operation. The

FIG. 7. MOLTEN STELLITE AT A TEMPERATURE OF 3,700 DEG. F. BEING CAST IN GRAPHITE MOULDS.

are firmly fastened to a circular frame made of flat and angle iron, the angle iron forming a ledge for the bottom of the molds. This frame is carried on wheels running on a circular track in the floor, and enables the operators who are pouring to stand in one place and serve the molds as they are brought around to the proper position.

### Mould Shop

The mould shop is in many respects similar to the average machine shop or tool room, most of the tools being required for the cutting up of graphite slabs into the various shapes required for the graphite moulds. The slabs are first sawn into the required sizes on a band saw and are then shaped on a 20 in. Kelley shaper to a contour which will give the proper cross section when the halves of the mold are clamped together.

FIG. 8. EXPERIMENTAL AND RESEARCH FURNACE.

A 15 in. gap lathe and an 18 in. MacKenzie lathe form part of the equipment.

When the stellite has cooled sufficiently the molds are taken down and the bars removed, fins and sprues being broken off. In the next operation the bars are [illegible] cutter and broken into the required lengths.

This cutter, shown in Fig. 9, consists of a stand of box section, carrying bearings and a horizontal shaft, on one end of which a disc of steel 1-16 in. by 16 ins. in diameter is mounted between two [illegible] x 14 in. covering plates. The stellite bars are brought into contact with the [illegible] a ledge on its upper surface for engaging the bar. The actual nicking is not effected by a cutting action but by the heat generated through the friction between the rapidly revolving disc and the stellite. This heat is so great that the metal is melted at the point of contact and the disc consequently has only to remove the molten metal, and by so doing clears the dividing groove.

As the greater part of the steel disc is at all times out of contact with the metal and is being continuously cooled by contact with the air, and as each point on its circumference is only in contact with the metal for a minute fraction of a second during each revolution, the disc remains at all times comparatively cool and does not melt. After the bars have been nicked and broken to length they are ground and polished on the grinders, also shown in Fig. 9.

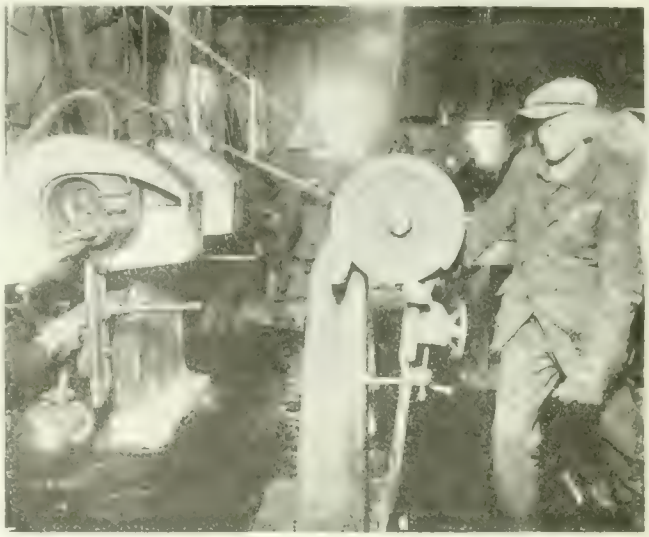


FIG. 9. CUTTING STELLITE BARS WITH STEEL DISC

### Inspection and Packing

A test bar is taken from each melt and is tried out and tested on a test lathe where the quality as regards speed and depth of cut is determined. Each melt also undergoes a sceleroscopic test and is subjected to laboratory analysis.

### Qualities

Stellite cutting alloy requires no tempering, no cutting compound, and may be used at a speed that would be impracticable for high speed steel, best results being obtained when working the tool at a red heat.

The following table gives the surface speed at which stellite should be used, the same depth of cut and feed being maintained as for high speed steel.

| Material— | Surface Speed per Min. |
|---|---|
| Mild steel to 30 pt. carbon | |
| Use No. 1 grade stellite . . . . | 130 to 300 ft. |
| Hard steel, 30 to 100 pt. carbon | |
| Use No. 1 or 2 grade stellite... | 100 to 200 ft. |
| Soft cast iron | |
| Use No. 2 or 3 grade stellite... | 200 to 350 ft. |
| Hard cast iron | |
| Use No. 3 grade stellite . . . . | 100 to 250 ft. |

### Forms and Shapes

The manufacturers recommend personal demonstration and instruction in order that the best results may be obtained and the proper methods used.

In addition to the usual square and flat sections a variety of special shapes are made, a few of which are shown in figs. 10 and 11. The circular cored section shown in Fig. 11 is made specially for a Canadian manufacturer and is held in a special tool holder in such a manner that when one portion of the cutting edge becomes worn the bit may be turned in its holder, presenting a new portion to the work. When the whole edge becomes dull the bit is ground off until the edge is even all around its circumference, and a conical wheel is then used to bring this new edge to sharpness.

In the smaller sizes formed cutters are made of solid stellite, being ground to the correct contour from the rough. This method is not so economical for the larger sizes, and built up cutters are preferred when the width exceeds ¼ in. These cutters are made with a corbon steel body and inserted blades of stellite, thus obtaining the strength of steel and the cutting powers of stellite. The inserted teeth may be held in place either by the usual method or by welding.

Stellite is fabricated into tool bits by welding a stellite tip on a machine steel shank. For this work either electric-arc or oxy-acetylene welding may be used with good results.

### Electrical Installation

Electrical energy for the electric furnaces and all other plant requirements is obtained from the Seymour system of the Hydro-Electric Power Commission of Ontario. The smelter receives power through a 3 phase 60 cycle 44,000 volt transmission line, which enters the substation through wall bushings on the second floor. The accompanying cross-sectional elevation, Fig. 12, of the sub-

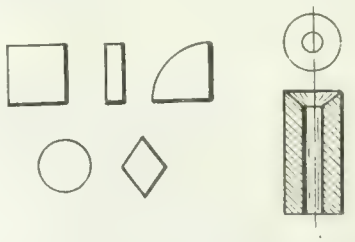


FIG. 10. USUAL STELLITE SHAPES.
FIG. 11. SPECIAL SHAPE.

station will serve to show some of the interesting features of this installation.

The building is of fireproof construction with hollow concrete block walls, and with steel and concrete floors and roof. The upper floor is used for a lightning arrestor and high-tension switch room, and the lower one for transformers and switchboard.

The electrical installation is protected by a set of General Electric type I electrolytic lightning arresters provided with

disconnecting switches for their isolation when being worked upon. From the line entrances the leads pass through choke coils and disconnecting switches to the General Electric type K high-tension oil switch. This switch is enclosed in a concrete cell and is hand operated from the switchboard on the floor below.

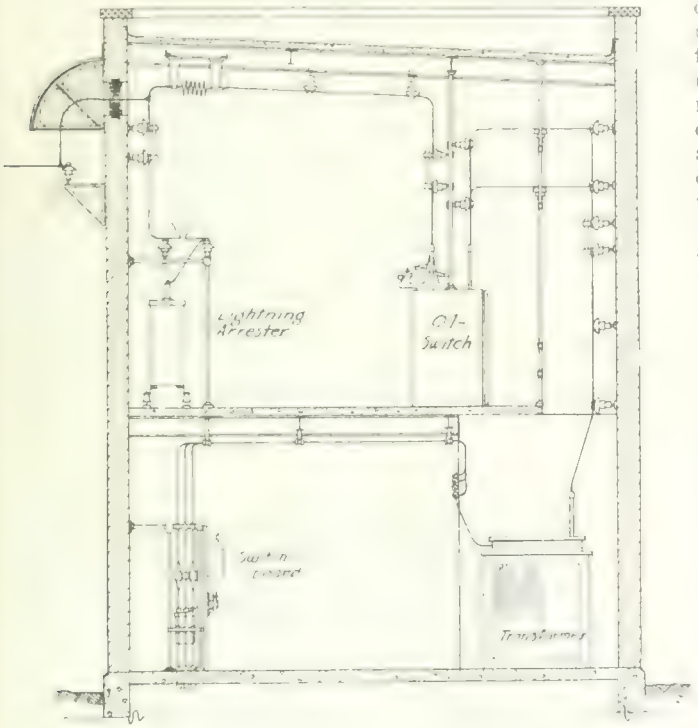



FIG. 12. CROSS SECTION OF SUBSTATION

The transformer equipment, consisting of three Westinghouse single phase 250 K.W. 44,000/600 volt 60 cycle transformers in separate concrete compartments, Fig. 13. These transformers are delta connected on both high and low tension sides, and the high tension side is provided with disconnecting switches by means of which any transformer may be cut out of service and the other two operated on open delta when the secondary side is opened as well.

The three panel switchboard is equipped with a C. G. E. type F form K 2 600-volt 1,000 amp. oil switch on the secondary side of the transformers, from which the single, three-prase feeder passes underground to the company's pole line for distribution to the plant. Both the high and low tension switches are provided with C. G. E. inverse time limit relays. A Westinghouse graphic recording wattmeter meters all the plant load, a Westinghouse type E integrating wattmeter being also provided. A General Electric horizontal edgewise ammeter with ammeter plugs and a similar type voltmeter on a swinging bracket are part of the equipment.

### Laboratory

A laboratory, with all the various apparatus necessary for the control of operations in a metallurgical plant of this character, is housed in a separate building by itself, and it is in this building that all the assaying of ores and other necessary control testing is carried out.

For this purpose a furnace room is provided where all cuppellation of the ores is carried out for the determination of their silver content. The rest of the laboratory is divided off into separate sections such as the office, hydrogen sul- for sulphur deter- room with four chemical balances and an office for the chief chemist. Two wet rooms, where general chemical analysis is carried out are also part of the laboratory, and an interesting portion of one of them is shown in Fig. 14.

The piece of apparatus shown in this illustration is for the determination of cobalt and nickel in the sampling of ore and furnace products by electro-chemical analysis. Four glass beakers containing known quantities of the solutions to be analyzed are placed on stands under the rotating glass rods. These rods are rotated by a motor, as shown, for the purpose of securing a faster deposition of the metals through the stirring of the solution. After the required metal has all been deposited out of the solution it is a simple matter to determine the various proportions of the metals present in the materials tested.

## STELLITE AND SOME OF ITS USES

WHILE stellite has come prominently before the engineering industry as a cutting material, its present applications are not limited to tool work, while increased supply and experience in its manufacture are expected to disclose further uses and additional alloys. In a recent article in the "Canadian Chemical Journal" the discovery and development of stellite and the circumstances attending its production in Canada are recounted by Thomas Southworth,* who writes as follows:

In 1910 a business correspondent of Swansea, Wales, in writing us regarding Cobalt matters, enclosed a clipping from an English paper that he thought would be of interest to the writer. This clipping was a reproduction of an article that had appeared in an Australian paper referring to an address made by a Mr. Elwood Haynes, of Kokomo, Indiana, before a chemical society in San Francisco. As the article in question stated that Mr. Haynes had discovered a new alloy of cobalt, it naturally was of interest, and I made inquiries as to Mr. Haynes through a friend in Kokomo. I then got in touch personally with Mr. Haynes, who had been anxious about a supply of cobalt, with the result that he came to Toronto, and Mr. Haynes and the Deloro Smelting and Refining Company linked up together in the development and production of the alloy.

Up to this time cobalt, which had been known for centuries, had been produced mainly in the form of an oxide and used almost exclusively in the ceramic arts. Originally found in Saxony and subsequently in limited quantities in New Caledonia, the large production from the cobalt silver mines flooded the market, and cobalt oxide was at that time un-

*Managing Director [illegible] ing Co., Ltd., Toronto.

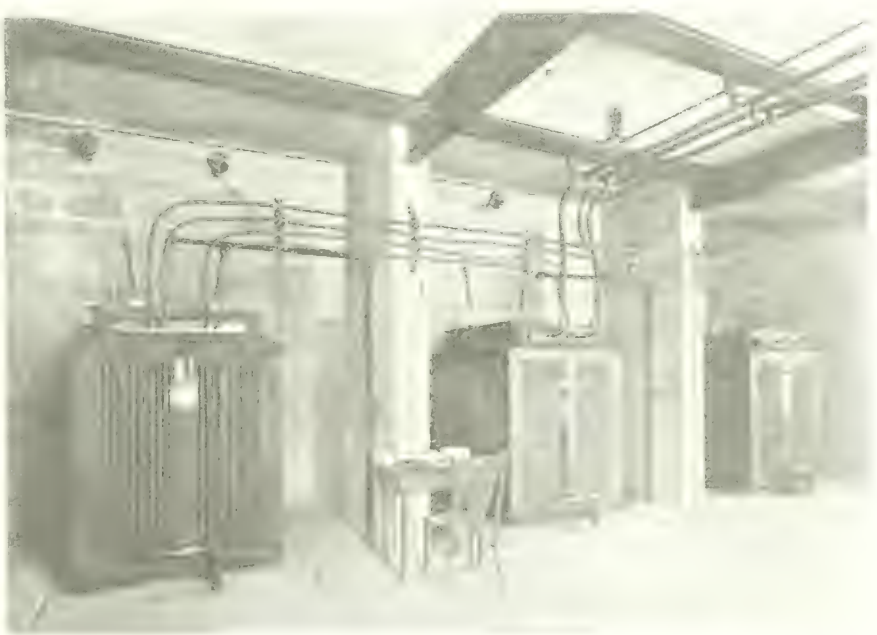


FIG. 13. TRANSFORMER ARRANGEMENT IN SUBSTATION.

[illegible] except in comparatively small quantities. Naturally, therefore, any new [illegible] that was likely to produce new uses for cobalt would be of interest to the Deloro Smelting and Refining Company, one of the largest producers of cobalt in the world.

On meeting Mr. Haynes I found that he was not only a metallurgist, but an inventor and manufacturer, who had to his credit the production of the first practicable gasoline motor car in the United States, and was then manager of the Haynes Automobile Company, makers of a well known car.

In his spare time Mr. Haynes devoted himself to metallurgical research, and as a result of numerous experiments he found that cobalt, although apparently similar to nickel, possessed quite different qualities in many ways, and at the time his paper on "Cobalt Alloys" was delivered he had produced an alloy of cobalt and chromium that bade fair to supersede steel for some purposes. This alloy Mr. Haynes called "Stellite," for the reason that when polished it took on a particularly brilliant lustre, hence the name "Stellite."

In addition to its brilliant color, which made it a very attractive looking metal for cutlery purposes, it was stain-proof and rustless. Stellite alloys resist oxidation or tarnishing better than any known metal excepting gold and the metals of the platinum group. It is absolutely immune to all alkaline solutions, and practically so to all chemical salts, including solutions of bichoride of mercury, iodine, etc.

Mr. Haynes states that a stellite bar was subjected to the action of strong, cold hydrochloric acid for thirteen days with a loss of .009 grams. The action of dilute sulphuric acid is slightly more pronounced. Nitric acid has no effect on the metal whatever. Fruit juices and acids do not discolor stellite, even though allowed to dry on the polished surface.

### Physical Properties

In point of hardness, the binary alloy, consisting essentially of cobalt and chromium, can be forged with difficulty at a bright red heat, but when it becomes cool, its hardness remains as great as before the first heating. The metal is somewhat stiffer than steel, and notwithstanding its great hardness, it still shows considerable elongation. The alloy can be made in great variety of hardness and toughness, not only by changing the proportion of its constituent metals, but by adding small quantities of other metals. By this means untarnishable alloys can be made which vary in hardness from about that of common, untempered steel, to that of quartz crystal. In fact, one of our stellite alloys is so hard that it will readily scratch the hardest and toughest steel ever produced. The unique and peculiar properties of stellite alloys may be summed up in the statement that the alloys combine a greater range of hardness than steel, with the resistance to oxidation of platinum and gold.

The original stellite produced in Kokomo and at Deloro, and intended for cutlery purposes, was found on being tested in Sheffield, England, by cutlers that, although the metal possessed many excellent qualities in the way of appearance and freedom from stains, it was so hard as to be—while not entirely unworkable, so nearly so as to be impracticable for the purpose. Mr. Haynes at once set about developing other alloys, and about two years ago produced a stellite used as a metal cutting tool, and this material, manufactured in Kokomo, Indiana, by the Haynes Stellite Company, and in Canada by the Deloro Smelting and Refining Company, has proven a very great success. It is quite generally in use in the United States, Canada, Great Britain, France and Italy, and there is no doubt that its use in Canada has to a very considerable extent been instrumental in increasing the output of large and small shells in our Canadian factories. The material does not lose its temper even though heated to a white heat, but retains its cutting qualities under these conditions. This makes possible a much greater cutting speed than can be obtained with any other metal, hence the increased output by the use of stellite.

Mr. Haynes has more recently developed a new alloy called Festal Metal, being a combination of stellite and iron, that will shortly be placed on the market for cutlery purposes. This metal has all the non-rusting and non-staining qualities of the original stellite, while it is much more malleable and possesses a greater elasticity than the original alloy. He has further produced a malleable stellite, which is to some extent taking the place of platinum in laboratory appliances, as well as for other purposes.

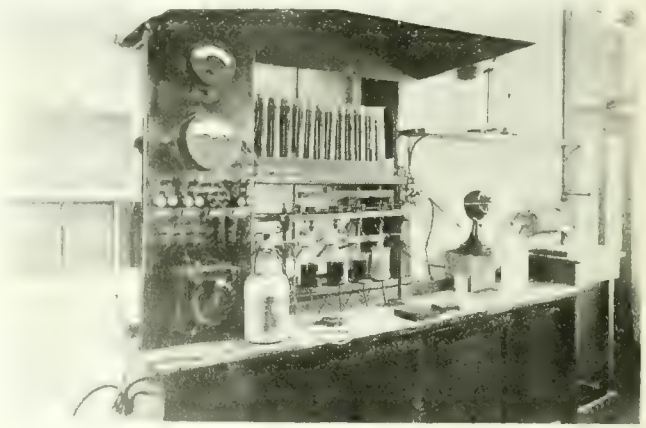


FIG. 11 ELECTRO-PLATING OUTFIT USED IN ELECTRO-CHEMICAL ANALYSIS.

The present writer not being a technical man is unable to give other than a general statement of the various stellite alloys and their uses, but the following from a paper recently read by Mr. Haynes will give a better idea of the nature and character of these alloys.

### Practical Applications

First, it may be said that these alloys are not fixed or definite in their composition, and may be divided broadly into two classes: (1) those malleable at a red heat; and (2) those which can be worked into the desired form only by casting.

The malleable alloys are composed almost entirely of cobalt and chromium only, though the proportion of the constituents may vary from 10 to 50 per cent. chromium, with a corresponding variation in the cobalt. These alloys are all hard, and while they may be scratched by the file, none of them is practically workable by this means. They cannot be machined, but some of the softest ones may be drilled by means of a hard-carbon steel drill or a drill composed of hard stellite. They resist nitric acid almost perfectly, even when boiling, particularly if the chromium content is over 15 per cent. They forge with difficulty at temperatures ranging from 750 to 1,200° C.

They have been forged into the following forms:

(a) Tableware, such as spoons, forks, knives, ladles, etc.

(b) Surgical instruments, pocket knives, dental instruments, etc.

(c) Evaporating dishes, crucible supports, lamp stands, etc.

(d) Jewelry, including finger rings, cuff buttons, scarf pins, etc.

These malleable alloys are all slowly attacked by either hydrochloric, sulfuric, or hydrofluoric acid, but are nearly immune to all chemical combinations, as well as the fruit acids. As the evaporating dishes made of this metal take a bright polish, and can be made of comparatively light section, they will prove suitable for evaporating many chemical salts to dryness, and are particularly suitable for boiling the caustic alkalies. Substances may be evaporated to complete dryness in these vessels without any danger whatever of breaking the vessel, since the tensile strength of the alloy exceeds 100,000 pounds to the square inch, and it also shows considerable elongation before rupture. When a vessel made of this material is struck by a hammer, it emits a clear, musical tone, and continues to vibrate for a considerable length of time. The vessels retain their lustre in the chemical laboratory under practically all conditions, since they are not affected in the slightest degree by sulfuretted hydrogen, ammonium chloride, or other vapors. Furthermore, they are practically immune to acid vapors. They give most excellent results in the form of lamp stands, supporting rings, triangles, etc. When these are heated to full redness, they become covered with a deep blue-black film, which does not change either in weight or appearance by repeated heating, and as no scale ever forms, these articles retain their weight, stability, and smooth surface indefinitely under all sorts of use. They can be subjected to temperatures up to 1,200° C., and still retain a considerable amount of strength. In

fact, the stellite alloys possess the highest "red hardness" of any of the alloys yet discovered.

### A Canadian Product

While stellite was discovered and developed by an American, the alloy may be considered as distinctly Canadian. All the stellite so far manufactured has been made from Canadian cobalt, and, as is generally known, Canada possesses the largest supply of cobalt at present known, and this position will likely be maintained for some time. Until the deposits of this metal at Cobalt were opened up very little incentive existed for research work in this line owing to the scarcity of the metal and its very high price. Cobalt had for years varied from $4.50 per pound of oxide to $2.50 per pound, which was the price obtaining when the Cobalt camp was opened. The price very quickly dropped to 75 cents, and without sufficient market to absorb the output of the Canadian refineries.

The first alloy of consequence that has so far been discovered is stellite, but no doubt the reasonable price of this metal, and the increasing supply will induce investigations that will disclose new uses and new alloys. One of these new uses is for a light weight metal to replace the household utensils imported hitherto from Hungary.

It may be stated that cobalt is being used to a limited extent in the production of the better grades of high-speed steel.

## THE RETURNED SOLDIER AND INDUSTRY

BY no stretch of the imagination could anyone apparently conceive of greater problems than those with which the various national governments are confronted at the present time in the stupendous task of waging a war, the equal of which has never before been experienced in the history of mankind. It is small wonder that mighty men, of marvellous mental ability and physical accomplishments, endowed with almost miraculous stamina for achievement, have risen to great power and influential position, and, after a period of brief or prolonged administration, have been superseded by others, fresh for the fray.

With the world conflict still at its height, it seems premature to dwell on the possible developments that will undoubtedly arise when peace is finally declared and the nations take a breathing spell before resuming the task of supplying the needs of a normal and sane humanity. While it is certainly obvious that the successful solution of war problems requires the concentrated, and oftentimes superhuman efforts of the executives, in whose hands lies the destinies of nations, it is prophetically true that the period of commercial and industrial, as well as social, readjustment that must inevitably follow in the wake of such a devastating war, will create unprecedented conditions requiring the closest co-operation of statesman, manufacturer and employee, both individually and collectively, for their satisfactory settlement.

One of the most important, if not the all-essential problem of the immediate post-war period, will be that of the returned soldiers. Already this question is receiving the attention of many interested parties. Much has been accomplished, and still greater plans are being considered for absorbing these men into the normal channels of the country's future activities. The problem is not so much that of the man who has been fortunate enough to pass through the turmoil of the eventful past and return again with all his mental and physical abilities—as these men, in most instances, will be able to look out for themselves but rather with the great number of men, temporarily or permanently disabled, who must rely on the honor and goodwill of those fellow citizens for whom this great sacrifice has been made. The care or employment of these men must not be considered as a charitable undertaking, but as a moral obligation on our part to which these men are justly entitled.

Without dwelling on the possibilities of after-the-war business, it is reasonably anticipated that many—in fact very many—of these men will eventually seek positions in that sphere of industrial life in which they were engaged previous to enlisting. It is probably here that patriotism will undergo its greatest test, to show whether our faith in these men has been overshadowed by the lust of a continuation of that prosperity that has only been possible through the trials and sufferings of these very men. These crippled or semi-disabled men will necessarily require some kind of employment to prevent them becoming a burden upon the various communities. Manufacturing establishments of every description should feel themselves obligated to employ several of such men when the occasion arises, and it should be the duty of executive heads to evolve factory methods whereby an armless or legless man would serve a purpose as well as one not thus afflicted. In order to employ these men in a capacity where their reduced ability will not detract from the general efficiency of a plant, it may be necessary for manufacturers to modify or readjust their existing equipments, or otherwise arrange the factory operation in order to provide suitable work at which they may prove as capable as others who are not minus some portion of their physical members.

One of the many details relative to factory operation, and one that is rapidly becoming recognized as an essential factor in economic plant management, is that of material transportation to and from the different machines and departments. Where modern and efficient methods are adopted for this particular purpose, the saving that has been effected has amply covered the initial cost of installation and subsequent maintenance. The mechanical improvements that have been made in the construction and operation of such facilities has almost eliminated the necessity of lifting heavy weights in and out of machines, or carrying same to different positions about the shop. It is this feature of factory operation that should form the foundation for the solution of the problem of the returned soldier. Not only would such labor-saving devices pave the way to a satisfactory settlement of the moral obligation, but it would undoubtedly result in greater plant efficiency. The accompanying illustrations show two automatic factory transportation trucks, the manipulation of which could be ideally handled by a legless or armless man almost as well as another not so handicapped. These trucks are so designed and constructed that there is no necessity for the operator to vacate his position on the operating platform, thus making it possible to so arrange the accommodation to conform to the specific requirements of the man in charge; by means of a suitable seat, men having lost a leg, or even two, would in time be able to manipulate one of these or similar trucks as well as anyone, the operation of the different control levers being the only physical exertion required.

It is in the adaptation of the automatic feature of factory facilities that will ultimately solve the most serious part of the returned soldier problem, especially in connection with the manufacturing industries.

## SCIENTIFIC AND INDUSTRIAL RESEARCH

MANY important matters came before the recent meeting of the Honorary Advisory Council of Scientific and Industrial Research.

A memorandum was forwarded to the Government urging immediate action to make available the varied fuel resources within the boundaries of the Dominion for the use of the people of Canada in the coming year and placing the services of the Research Council at the disposal of the Government to that end.

The council, at the request of the Institute of Civil Engineers of Great Britain, also took steps to bring before the Government and certain manufacturers of Canada the importance of Canada associating itself with the movement which has recently been organized in Great Britain, the United States and France, for combined action in connection with the standardization of various engineering products used and exported from these countries. This is a matter of great importance in connection with the building up of an export trade in this class of products by Canada at the close of the war. Connected with this the council is investigating a number of other questions which have been submitted to it, dealing with post-war conditions with which our Canadian industries will be brought face to face upon the declaration of peace.

It was decided also to approach the Canadian Manufacturers' Association on the question of the development of trade organizations for the promotion of research, etc., in connection with groups of industries, such organizations having been developed with most beneficial results in Great Britain and in the United States. Co-operation along these lines is of the highest importance if Canada is to be able to hold her own in the keen competition which will develop in foreign markets with the cessation of hostilities.

## PROGRESS OF THE STEEL INDUSTRY IN AUSTRALIA

[illegible] the following [illegible] of the steel industry in Australia:

[illegible] principal engineering developments at the annual meeting of the association held recently and stated: That quietly, but surely, a powerful steel industry was growing up in Australia. Not only was it expected that the Lithgow (100 miles from Sydney) and Newcastle (60 miles from Sydney) steel works would henceforth provide the whole of Australia's requirements of steel rails, but the time was not far distant when export might be possible.

### Scientific Aspects

Of yellow and white metal alloys, it was interesting to note the development along sound lines of the manufacture of rolled manganese, phosphor, and other bars, and that difficult business had not been undertaken without due recognition of the necessity for maintaining a laboratory for the scientific control of the processes. Considerable improvement was taking place everywhere in the extension and addition of modern foundry equipment, the capacity of which for large iron castings was now practically unlimited. For the more difficult work [illegible] there was also a most noticeable improvement and an increasing number of plants are being laid down.

The casting of steel rolling stock wheels is gradually developing to a satisfactory stage and it was generally understood that the establishment of another modern plant on extensive lines was contemplated in the near future at Newcastle. When it is remembered that there are now approximately 20,000 miles of railway in operation in Australia, it would be realized what possibilities there were for the local manufacture of rolling stock material.

### Engine Building

A better example of high-class workmanship could not be quoted than the manufacture of modern high speed steam [illegible] are now being successfully made. In the manufacture and export of agricultural machinery, harvesters particularly, quite a striking success has been achieved, and a considerable quantity exported to Argentina and elsewhere. The imperative call of the man on the land for a cheap and handy form of power to supplant hand or horse power has given manufacturers of internal combustion engines a great impetus. Before the war perhaps 10 [illegible] was imported. In ten years time the percentage will probably be reversed. Oil engines, from [illegible] farm unit [illegible] marine engines 150 horsepower are now being made. [illegible] only 15 per cent of the centrifugal pumps used were made locally. This figure is now believed to be 50 per cent. Refrigerating plant has for many years been made but it is worth noting that the largest compressor so far made here was recently completed by a local firm. In machine tools, woodworking machinery, rail and road tractors and cars, tin-making machinery, electric motors, capstans, boilers of every class, including water tube, further reminders are given that engineers are broadening their resources. Steam boilers which before the war could be manufactured and sold for approximately £32 to £10 per ton complete are now costing £70 to £100 per ton, due almost wholly to the fact that boiler plates are only procurable at from £50 to £80 per ton. If a modern steel plate rolling mill had been established locally it could be producing and selling them under present conditions at £14 per ton.

## THE EDUCATION OF THE ALIEN

Walter P. Miller*

THE problem of the foreigner in industry is one that needs to be carefully worked out by the employer to a proper conclusion without undue delay. The census of 1910 tells us that there are in the United States about three million adult non-English speaking aliens. All races are included in this survey, which represents Albanians, Armenians, Austro-Hungarians, Chinese, Danes, Finns, French, Germans, Greeks, Italians, Lithuanians, Magyars, Norwegians, Persians, and other nationalities.

Each immigrant group finds a settlement of its own here in our various settlement centers. The colonies do not fraternize with the English-speaking people, but conform to the customs and habits of their native lands. A knowledge of the English language would help to broaden the mental horizon of these people, would induce them to take an interest in things that are American, and would be a stepping stone toward the attainment of citizenship.

At the present time the foreigner is in demand in the industrial works of our country as he never has been before. The Ford motor works, employing an army of all nationalities, soon found it necessary to take steps to educate these foreigners, giving them an understanding of the English language in order to secure that degree of efficiency that was necessary to their business.

A little thought on the subject will make it unnecessary to reiterate the importance of an alien employee learning to speak English. It is to him an opportunity for better wages, because he can adapt himself intelligently to the work that he is given to do. It secures to him better protection from accidents, because he can read the signs and understand the word of warning that is spoken. His standards of living must necessarily keep progress with his educational advancement, and the holding of property is not a far cry to his ambition. We have, therefore, a better citizen, paying taxes, sending his children to school, a permanent resident of the community, identified with local organizations, and one who thinks of the place he lives in as home.

The solution of the problem of the foreigner can be worked out by no one more successfully than the employer, and the great need for the business man to appreciate how necessary it is for him to lend himself for the encouragement of the education of the foreigner.

If the business men in every community will take an active part in seeing that the foreigner is directed to such schools in his immediate neighborhood that can and will give him the necessary instruction, see that he attends regularly and that his interest is maintained, they will reap the reward of a better emcreased production with its logical sequence of less overhead expense and more profits to the business.

To the community we shall have added a loyal citizen who has detached himself from his racial group, swearing allegiance to but his adopted country, and, if necessary, giving to his adopted country even life itself, that his children may enjoy the blessings of peace and prosperity.

*Chairman of the Committee on Americanization, Philadelphia Chamber of Commerce.

## HEAVY FALLING OFF IN BUILDING PERMITS

BUILDING activity throughout the Dominion fell off sharply during the year just closed, according to figures compiled by *The Financial Post.* Figures from thirty-three cities, twenty-one in the east and twelve in the west, show a slump of nearly $5,000,000.

Toronto led in losses, with a decline of $2,718,921. Vancouver had a loss of $1,644,634. Montreal's loss amounted to nearly a million. There was a loss of nearly half a million in Ottawa, and of $351,746 in Windsor, these being the principal declines. Peterboro, with a gain of $825,463, heads the list of cities showing an advance over 1916. Altogether the cities under review showed a decline of $4,515,627.

The applications for permits in Montreal fell rapidly during the last three months, and although the totals had kept up fairly well during the earlier part of the year, the decline in the later part brought the total below 1916 by almost $1,000,000. As compared with the record year in the history of building operations in Montreal, 1913, the figures for 1917 were less than one-fifth, or $4,38[illegible] compared with $27,037, 297. In[illegible] must go back to the year 19[illegible] as low a level as last year, wh[illegible] was $3,651,164. The figures for the la[illegible] five years were as follows:

| | |
|---|---|
| 1917 | $ 4,387,638 |
| 1916 | 5,334,184 |
| 1915 | 7,486,271 |
| 1914 | 17,394,244 |
| 1913 | 27,037,297 |

Included in the total for 1917 was $1,234,881 for repairs, and $3,252, 757 for new construction.

# CANADA SHOULD BE ABLE TO DEVELOP GOOD TRADE WITH RUSSIA AFTER WAR

Special Interview

## Canadian Trade Commissioner at Petrograd Had Brought Together a Good Organization, but it Has Been Disrupted Owing to Conditions Following the War—Germany Had a Great Hold on Russian Trade.

## The Russian Peasant Has Quite a Mechanical Bent in His System, and Should Develop When Given the Chance to Do So—Conditions in Capital Not Good Now for Life or Business Either.

"HAD it not been for the breaking out of the revolution and the unfavorable conditions that accompanied the war Canadian trade in Russia would have gone ahead in leaps and bounds." That is the opinion of Mr. H. G. Pickard, Russian trade expert of the Massey-Harris Co. Mr. Pickard likes Russia; likes it so well that he wants to go back there as soon as conditions become a little more settled. "Life in Moscow or Petrograd is not the most pleasant thing at the present time," he stated when interviewed recently by CANADIAN MACHINERY. "I refer especially to conditions as they existed when I left Moscow less than two months ago. At that time there was no protection for the people. I have seen armed soldiers of the Bolsheviki stop a man on the street who happened to be wearing a good coat. They would simply take the coat. They enter the restaurants or places where people happen to congregate, hold them up, take what they want and depart. They can just as readily enter a man's home and do the same. thing. There is no use appealing for protection to the police, for the good and simple reason that there are no police to appeal to. Yet, in spite of all that, strange as it may seem, when I left Moscow I felt that I was leaving home and I want to go back. I like the country and I like the people."

Considering the conditions of traffic at present, Mr. Pickard was able to make an exceptionally good trip, it being just five weeks from the time he left Moscow until he arrived in Toronto, which city he left some ten years before in the interests of the Massey-Harris Co., seven of which have been spent in Russia.

### Knows the Country

Mr. Pickard had travelled in Ontario for the Massey-Harris Co. for some time before he went abroad. He is well informed concerning actual conditions in Russia. He knows the trade conditions, the people, their language and their customs. He has followed the trend of the various currents that in the end swelled into the tide that spelled revolution for Russia. He is not a pessimist regarding the future of the country. He has faith in the people themselves, and on this close acquaintance bases his opinion that there is going to be a good future for the development of the Russian trade. He views the present turmoil and uncertainty more in the light of a reaction from conditions of suppression that previously prevailed.

### Canada's Trade in Russia

"Was Canadian trade being developed satisfactorily with Russia before the war started?" inquired the representative.

"It was being handled remarkably well," replied Mr. Pickard. "The Canadian Government had a most capable man at Petrograd in the person of Mr. Just, who was in charge of the trade bureau at Petrograd. I presume he is in Moscow now, as it will probably be safer there than in Petrograd, but mail addressed to him in care of the Embassy will always be safe. I know of many cases where he has been the go-between for the customer in Russia and the manufacturer or producer in Canada. If we had not been up against war conditions the organization that he had worked out would have been the means of sending Canadian trade ahead by leaps and bounds.

### The German Monopoly

"The Russian people in recent years have been getting their eyes open to the fact that they can buy goods cheaper from other nations than they can from Germany, and also that the conditions surrounding the sales are better and fairer. But Germany has had a strangle hold on the trade of that country for a long time. Here's a case that will show it in a concrete way. Just about the time the war broke out I went out in company with Mr. Just, the Canadian Trade Commissioner. We visited a large retail and wholesale store in Petrograd that carried chiefly hardware and other similar lines. To be exact, they had cutlery, house trimmings, including knobs, locks and hinges, millwright tools, machinists' supplies of all kinds, and the other lines that are usually carried in such a place. This was not a small store, but a place that would give employment to at least a thousand hands. The manager was very anxious to show us exactly what he had. It is a matter of absolute fact," continued Mr. Pickard, "that fully 95 per cent. of the entire stock in the store was 'Made in Germany' output. The only things I remembered seeing to break the monotony were some Starrett tools and Yale locks from these United States firms. That is a fair indication of the German influence in Russia, and what the markets of that country have meant to the industrial life of Germany."

### Making a Start

"What success had been met in bringing Canadian goods into the Russian market to compete with the product of Germany?" was a further inquiry.

"A good start was being made, and I am firmly convinced that there were good prospects of success," replied Mr. Pickard. "You see, it is this way, the trade conditions are entirely dependent on the transportation, and even at their best these facilities in Russia are poor. Recently the bulk of trade has entered Russia at Vladivostock. The line leaving there runs as a single track. It is safe to say that it takes three months for a car of goods to go from there to Moscow. In broken lots the time taken for that trip would be much longer, as much as six months at times. It is quite within reason to place the time that it takes a shipment to go from a Canadian point to Moscow at well on for a year. The congestion at Vladivostock just now is almost past description. Everything is piled up there. I have heard men who know the conditions trying to figure out just how much war material is piled up there, but a person can't grasp the confusion into which the shipping trade at this great Russian port has fallen. Much the same thing will apply to Archangel, the only difference being that there is not as much material coming in at that northern point to get piled up. Archangel is open for trade from about the first week in May until the end of October. That is where the ice-breakers are operating that Russia bought from the Canadian Government.

### The Same All Through

"What applies to these two great Russian ports applies to Russian railroads all through. There is not a single inch of space that is not used on every train that now runs. On one trip I made of considerably over one hundred miles six of us had to stand packed in a small toilet department. A person going on a long journey in Russia just now has to put up with all sorts of inconveniences, some of them being of a most disagreeable nature. I found it necessary to leave all my personal belongings behind when I came from Moscow, as there was no chance at all to find space for them on any of the trains. The rolling stock of the railroads is almost done for. The country just now can neither manufacture or repair the engines or cars. I know of one round house where on an average of twenty locomotives used to be handled every month and made fit for

[illegible] Now that [illegible] turn out more than one a month, and the work is of a very different sort. The car windows are nearly all broken, and there is a general rundown, some to [illegible] appearance over the whole system. Roving bands of soldiers seem to think that they have a preference in anything, and they apply this to the trains as they do to everything else. Travelling in Russia just now is not altogether a pleasure jaunt," laughed Mr. Pickard.

### Russians as Mechanics

Although little has been heard of the Russian as a mechanic, Mr. Pickard sees no reason why the people there should not develop in this line were the opportunity for so doing given to them. When asked if the Russian peasant, with proper training, would make an acceptable mechanic, and if this would have any bearing on the future of the country and tend to make Russia an industrial nation, he said:

"Well, our binder is quite a machine for a man to put together who has never seen one," he replied, "and yet I know of cases where Russian peasants, unused to machinery of any sort, have done the trick, and arrived at the result desired. True, they may not have taken the proper or the easiest way, but the peasant has a great knack of sticking with a job like that until he gets it right. That is one thing that would cause me to think that the people there might develop into a great nation were they given the chance and the scope in which to work. Again, go into the Russian universities, and you will find that the students there are trained technically as well as in this country, if not better; but the great trouble is that they have not much of a chance to apply their training. It's a little bit hard for the people of Canada to get a correct idea of what the people of Russia really are. We don't get the best of them in Canada. There are some, in fact, quite a number of Russians who are anxious to get out of the country for various reasons. A man who does so without first securing his passport cannot hope to go back.

### A Wonderful System

"The Russians really have a wonderful system of keeping track of every person who enters their country. This is not exactly along the matter of trade," remarked Mr. Pickard, "but it will show Canadians a condition that is hard for them to realize. There are many political prisoners in Russia. It requires only a very small offence to put a man in the category of a political prisoner there. It is not possible, as it is in this land, to refer to a government official as a 'pinhead.' The one great crime there can be summed up in 'Speaking against the government.' Arrest follows. A trial [illegible] a week, a month, or in a year. The term 'political prisoner,' of which you read so much, does not necessarily indicate that the prisoner is a dangerous man or a bad one. At every station you find the gendarmes, and they listen to conversation, to the remarks of travellers, to everything they can hear. It is a splendid policy in that land to keep your opinion to yourself, especially if they are not favorable to the government. When Kerensky came into power he attempted to do away with a lot of this. He set about to liberate all the political prisoners. It was never intended that the criminal class should get their freedom. But in the confusion that followed the revolution it was simply turned into a wholesale jail delivery. Criminals, etc., at once climbed into the category of political offenders, and when the jails were opened out they came, and the wave of crime that swept over the country following this is now a matter of history."

### German Trade Methods

According to Mr. Pickard, Germany had a wonderful system of following up her industrial expansion with her banking facilities. "As soon as a German industry had found or developed a new avenue for business, immediate assistance would be given from the German banking firms, encouraged and aided by the Government. This worked out especially well in the matter of taking care of collections. It is well known in Russia, probably not here, that a number of the big banking houses there are really German institutions doing business under Russian names. United States has been taking steps to help her business interests there by opening up branch banks. Not long ago the National City Bank opened an office in Petrograd, and later on a branch in Moscow, the idea being to make it easier for American trade to be developed and financed there. German methods of doing business did not bring much favor with many of the Russian people. There was a feeling all the time that the German was getting the Russian country piecemeal and the Russian people resented it. This was the cause for the popularity of the war at the outset. There were other reasons as well, but the chief one seemed to be summed up in the words that Russia was anxious to get a 'crack at the German.'"

### The Natural Resources

"Has Russia the natural resources that would make her a great manufacturing country in case the opportunity presented?" was then asked.

"Undoubtedly she has," replied Mr. Pickard. "Russia has coal, oil, minerals, timber—in short, Russia has everything, but there has been no serious development. The mines are worked largely by foreigners. The Belgians and the French are interested largely in the steel and metal trades. Before the outbreak of the war a movement was beginning to take form in Russia that sought to develop the industrial side of her life. The party were advocating a certain form of protection for the industries that would establish their works in Russia. Their programme included the granting of sites and certain concessions, but, of course, the war cut this short. Tariffs in Russia have gone up tremendously since the start of the war. On some lines the start would be at 10 per cent., and from that working up to as high as 50 per cent. Railroad rates have gone up 100 per cent. since the start of the war. But it will take years and years, even under the most favorable circumstances, for Russia to arrive at the stage where she will be sufficiently of a manufacturing nation to supply her own wants."

### Can't Repudiate Debts

Nor does Mr. Pickard believe that Russia will repudiate her obligations, as announced by the Bolshevik Government. "The Russian business world, sooner or later will have to go into the markets of the world again if they intend to do business. If this mad idea of debt repudiation were successful, no firm, corporation or nation would want to do a cent's worth of business with Russia. For her own protection she will have to discharge her obligations. The amount of the debt looked so big to the Bolshevik Government when it came into power that they could see no way out. They simply said, 'We can never pay this. It's too great.' To the present Russian mind Socialism means freedom, the getting of what they want without paying for it. But to the Russian mind this cannot appeal permanently, for there is an inherent honesty in the great peasant body. In all my experience with them I never lost anything.

### The Haggling Method

"The Russian ruble has dropped and dropped, but that does not affect buying and selling very much. Of course goods are away up now. I paid $40 for a pair of shoes shortly before I left Moscow. In ordinary times you can purchase the standard makes of American shoes there for about $10. The whole trading is done on the old system of beating a bargain. Go into a store and the keeper sizes you up. If you look well to do he will shove on the price. The customer who is experienced will admire the goods, then throw them down and walk out of the store on the pretext that the price is away too high. Nearly every time the dealer will beat you to the door, and a big reduction in the price will result. The same thing applies to the hiring of a cab. Start making a bargain for a ride and you will soon have half a dozen drivers. The result is that you will ride much cheaper than if you had accepted the terms of the first man. Since the war prices of foodstuffs have increased enormously, but wages have also gone up to a considerable extent.

### The Political Parties

Mr. Pickard is doubtful if there will ever be a return to a monarchy in Russia. The great mass of people seem determined on one thing, and that is that the fruits of the revolution shall not be lost to them.

"The terms that describe the different factions in Russia just now are not nearly as confusing as they may seem. The word 'Bolshevik' (although Mr. Pickard says the proper spelling would make it 'Bolshevick') means a man with a large or a great idea. It really is used by way of comparing large with something smaller. The first part of it is 'bolshoe,'

meaning in Russian, large, extreme, or great, and the 'vick' or 'vik' termination simply puts it in the masculine sex. He is simply an extreme Socialist. The Bolshevik have a very large following all over the country. They are especially strong among the working classes. They are found in the army. In fact they have simply carried their ideas from civil and industrial life into the army with them, and that's where a great deal of the trouble has come in from the ranks. Against this faction is lined up what can be termed the 'Menshiviks.' They have ideas that are far less radical and dangerous than the Bolsheviks. When the Constituent Assembly was called in Petrograd it was found that the Mensheviks had 273 members against a showing of 140 Bolsheviks. But the Bolshevik section had the arms with them, and a man with a gun is a great power in Russia just now."

Mr. Pickard has seen Kerensky on several occasions. He did not impress him as a man who was big enough for the job he undertook to handle. He is not likely to come to the top again, although it is possible he may be heard from in a minor capacity in some future government.

### A Good Place to Leave

"Everything was done by the card system in the cities of Russian long before I left there," said Mr. Pickard in conclusion. "Street fighting was not at all uncommon. In fact it got to be more of a matter of routine than exception. Armored motor cars were seen in action in the streets. The troops simply went mad. Very few people ventured out after eight in the evening. The daily allowance of bread was 3½ ounces. It was made of rye, wheat, oats and barley, with the husks and all ground in with it. It looked for all the world like a straw ball. The allowance of butter is ¼ of a pound every third week. Meat is served in small quantities only twice a week. The cattle have been so poorly fed that the meat is of very poor quality. You can get nothing without a card. But in spite of all that I want to go back to Russia. I would like to make my home in Moscow. It may seem strange," said Mr. Pickard, "but it's a fact that I am homesick for Russia. I like the land and I like the people."

## PULP AND PAPER SITUATION IN AUSTRALIA

B. MILLIN, Canadian commercial agent for New South Wales, reports as follows in regard to the pulp and paper situation in Australia.

### Shortage of Paper

The annual conference of the New South Wales County Press Association was recently held in Sydney and the question of future paper supplies was earnestly discussed. During the conference it was stated that the normal consumption of paper for newspapers in Australia was about 100,000 tons per annum. During the first year of the war the quantity imported was 70,000 tons; in the second it was 60,000 tons; last year it was 50,000 tons, and now newspaper proprietors are faced with a notification from the Commonwealth Government that it could not undertake to bring into Australia more than 25,000 tons after January 1. In the open market in Sydney, with an importation of 50,000 tons per annum, the price would be about £50 per ton. With a cutting down to 25,000 tons the trouble was going to be more acute. The association buys paper collectively, and had it not been that it was able last year to obtain some extra supplies at least 100 papers in this state would be out of print. A deputation from the association waited on the Premier of this state and he spoke of the encouraging prospects of manufacturing paper. In the adjoining state of North Queensland paper pulp was being produced from blady grass which it is estimated can be manufactured for £7 per ton. It is also stated that pulp costs 75 per cent. of the cost of paper, consequently paper could be produced at about £10 per ton. Add the freight from Queensland to Sydney £3 per ton and the total cost of the paper will be £13 per ton.

### Manufacture of Paper Pulp

Paper pulp is manufactured only at one place in the Commonwealth and that is at Cairns, Queensland. The works have been established within the last few years and are mainly experimental. The production so far has not been very large and the raw material used is blady grass and the plant known as *sida retusa*. Experiments have also been carried out with several other materials.

The Commonwealth Advisory Council of Science and Industry has collected much information on the subject, and states that the present supply of raw materials is very inadequate for the development of the industry to a point which would render Australia self-supporting in the matter of paper, and that it appears clear that the only possibility of reaching this point is by growing some crop for the special purpose of manufacturing paper pulp from it. Of possible crops esparto grass and soft woods appear to be the only ones worthy of consideration, and it is doubtful whether under Australian conditions esparto grass could be harvested sufficiently cheaply to make its cultivation a paying proposition.

A scheme has been suggested for growing timber for pulping in the cold and mountainous districts where there is a plentiful supply of water available for mill purposes. Spruce and poplar are the timbers mentioned and it is estimated that the material would not be available for fifteen years.

### Government Assistance to Manufacturers

A minister of the Commonwealth Government recently stated that all efforts to make paper from Australian wood pulp had failed, and that as no claim had been made for a bounty on production it would be useless at present to earmark money for that purpose. The money which would have been allocated for the payment of the bounty was being utilized in carrying out experiments in paper-making at the Government Science Bureau. It is hoped that the experiments will eventually lead to the development of the paper-making industry. The difficulty with Australian woods is that they are too resinous. Chemists are now endeavoring to extract those restrictive qualities from the wood and as soon as they become successful the government would give practical encouragement to the industry.

On the other hand the acting premier of the State of New South Wales was more hopeful and stated that experiments are being conducted in the manufacture of paper and that they have been eminently satisfactory up to the present. Although the State is a large user of paper there is no intention at present of establishing a paper mill.

## TRADE OPENINGS WITH ITALY

W. McL. CLARKE, Canadian Trade Commissioner at Milan, Italy, reports that inquiries being continually received indicating that many important firms in Italy are turning their attention to Canada as a new or larger source of supply for the varied needs of this market, both now and after the war. The products thus far inquired for are enumerated herewith. The names and addresses of the inquirers may be obtained on application to the Commercial Intelligence Branch of the Department of Trade and Commerce. (Refer Trade Inquiries Branch.)

### Chemicals

Bichromate of potash and soda, caustic soda, soda ash, silicate of soda, sal-ammoniac, sulphate of soda, acetic acid, sulphate of copper, nickel salts, cobalt salts.

### Machinery

Agricultural, wood working, metal working, shipbuilding.

### Metals and Minerals

Corundum, mica, asbestos, pig-iron, nickel, cobalt.

### Miscellaneous

Auxiliary machinery used in ship building and engineering trades, steel plates and sections for shipbuilding high-speed steel, shafts for steamers, railway and tramway points and crossings, mineral oils, pumps, railway supplies, motors, wood-pulp, agricultural instruments, transformers, dynamos, turbines, electrical motors, electrical cable, marine oil engines, wrenches, pliers, mandrels, helices, chisels of high-speed steel, electrodes, castings and rolled steel, drums and discs for steam turbines, machine tools, files, screws, saws for wood and metal, carpenters' planes, hardware, drills.

# PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

## HANDLING THE LARGER SIZED SHELLS.

By M. H. Potter.

One of the most requisites in efficient quantity production is an adequate handling system. A well-balanced production system is of little avail if the shop transportation factor is lost sight of.

It has been the writer's experience in the manufacture of the larger (6 in. or over) shells, that one of the most important minor details is the combating and overcoming of the congestion of shells in the shop. As production increases this factor becomes of more importance and should therefore be taken into consideration at the outset and the necessary transportation facilities be provided at the time when the machine tools are set up.

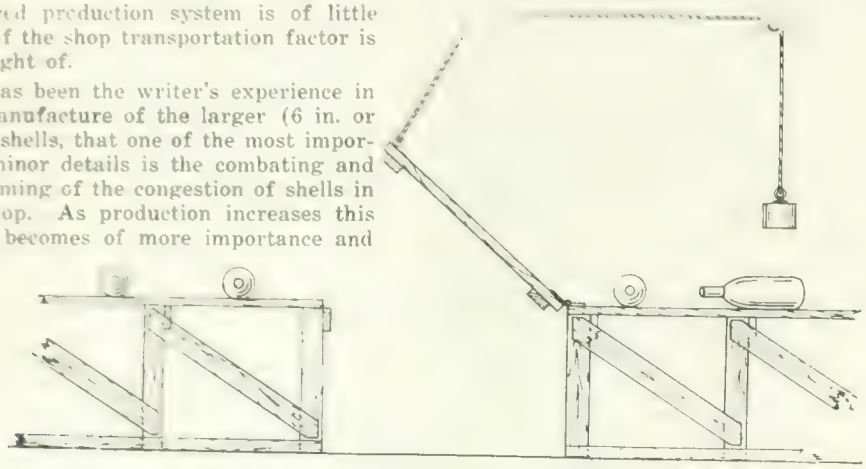


FIG. 1. BENCH SYSTEM

The bench system as shown in Fig. 1 is the only satisfactory way, although the trucking system is very suitable for the smaller shells. These benches should be wide enough to allow two shells to be rolled past each other and also permit a double row of shells to stand in the centre. They can be made up in sections and bolted together in place. Whenever it is necessary to cross the main aisle of the shop, a bridge as shown should be built. Steps can be built to permit of crossing the benches elsewhere if necessary.

The simple device shown in Fig. 2, facilitates the rolling of shells along the bench. It consists of a hard piece of wood with a piece of pipe driven over the small end.

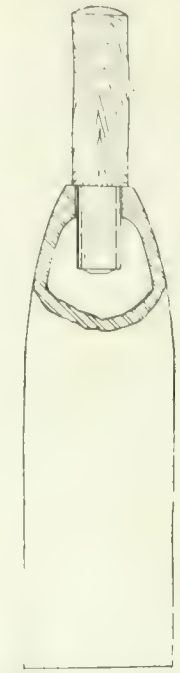


FIG. 2. SHELL HANDLE

Shell manufacture frequently involves the employment of female labor, and necessitates therefore, an increased number of operations, in order to make each operation as simple as possible. As a result an efficient and well managed transportation department is essential. The managing of this work is no small job and should be intrusted to some one who is familiar with the employment and handling of the lower class of help.

The duties of the operators running the various machines consist of what the name implies. Likewise the inspectors or the tool setters. They must be operators, inspectors or tool setters and nothing else. That is if they are to be efficient and produce the maximum amount of work.

A clerk must be employed to keep account of the heat numbers of the shells in order to properly arrange the series for preliminary inspection. He should have a definite alloted number of laborers working under him. The special truck shown in Fig. 3 is adapted for

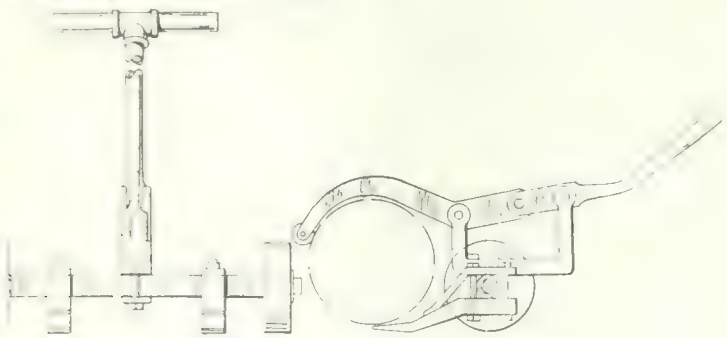


FIG. 3. SHELL TRUCK

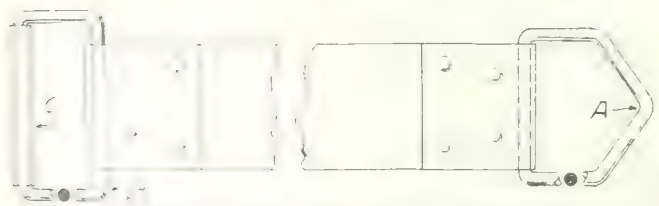



FIG. 4. SLING. THE HOOK A IS PASSED THROUGH THE NARROWER HOOK B.

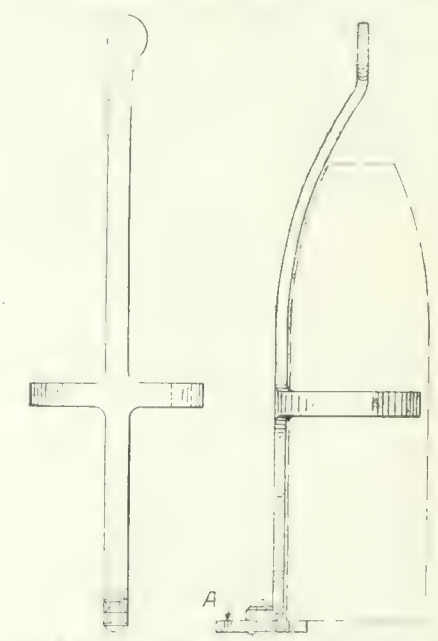



FIG. 5. SHELL SLING. THE HOOK A IS TURNED SIDEWAYS IN PLACING SLING OVER SHELL.

handling the forgings or shells along the floor. Its main use is after nosing in, when the shells are placed on the forge room floor to cool.

The other devices shown lend themselves to quick and easy manipulation, and can be depended upon. Fig. 4 when properly fitted to the inside contour of the shell can be used after a number of different operations. It may be used after the nose has been threaded without injury to the threads.

Hydraulic lifts were used to take the shells from the bench to their place in and from the machine. Whenever possible (single purpose open end machines were used) the shells were rolled along the bench and directly into the chuck.

If the system as here outlined is properly installed and worked out as an independent department similarly to the inspection or any other department, the results obtained would give a greater output, and a shop free from confusion and congestion. True, there will be times when certain operations may be held up or drag behind the others but this will be readily overcome by the transportation department.

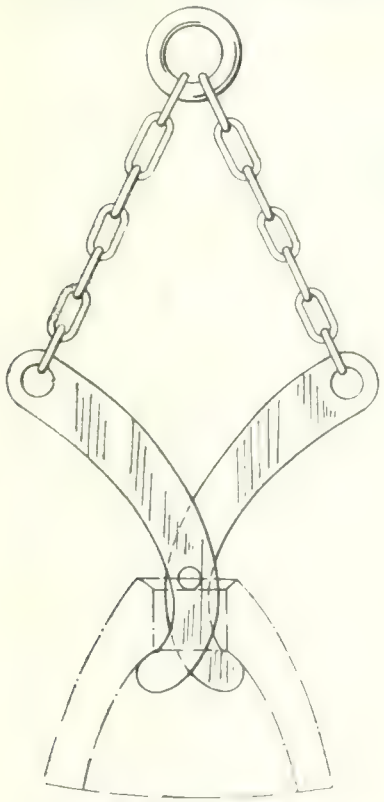


FIG. 4. SHELL TONGS

The problem of removing the chips and cuttings was handled by this department also.

## ROUGH TURNING SHELL DRIVER

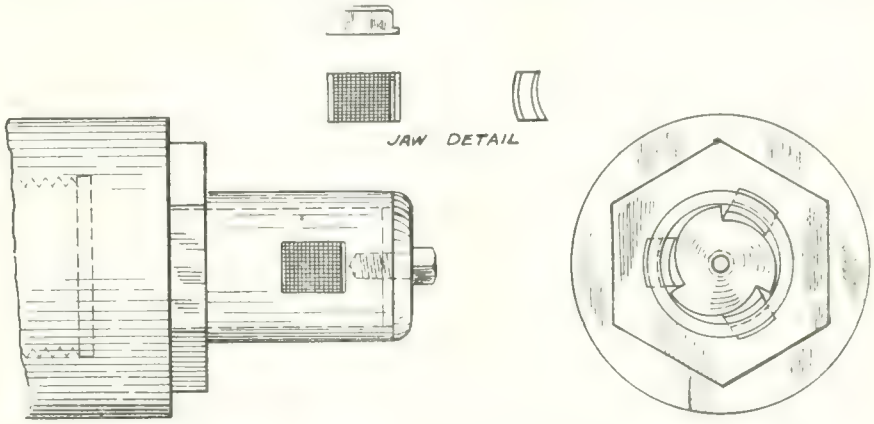
By H. A. W.

CONSIDERABLE difficulty has been experienced by shell makers, particularly those machining high explosive shells, in getting a cheap, efficient, and long-lived driver for the rough turning operation. The accompanying cut shows a sinple device which has been used on 4.5 in. British howitzer shells with marked success for over two years. In the rough-turning operation it is necessary for the driver to perform the dual function of driving and at the same time revolving the shell true with the rough bore of the forging, so that after the operation is completed the walls of the shell are of a uniform thickness on all sides.

Expanding mandrels, which support the shell independently of the tail center have been tried, but owing to the excessive overhang have shown a tendency to spring and thereby produce inaccurate work.

The short driver shown gives all the driving power necessary and centres the open end of the shell. The base end of the shell is centred so that with the aid of a tail center the shell is revolved true with the center hole of the forging. The end view shows how a three point cam is milled, and the deeper the cut taken by the tool the harder the little internal expanding jaws grip the shell.

The cam, the jaws, and the jaw-holder are all made of carbon tool steel and hardened. The jaws are serrated in such a way as to have a tendency to dig into the forging as the cut gets heavier. The jaws are kept from falling out of the fixture by small flanges on each end. No springs are used to withdraw the jaws from the work or to keep the jaws well into the fixture to enable a shell to be placed on the driver. The front ends of the jaws are bevelled so as to allow the shell to be easily placed in position. Originally a piece of spring wire passing through grooves in the jaws was used, but this was discontinued, and the flanged jaw adopted.




DETAIL OF AUTOMATIC SHELL ARBOR.

The end of the fixture is protected by a cast iron washer held in place by a cap screw. Once a day this is removed and the small chips and dirt removed. A small quantity of heavy oil or cup grease is placed inside to lubricate the moving parts.

The back of the jaw-holder is flanged and the flange milled, giving six flat sides, which ensures the easy release of a shell should it for any unforeseen reason get seized. It is rarely that a shell seizes after the fixture has machined five hundred shells. Once in a while a shell in the first five hundred is released through the medium of a wrench on the jaw-holder. After the fixture has been worked in, all shells can be removed by hand. This fixture enables an operator to speed up production and run more than one machine.

## GRIPPING AND DRIVING METHODS FOR LATHE WORK—II

By E. Scriber

Arbors in the machine shop are one of the indispensables and many varieties of the same are in evidence although nothing has been found which supplants to any great extent the ordinary strait arbor that is slightly tapered for driving purposes and while there is some objection to driving an arbor in and out of a hole with a hammer the arbor press has done much to remove this objection. The strait arbor needs no extended description here, the expanding arbor was described in Fig. 6, and a group of arbors made for various purposes are shown in Fig 7.

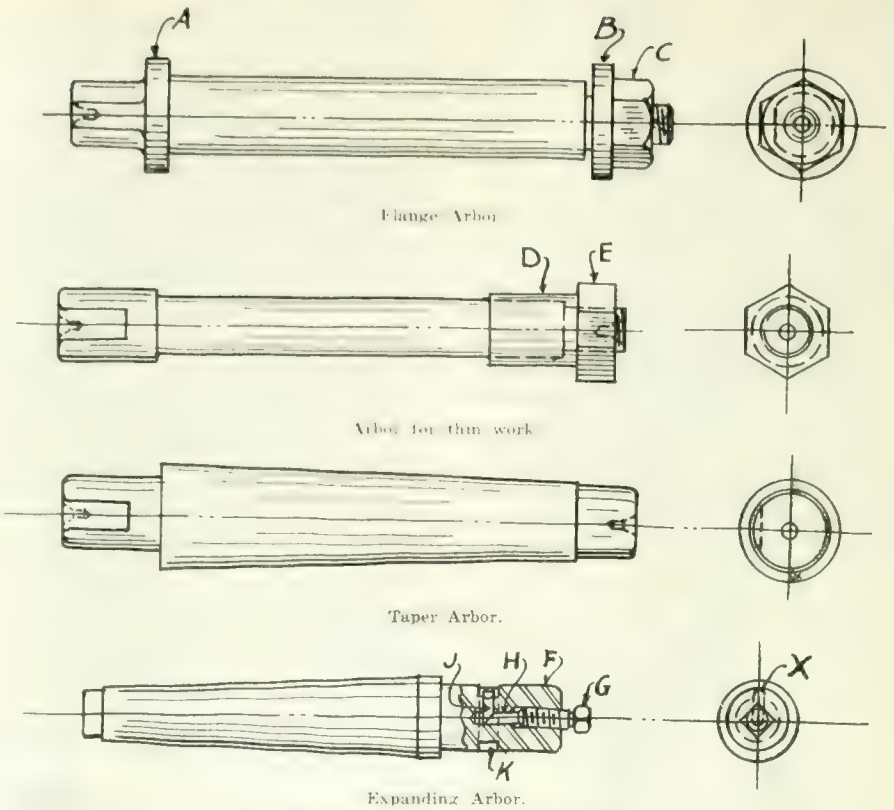
The first of these is known as a flange arbor and is often used for turning or milling a number of thin pieces; this is made a slip fit in the hole of the work and the pieces be they one or more are gripped between the flange A and the washer B, while the nut C is of course used for tightening purposes. If it sometimes happens that work is to be machined where some portion of the work is but slightly larger than the diameter in the hole of the work in it, such as flattening squares and turning thin bushings. An arbor suitable for handling such work without interference is shown below the flange arbor and is used in the same manner except that a sleeve D which is turned down so the tool or cutter will not strike it in machining is provided. On this arbor is shown a thin nut E for tightening purposes. The advantage in using a thin nut is that fewer turns are necessary to bring [illegible] of the thread, saving somewhat in time where a number of parts are handled.

The third illustration in Fig 7 shows a tapered arbor; [illegible] type depending on the taper for driving purposes. In the lower view of Fig 7. an arbor that fits into the headstock of the machine is shown, the work is slipped over the portion F until it comes against the shoulder, when by tightening the screw G which pushes in a pin H this in turn forces the pin J up; the top of this pin J is beveled off at X and this bevel causes the ring K to expand and

...ing the work in the hole. In making this arbor the ring is hardened and ...ing tempered which causes it to close in when the screw is released. In assembling the ring on the arbor it is ...ing into position in the ...

Two other arbors which grip the work in the hole are shown in Fig. 8. The first is a ... roll grip arbor, holds the work by forcing a roll. A wedge ... between the ... and a hardened plate B. The ... is pushed up against the shoulder ... and the ring D, held in place by screws, keeps the tool in position. This arbor is placed between centers on the lathe and is driven by a dog in the usual manner.

A plain expanding arbor was shown in Fig. 6 and an expanding arbor of a more complicated type is illustrated in the lower view of Fig. 8. This arbor is placed between centers in the usual manner although the construction is one which permits of its use in a lathe spindle or chuck. Likewise the roll grip arbor may be so used. In using this arbor a steel ring E ... is made to fit on the arbor. This ring comes against the shoulder at X, the work is slipped over the bushing F until it is snug up against the ring, the bushing is then forced up the taper by ... of the nut G; this expands the bushing which is split and securely grips the work.




Flange Arbor.

Arbor for thin work.

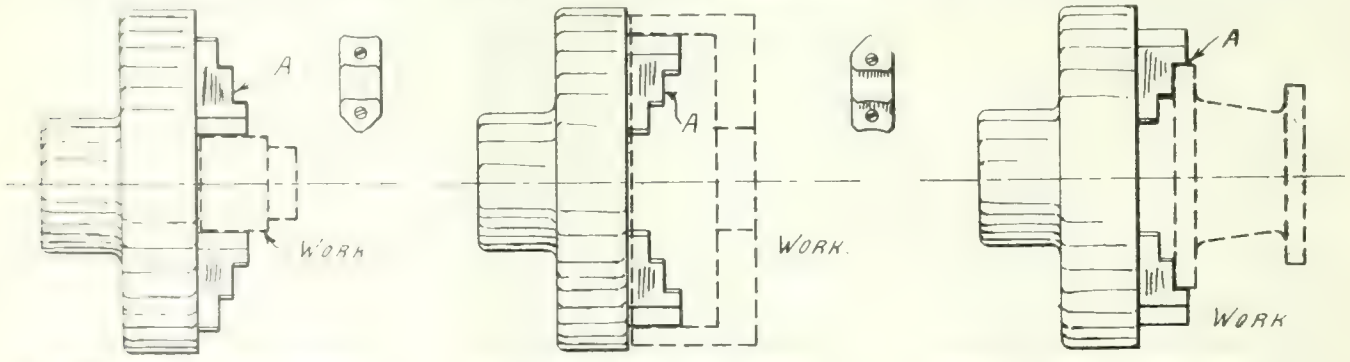
Taper Arbor.

Expanding Arbor.

FIG. 7. VARIOUS TYPES OF ARBORS

After completing the operations on the work the nut G is released; when by driving a wedge H in this forces the ring E back which in turn pushes the work off the arbor. When the work is removed the wedge is of course slipped back and the ring returned to its original position. With this driving arbor the work is always located in the same position; this is an advantage when turning to a shoulder, facing to length, grooving etc. The pin J prevents the wedge from dropping out of the arbor, the elongated slot in the wedge permitting the same to be driven in or out sufficient to force the work off the arbor.

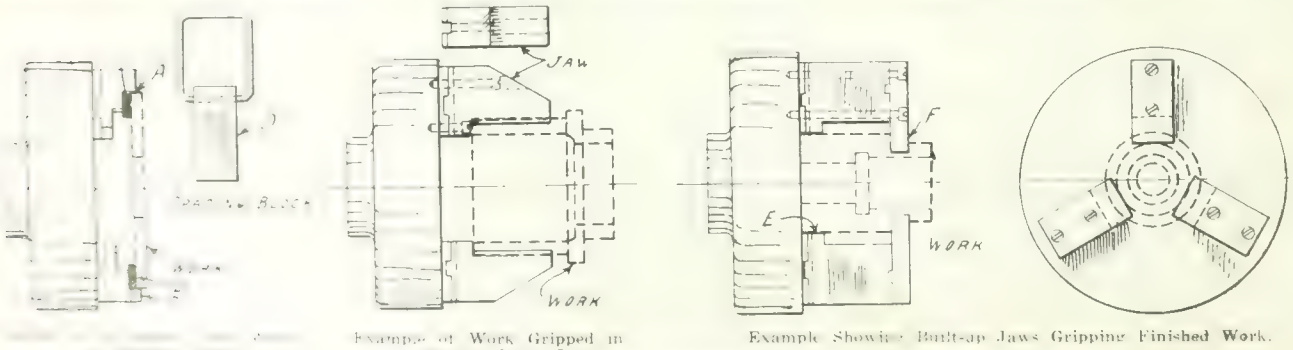
Perhaps the most varied of lathe driving methods apart from special fixtures are the various methods of holding and driving work by means of chuck jaws. No attempt could be made here to include all of the various methods which exist for this purpose and in fact, this would not be desirable, but a number of examples showing the general run of chuck jaws are illustrated. Referring to Fig 9, the upper left hand view shows a standard chuck jaw gripping a piece of work by the outside diameter, the illustration to the right of this shows the same jaw reversed, gripping a large casting inside or under the rim; the lower view in this illustration likewise shows the same set of jaws gripping on the periphery of a casting, using the step of the jaws designated as A in all the views.




... Outside of Small Diameter

Gripping Inside on Large Diameter

Gripping Outside on Large Diameter

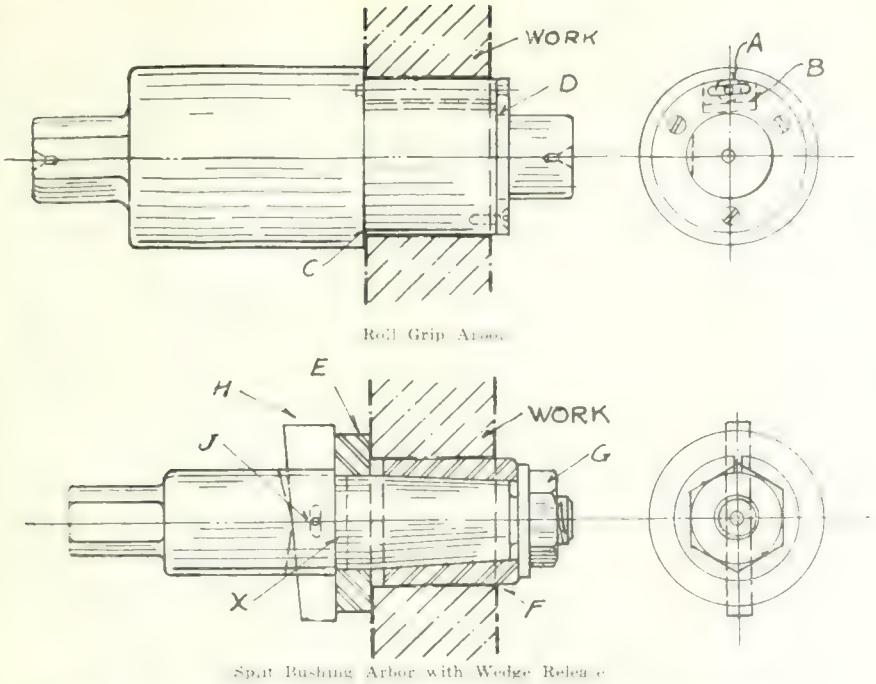



... Jaws

Example of Work Gripped in Special Long Jaws

Example Showing Built-up Jaws Gripping Finished Work.

FIG. 10 ... AWS AND CHUCKING ARRANGEMENTS FOR VARIOUS KINDS OF WORK




Roll Grip Arbor.

Split Bushing Arbor with Wedge Release

FIG. 9. TWO HANDY LATHE ARBORS HAVING DISTINCTIVE FEATURES

These illustrations show quite clearly the adaptability of this type of jaw.

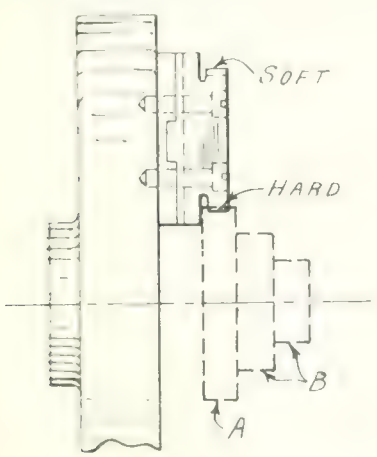
The same set of standard jaws used for gripping thin work are also shown in the upper left hand view of Fig. 10. Here also the step A is used for gripping but as it is necessary, in machining this piece, to face the side of the work B which under ordinary conditions would come below the face of the jaws at C, three spacing blocks D are provided. These blocks have a hole drilled through them and a wire is put through these holes, by means of which the blocks are hooked over the jaws in the manner shown. In putting the work into the jaws it is held back against these blocks, thereby being trued up and held out the correct distance to permit of squaring up. Above the chuck a detail of the spacing block is shown.

The upper right hand view of Fig. 10 shows a set of chuck jaws which might be termed extension jaws; these jaws are used in the same manner as those just described, being simply made long to get a good grip on the work. In the lower view of Fig 10 a set of built up jaws are shown. The manner of using these jaws is obvious as they are used for gripping work which has been finished on the outside while the hole is being machined. These jaws are made in two pieces, the surface next to the chuck E being bored out a few thousandths large so it will just centralize the work at that end while the end F grips the work tight and does the driving.

When using chuck jaws for manufacturing purposes it is often advantageous to make a special set of jaws and keep these jaws for one particular job, by so doing, the jaws may be bored out to conform to the diameters which they are to grip, thereby making them grip the work the full width of the jaws and not at one or two points as is the case where the radius of the jaws does not conform to the radius of the work. By this it is meant that if the work is smaller than the bore of the jaws it will be gripped in the center of the jaws only, while if the work is larger than the bore of the jaws it will be gripped on the edges of the jaws.

A set of jaws made with this in view are illustrated in Fig. 11; these jaws are made double ended and one end is hardened while the other end is left soft, the hardened is scored and grips the rough diameter A, while the two diameters B are machined. After machining these diameters the jaws are reversed on the chuck and the soft end of the jaws is used for gripping on the finished diameter D, while the diameter E is turned. Other operations on this piece might consist of boring, facing, reaming, etc., although these are not included in the description.

Another type of special jaw is shown in Fig. 12. This jaw A is beveled at B. The purpose of this is to cause the work to be wedged back against the surface C while gripping; this makes a more secure grip where the work overhangs the jaws considerably as in this instance. The operations performed on this piece consist of boring the hole, turning the outside up to the shoulder and cutting the piece off into rings and the flange X is simply cast on the piect for gripping purposes. An example of chuck jaws gripping on a pulley hub and another example of chuck jaws gripping under the rim of a gear are shown in Fig 13. The jaws which grip the pulley on the hub are extended out so that a facing tool may square up the flange of the pulley at A and the manner of holding the work is obvious in this instance. Referring to the jaws which grip the gear these are made to grip under the rim and the surface B is used to back up the work. The advantage in gripping under the rim on this gear is that the outside is thus turned fairly true with the under side of the rim and as the hole in the gear is bored and the hubs turned the gear is much more apt to run in balance than would be the case if it were gripped on the hub when machining. Gripping on a small hub and turning large diameters magnifies errors in the hub or, in other words, if the hub is out of true with the outside in the casting the outside will be turned true with the hub but the sur-



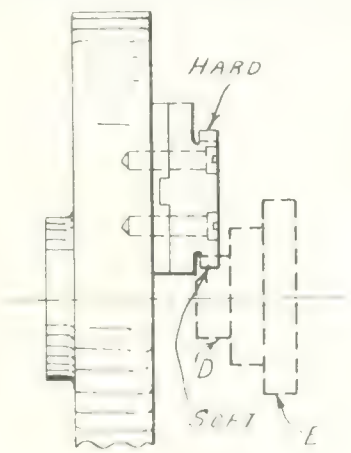
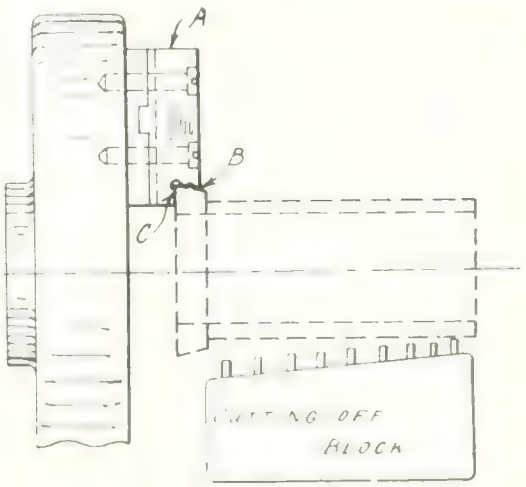
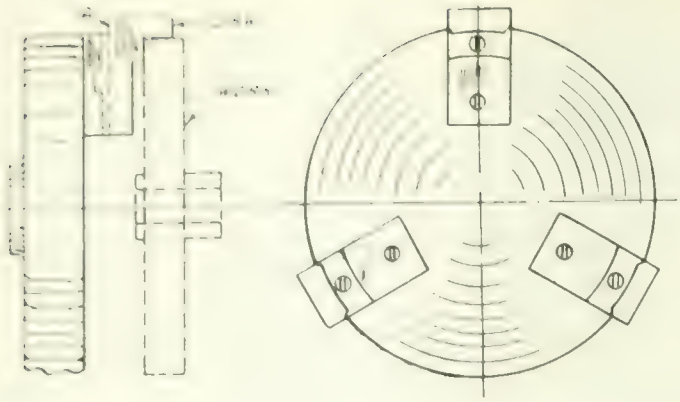




FIG. 11. SPECIAL JAWS GRIPPING ON ROUGH AND FINISHED DIAMETERS USING HARD AND SOFT ENDS OF SAME




METHOD OF HOLDING CASTINGS WHILE TURNING AND FACING



Gripping Hub of Pulley. FIG. 13. Gripping Under Rim of Gear.

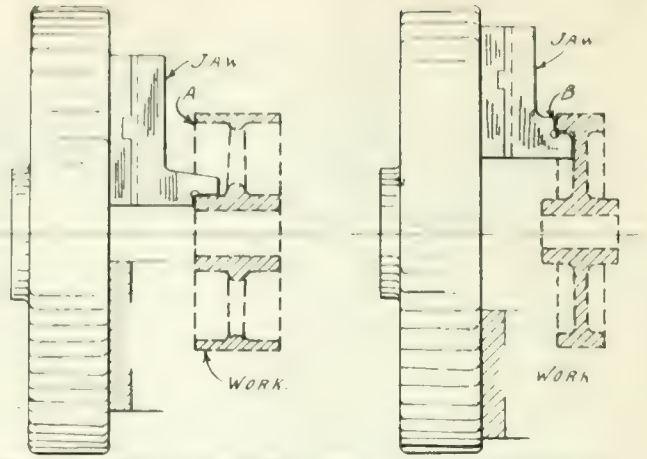



FIG. 14. METHOD OF GRIPPING WORK TOO LARGE FOR CHUCK.

face under the rim will be out of true with the hub and the outside, this leaves the rim thin on one side and makes a bad job.

Fig. 14 illustrates a set of chuck jaws designed for gripping work slightly larger than the normal capacity of the chuck. In this instance it will be noted that the jaws extend beyond the chuck at A and the jaws will therefore, grip the outside diameter of work somewhat larger than the chuck.

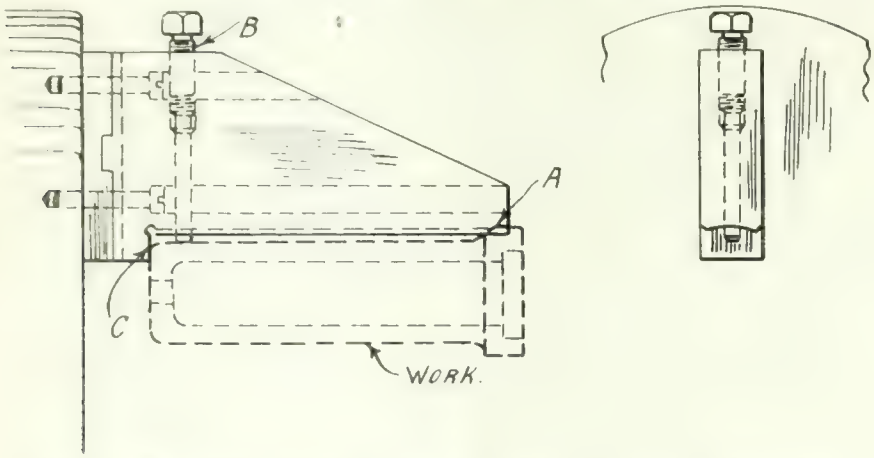



FIG. 15. METHOD OF GRIPPING LONG WORK IN TWO PLACES BY LONG JAWS.

A set of chuck jaws for gripping extra long work having two diameters are shown by Fig 15. These jaws are constructed so as to grip the work at A while the screws B are used for supporting the work at the end near the chuck. The work is located in position by means of the back edge of the jaw C. A set of three cast iron chuck jaws built up to handle the work shown in position Fig 16., have six spring pins in them to aid in holding the same when gripping, and the construction of these jaws is as follows; the main portion of the jaws A are cast iron and these jaws have hardened steel plates B set on them. These hardened steel plates are bored out and grip on the surface C. This surface is not long enough to effectively grip the work although they are used for driving the same, therefore after gripping the work between these plates just tight enough to hold it is trued up in the chuck and the six spring pins D are set up in contact with the work and locked there by means of the screws E, and beveled shoes F in the usual manner. With the work running true and all spring pins in contact the jaws are now set up tight and thus securely holding the work true and driving the same while boring and facing. A detail of the spring pin is shown in the lower left hand corner of this illustration.

Various modification of this design are used to good advantage, and the use of spring pins and screws in chuck jaw design can often be made to do work which would otherwise require an expensive special fixture.

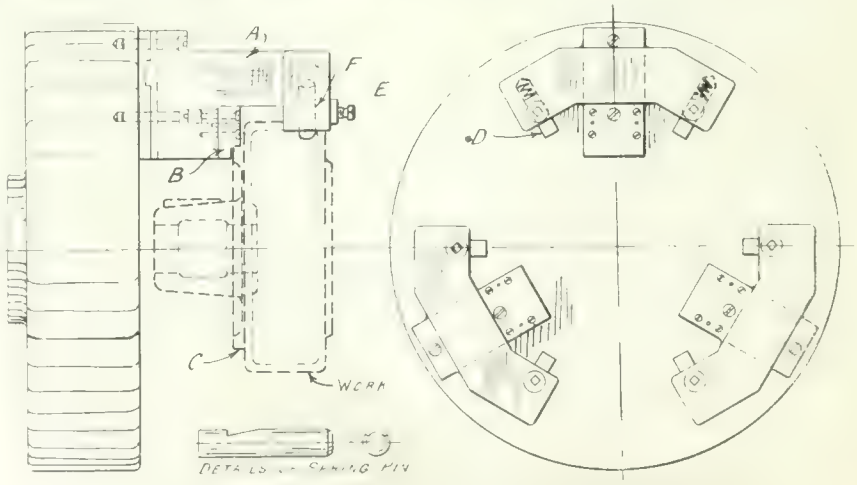



FIG. 16. EXAMPLE OF BUILT-UP JAWS AND SPRING PIN.

## THE WOOD WORKING ENGINEER

By D. A. Hampson

GASPER Chase was a self styled "wood working engineer" and really there seems to be no good reason for objecting to such a term. Chase had a shop that made wood specialties from wooden nutmegs to picture frames. He himself knew the business from A to Z and had the respect of all in his own line who knew him. They phoned to us one day to know if we had any babbitt, good for spindle bearings. Said they had been buying of the F—— Co., who did their repair work, but the babbitt didn't give satisfaction.

Well, we supplied them with Mongolia and genuine babbitt and No. 4 metal during the succeeding year but they complained a good deal about all three. To our queries they replied that they most certainly did not overheat the babbitt, they used a good grade of mineral oil, they did not set the boxes up too tight but still they had trouble with the bearings and journals roughing up. They lost much time re-pouring and with hot bearings.

Frank, our outside man, was going

past their shop one day and we asked him to stop and see if he could find any reason why they were having so much trouble. It happened that he was just in time. The men who did their babbitting had finished pouring the boxes of a planer and had scraped them to a fair fit. When Frank entered the room, he was putting the final touches on with a piece of emery cloth wound around a file—yes, scouring the babbitt with emery. Frank asked if he didn't know that the particles of emery would stick in the babbitt and cut the shaft and would work lose and roll around tearing up the surface of the box. No, they hadn't heard of that and thought emery cloth was the proper thing to use on all metal.

Before Frank left he had thoroughly instructed the force in the babbitt scraping process which requires no finishing. Mr. Chase was called in to O. K. the change. He had seen the man emerying the boxes but did not know that it was wrong, "I'm a wood working engineer you know and so far as I knew that was the right way to do—but a man can't know everything." They got results from any grade of new babbitt after that.

## GRAPHITE IN OIL

IN preparing mixtures of graphite and oil for lubricating purposes, it was for a time thought essential that the graphite should be ground to the utmost practical degree of fineness in order that it might remain suspended in the oil without any tendency to settle by gravity or choke the passages of the lubricators, and in pursuit of this aim, methods of preparing graphite were evolved capable of giving a powder in which no particle exceeded 1-250,000 in. in diameter.

When, however, such fine particles are mixed with oil, a curious phenomenon is observed. The particles begin spontaneously to coalesce, and when the mixture is examined under a powerful microscope, it is seen that the particles are in perpetual zig-zag movement through the oil. The explanation, as given by the Brownian hypothesis, is that the movement is due to the particles of graphite being struck by free electrons, whereby a particle, in being struck, starts with a jerky movement, and continues moving until arrested by the fluid friction of the oil, provided it has not already been struck by another electron, causing it to bound off in another direction.

During these erratic movements the particles of graphite collide with each other, and, as a result, adhere; they in turn are struck by other particles, and in this manner there is gradually built up a mass of adhering particles which is subject to the action of gravity, and results in settling out. Various expedients have been resorted to in order to negative this tendency. The one most commonly made use of is that of coating the finely-ground particles with a foreign substance and then effecting a high dispersion of those coated particles throughout the oil.

The coating material is usually a vegetable compound, such as castor oil, or it may be tannic acid or an allied tanning compound. By these means the permanent suspension of the ultra fine graphite particles in oil has been successfully achieved, but of late the question has been raised whether this extreme fineness, to the securing of which so much effort has been directed, does not of itself render the graphite ineffective.

It is to be borne in mind that in the bearing properly constructed, lubricated, and in operation, the bearing surfaces are completely separated by the oil film, and the particles of graphite simply float in the film, exerting no appreciable effect, either beneficial or otherwise. In such a bearing the graphite is not intended to play any part, its role begins when, for any reason the oil film between the bearing surfaces is destroyed. Then, as the oil film is squeezed out, the graphite particles are carried along with the oil from between the bearing surfaces until the film is reduced to a thickness corresponding to the dimensions of the largest particles of graphite, which at this stage will be arrested and held between the surfaces. Upon the complete destruction of the film these particles so held are crushed and embedded into the grain and pores of the surfaces, and thus are made to perform their function of solid lubrication.

Mr. C. H. Bierbaum, who is chairman of the Bearing Metals Committee of the American Society of Mechanical Engineers, asserts positively that fineness is inimical to utility on the ground that the smaller the particles are the less will be the amount of graphite so intercepted between the bearing surfaces; therefore, a given amount of graphite is efficient if it exists in particles of the largest possible size, and, contrariwise, the more nearly permanent a graphite suspension is, the more completely is it carried out from between the bearing surfaces when the oil film is being destroyed. This, he says, can be demonstrated in a most striking manner by taking a light-colored lubricating oil, thoroughly mixing with it a definite amount of graphite, and then placing it between two accurate glass surfaces, and observing the amount of color left after a definite pressure has been applied for a definite time, while maintaining a fixed temperature. An amorphous natural graphite, ground so that its coarsest particles do not exceed 0.002 in. shows under the foregoing conditions an almost opaque surface, while a commercial graphite suspended in tannin, and whose largest particles do not exceed 1-250,000 in., shows a substantially colorless surface. The reasoning is sound and the illustration suggestive, but in view of the often experienced efficiency of ultra-fine graphite in oil when applied to troublesome bearings, there would appear to be factors in the action of such graphite under working conditions of which the theory does not take account.

## SANDING SLIPPERY IRON FLOOR-PLATES

WHEN iron floor plates become worn smooth, they are dangerous under foot, especially when wet. A method of roughening them slightly is as follows:—

Mix a small quantity of powered sal ammoniac thoroughly with fine sand. Sprinkle the mixture over the iron floor, covering it with a thin layer. Damp the surface with a sprinkling can, and permit the material to remain overnight, or preferably over a holiday. Sweep up the sand and it will be found that a rough coating has been formed which will last several weeks. The process may be repeated until the desired roughness is obtained.

## GAUGING CUTTING TOOLS

By J. H. R.

WHERE several diameters are required on the one piece of work it is often the practice to use a turret tool post in place of the solid style generally used on standard engine lathes. For repetition work, like the production of shells and shell parts, greater efficiency is often attained by using several tools mounted in a revolving support or turret so that each separate tool, when turned to the working position, will be ready to start cutting without further adjusting to height or direction. Where this method is adopted it is necessary to have suitable stops located on the cross slide, or a mental record of the graduated position of the cross feed screw, to avoid unnecessary gauging of the work when starting the cut. The nature of the work, and the fact that the various cutting tools will require grinding at different periods, means that with each resetting of a tool a corresponding adjustment must be made in the stops or graduations. The method adopted in one shell shop, and one that has given very good satisfaction, was the use of a small slate, mounted on a block and conveniently located to be always facing the operator when setting the tool to the cut. No stops were used, but each tool position had a specific letter or number, and against this letter or number was placed the graduation at which the dial should be set for that particular tool. Should one of the tools require sharpening it was removed and ground, and when again adjusted to the correct diameter of cut the new graduation was recorded on the slate leaving the register of the other tools the same as before. Each tool as it was ground and reset entailed the erasion of the old mark and the recording of a new graduation.

STATISTICS shows that there are few safer places than a railroad train. In 1916 railroads whose lines totalled 139,000 miles transported 60 per cent. of the country's entire passenger business and 67 per cent. of its entire freight business without losing a passenger in a train accident. The mileage controlled by these roads equals that of Germany, France, Austria-Hungary and Russ[illegible]

## LAUNCHING A FREIGHTER IN MID-WINTER

AN unusual event took place at the Polson Iron Works, Toronto, on Feb. 11, when the 3,500-ton steel freighter Asp was launched in spite of the severe weather and thick ice in the bay. As a result of the exceptionally severe winter the ice in Toronto Bay was unusually thick and a large sheet had to be removed before the launching could take place. The method adopted for removing the ice was decidedly ingenious and perfectly successful.

### Ice Feature

A large sheet of ice, 300 feet by 8[illegible] feet, and approximately 28 inches thick, was first cut away and broken up, beginning at a point about 150 feet from the end of the dock. Two narrow channels 45 feet [illegible], [illegible] 300 feet in front of the ways, were then cut in the ice, forming a sheet 450 feet long by 70 feet wide. This sheet was towed into the large space prepared for it, leaving open water in front of the ways. The ice in front of the ways on the far side was then blown up with dynamite, the loose blocks forming a cushion for the ship when launched. The ice in the dock in front of the ways ranged from 48 inches to 54 inches thick. Altogether approximately 6,000 tons of ice had to be removed before the launching could take place.

### Constructional Features

The Asp is a sister ship to the Tento launched last October, and was the twelfth ship launched at the Polson's yards since last August. The Asp was built for Norwegian interests, but will be taken over by the British Government for the duration of the war. She was christened by Mrs. Winstrup, wife of Captain Winstrup, representing the owners. The Asp, like the Tento, is of standard construction for ocean service, built to the highest class Bureau Veritas. The principal dimensions are as follows: Length over all, 261 feet; length between perpendiculars, 251 feet; beam moulded, 43 feet 6 inches; depth moulded, 23 feet. The mean draft will be 19 feet 6 inches when carrying a total deadweight of 3,500 tons.

THE "ASP" AFTER LAUNCHING THE LOOSE ICE OBTAINED BY DYNAMITING RECEIVED THE IMPACT OF THE HULL IN EXCELLENT MANNER.

The engine room, boiler room and navigating bridge deck are amidships, with cargo spaces fore and aft. The ship is of single deck type, and was built on the deep frame principle. The deep frame system with auxiliary side frames constitute the basic constructional features of the hull fabrication. She has a cellular double bottom fore and aft, also peak tanks and power watertight bulkheads. The shell plating is overlapped at the edges with overlapped scarf butts. The Asp is a single screw freighter.

### Main Propelling Engines

The propelling machinery has been constructed to Bureau Veritas requirements for a working pressure of 180 pounds per sq. inch. The main engines are of inverted, direct-acting, surface condensing, triple expansion type, the cylinders being 20½ in., 33 in., and 54 in. diameter by 36 in. stroke. The condenser and pumps are independent of the main engine structure. The H.P and I.P. cylinders are served by piston valves, and the L.P. cylinder by a double ported slide valve. All these valves are on the fore and aft centre line of the engine. The bed plate is of box section cast iron, as are also the columns. All shafting is of best open-hearth forged steel. The crank shaft is of built-up type, with cast steel crank arms. The connecting rods, cross-heads, and piston rods are of open-hearth, forged steel. The valve gear is of Stephenson link motion type, with direct acting steam reversing gear. The propellers are four bladed of cast iron.

[illegible] IN THE LAKE TO RECEIVE A 450 FT. BY 70 FT. SHEET OF ICE FROM THE LAUNCHING BASIN.

### Boilers

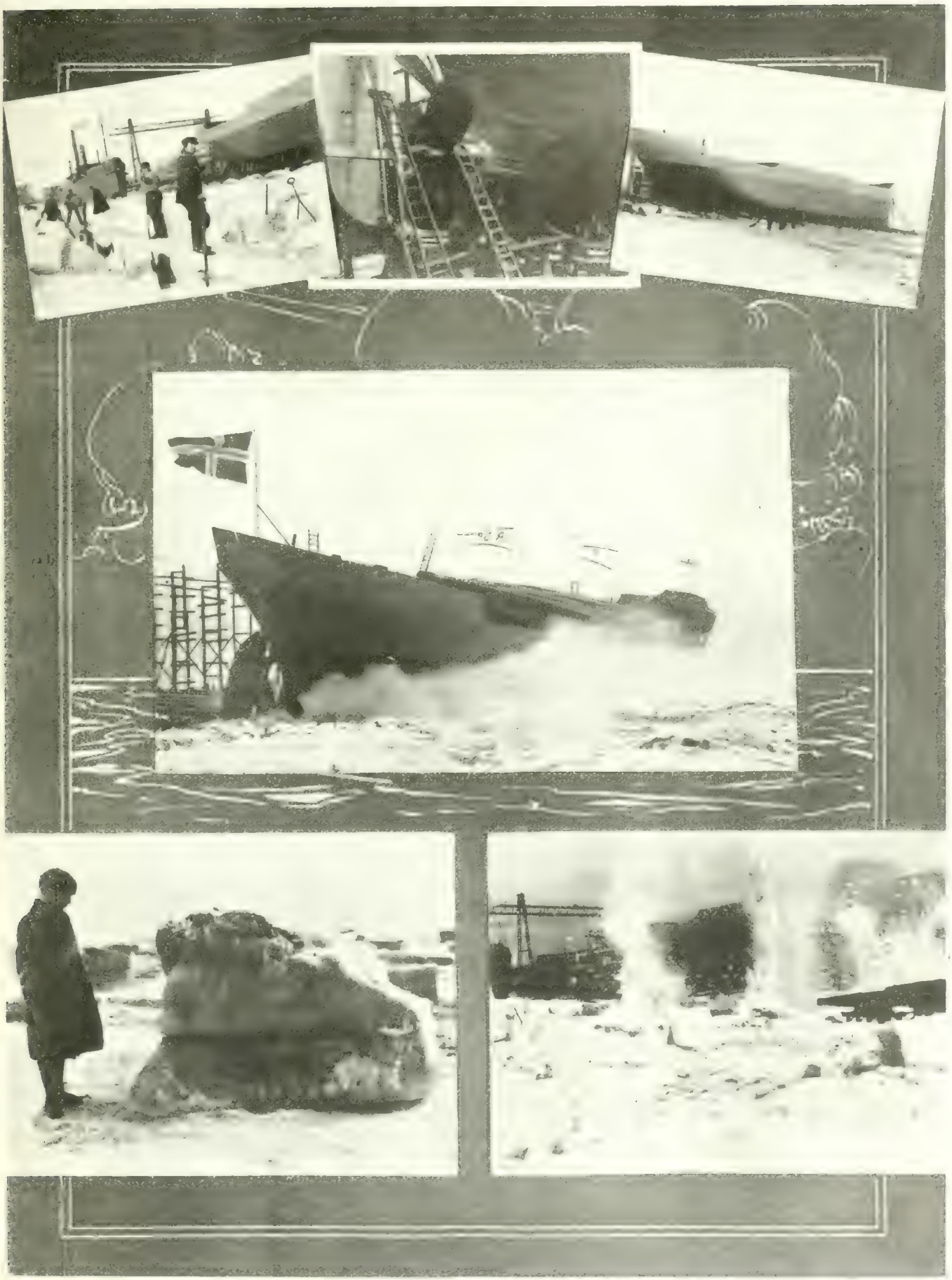
The boiler installation consists of two 14 ft. diameter by 12 ft. long, single-ended, Scotch marine type units, arranged for natural draft only, and built to pass Bureau Veritas requirements for 180 pounds working steam pressure. Each boiler has three corrugated steel furnaces of 42 in. inside diameter. The tubes are 3½ in. diameter, lap welded and standard gauge. A separate combustion chamber for each furnace and one double funnel are other features.

### Auxiliary Machinery Equipment

The pumping equipment includes deck pumps for each hold; vertical duplex, brass-fitted, main boiler feed pump; a duplicate of the latter for use as a general service donkey pump; duplex horizontal piston type bilge pump; a 7-in. duplex, brass-fitted, ballast pump; and a fresh water pump, 4½ in.—4 in.—5 in. of duplex type; air pump and centrifugal circulating pump for main condenser. The feed water heater is of multi-coil type installed in the feed pump discharge line. One 7½ k.w. Enberg electric generating set is installed in the engine room for the ship's lighting system. An evaporator of 15 tons capacity is also installed in the engine room.

### Deck Machinery

For handling cargo there are six 7 in. by 10 in. horizontal double cylinder steam winches of Clark-Chapman type, one at each mast and derrick. The



THE 2,000-TON STEEL FREIGHTER "ASP" TAKING THE WATER AT POLSON IRON WORKS, TORONTO. LEFT, [illegible]. THE BASIN IN THE ICE. BELOW, DYNAMITING ICE IN ICE TO ALLOW VESSEL FOR BOAT ALREADY ENTERING WATER.

[illegible] and are placed on girders above the deck. Each mast carries one 3-ton [illegible], the latter being enough to land cargo 10 ft. away from ship's side. The windlass is of direct-acting type for operation by hand, as well as by steam, and is complete with reversing gear. A hand screw steering gear is installed aft, and a steam steering gear amidships. The total bunker capacity is about 350 tons.

## TO USE BITUMINOUS COAL MORE EFFICIENTLY

AT the present moment, when the fuel situation forces itself upon the attention of every householder in the country, any discussion of the coal problem that goes into the causes at the bottom of the present unstable and unsatisfactory state of affairs should receive a careful and serious hearing. Especially so if at the same time this discussion is constructive and points the way to a rational development of the vast coal resources of the nation so that they will not only meet adequately the demands of a growing industrial development but also will be firm and strong enough to stand the shock of untoward events. It is evident that their present development fails now the test of world emergency.

Such a discussion is to be found in a short bulletin by Chester G. Gilbert, entitled "Coal Products: An Object Lesson in Resource Administration," just published by the United States National Museum, and constituting the third paper of the series, "The Mineral Industries of the United States," in course of issue by the division of mineral technology of this institution.

### American "Lack of Analysis."

The author at the outset points out the magnitude of the coal resources of the United States and the utter dependency of national welfare upon their proper development. Yet with more coal than is found in any other country, or indeed on any other continent, this country has long been dependent upon foreign sources for such essential products made from coal as dyestuffs, fixed nitrogen, and many important drugs; and is to-day, with the first pinch of war stress, uncertain whether the fuel needs of the American home can be met even during the coming months. With characteristic lack of analysis, the American public has never faced these shortages in phases of a single problem, but has first become alarmed at the dye shortage, then excited over the nitrogen dearth, and is now shivering in anticipation of a meagre fuel supply.

### Output Inadequately Used

To explain the present coal shortage by transportation congestion or labor difficulties is to offer a superficial cause. These dilemmas, of course, are the concrete means through which the trouble makes itself felt, but back of them stretches a far-reaching failure to work out a proper development for America's greatest resource. The trouble is not that insufficient coal is mined and transported but that the present output is inadequately used its full commodity value is not obtained. In general, our coal could be made to go a third further in meeting the nation's needs.

The domestic fuel stringency is only one angle of the coal problem, but a very distressing angle for the average person. The trouble here is the fact that the demand put upon anthracite, or hard coal, which is practically limited in occurrence to a few counties in Pennsylvania, is out of all proportion to the size of the deposits. The homes of the country must begin to turn aside from the luxurious and costly anthracite and look more to our vast bituminous resources, which are widely distributed, favorably situated, and can not so readily be tied up by concerted strikes or so easily held down by traffic congestion. But bituminous coal is dirty; and its widespread utilization as such would be a long step backward, retarding progress in civic betterment as well as involving a 30 per cent. waste in commodity bulk.

### Saving by Proper Usage

This waste, however, which appears in the guise of smoke, is in reality convertible into gas, tar, ammonia, benzol, and an endless number of other by-products, such as dyes, medicines, and explosives. It is therefore possible by proper shaping of economic policy to remove the disproportionable drain on the limited supply of anthracite, to turn the wasted third part of bituminous coal into useful products, to eliminate smoke from our cities, and to so distribute the sources of domestic fuel supply as to alleviate, if not entirely solve, the labor and transportation perplexities of the present situation.

These desirable results are already in course of natural development, but progress is disastrously slow, impeded as it is by lack of proper stimulus and excess of misdirected pressure. The advance so far has been solely in the metallurgical field. For converting iron ores into metallic iron, a substance known as coke is needed. This is made artificially from coal by driving off its volatile portion, its smoke, so to speak. Almost a seventh of our coal is made into coke, so great are the demands of the iron industry, but two-thirds of this coke is produced without regard to saving the valuable products driven off during its manufacture. Therefore we face the alarming conclusion that only about 4 per cent of the coal mined in the United States yields its full value to society.

### More Coke Needed

Progress in coal utilization depends fundamentally upon the production of more coke. At present the situation is limited by the needs of the iron industry. The quantity and type of coke thus far produced has been determined by its metallurgical use. Sporadic attempts to apply metallurgical coke to household purposes have met with failure and placed coke in an unfavorable light. Coke must be made of such kind as to be suitable for domestic use. This can be done; and the accomplishment is an urgent necessity. Domestic coke, in reality, will be artificial anthracite.

There is room in our industrial system for a greatly changed utilization of coal; in short, for coal to be used in the form of anthracite, artificial anthracite (domestic coke and steam-engine coke), metallurgical coke, gas for illuminating and power purposes, benzol for automobile engines, and at the same time made to yield a sufficiency of nitrogen, dyestuffs, explosives, and other coal-product chemicals. There is present need for all these products. The problem is to make the necessary readjustments.

The solution of the whole coal problem, in short, does not consist in cutting down industrial activities to meet present coal output, nor in circumscribing the scale of economic life to fit present misdirection of coal resources, but lies in working toward an industrial situation that will both permit and demand a widespread treatment of bituminous coal so as to yield on the one hand a smokeless fuel, an artificial anthracite so to speak, suitable alike for the home and the factory; and on the other a host of by-products essential to the industries of the nation.

## RESISTANCE OF AN OIL TO EMULSIFICATION

WHEN oil is used over and over again, as is the usual practice in large power plants, it may emulsify in a few days, if it is not of good quality, and have to be thrown away, as it will not pass through the filters. In order to arrive at a definite knowledge of the emulsifiability of oils, the United States Bureau of Standards has carried out investigations, the results being embodied in Technologic Paper No. 86, entitled "Resistance of an Oil to Emulsification."

To avoid the waste of time and the inconvenience of actually trying the oil in a turbine or other machine, a laboratory test has been devised by means of which it may be predicted whether or not the oil would give satisfaction in service.

The test consists of violently stirring a small sample of the oil with water under standard conditions. Then the oil that will separate out from the water the most rapidly is the best oil for turbine lubrication, other things being equal. It is found that most of the oils on the market are either very bad or very good, and that there is no difficulty in finding turbine oils that will settle out from the water in a minute or less after stirring.

For some other purposes it is desirable that oils should emulsify readily; and the test shows that oils of this class, when subjected to the same treatment as the turbine oils, will not separate at all in one hour, nor completely separate in one year. When turbine oils are used for months or years without renewal, they gradually deteriorate until they emulsify readily, even though they are very good oils to start with. The conditions of use in different plants are so different that it would be impossible to predict just how long a given oil would last, but it is believed that any power-house engineer, by the use of this test, could keep track of the deterioration of his oil and thus discover when it is time to clean out his lubricating system.

# Fundamentals of Apprenticeship: National Interest Grows--II.

Special Correspondence *

*Industrial education is to-day the principal educational theme in this country. Employers, business managers, superintendents, thoughtful craftsmen, educators, economists, social workers, men and women in a hundred walks of life, have focussed their attention with growing earnestness upon the problem. Discussions, proposals and theoretical and practical experiments are gradually leavening the great mass of our industrial life.*

MOST larger concerns which have modern apprenticeship systems, provide study to supplement the work in the shop. It is recognized that the object of an apprenticeship system is to teach the boy a trade, and that the trade cannot be properly learned unless the boy knows the mathematics, mechanics, theories, and business methods which accompany the trade. This instruction is given generally in a schoolroom connected with the factory or shop.

### Practical Trade Training and Applied Technical Instruction

The great mass of industrial workers have only a certain amount of manipulative skill; the work which they perform is often meaningless to them. Modern apprentice instruction, by a proper correlation of practical trade training and applied technical instruction, seeks to impart a thorough all-round knowledge, not only of the actual manufacturing processes but the reasons that lie behind. Technical education, as combined with apprentice instruction, is simply the education necessary to enable a boy to become an intelligent workman—one who can see the principles underlying the methods of work—one who can give a reason for doing a thing in a certain way and who does not blindly follow a certain rule. Technical education is the mental training of the apprentice, so that his understanding may be fully awakened.

That there is great need of awakening this intelligence is easily seen, when one considers that most of the boys and girls who seek industrial employment are deficient in even the common fundamentals which are popularly called the "three R's"—reading, 'riting, and 'rithmetic, and this condition is not confined by any means to boys and girls, but extends likewise to older students.

Be that as it may, the employer is confronted with the task of securing his supply of beginners and junior workers from an untrained host, and if the findings in the published report of the Commission on Vocational Education appointed by the Sixty-third Congress are correct, or even approximately correct, that 85 per cent of all the children that enter the public schools of the country leave the schools before they reach the age of 16; that not over 8 per cent. of those who enter the high school ever get through and take the diploma; that not over 2 per cent. of those who are graduated from the high schools ever enter the college or university, and that hardly 1 per cent. of the 14,250,000 persons engaged in manufacturing and mechanical pursuits have had, or at the present time have any chance to secure adequate training in their chosen industry, is not the necessity of supplementing practical trade training with applied technical instruction imperative.

This conference board believes it is essential to the success of apprenticeship instruction to co-ordinate a careful system of class-room studies with shop training, arranging these studies on a definite schedule of time.

### Class-Room Work on Employer's Time

No employer should begrudge the time spent by his apprentices in class-room work, whether this time be spent in his own class-room or in the class-room of continuation schools.

In some states, and in places abroad, attendance at continuation schools is compulsory on certain classes of minors, and the employer is obliged to grant the necessary time for this study. But whether compulsory or not, employers should recognize the fact that class-room work is an important phase of apprentice instruction, and not only insist upon it, but also continue regular pay during specified class-room hours.

It is essential in a proper system of apprentice training that adequate instruction be given to the apprentice along every line, cultural, technical, and practical, and as the cultural and technical are only parts of the required instruction, and as all the instruction given is for the purpose of developing the apprentice into an economical producer, —a profit maker for the employer as well as a good [illegible] for time spent in class-room work, which awakens and develops the intelligence, and thereby creates a much higher degree of operative or manipulative skill, eventually becomes a profitable investment.

### No Financial Obligation of Apprentice

It has been said by an English writer upon "English Apprenticeship", that in all probability the Elizabethan system of apprenticeship was the most efficient and the cheapest system of training that was ever available for the masses of the English nation. The nation neither paid for class-rooms nor for teachers and inspectors, since the guildsmen served as inspectors, and master and boy entered into an agreement for their mutual advantage, which required no payment on either side. For although the apprentice received not only instruction, but board and lodging, there seems to have been no idea, when first the system of apprenticeship was developed, that the training and education, which it provided, should be paid for in money. It was upon the services of the apprentice, especially at the end of his term, that the master had to count for a return of his trouble and the lad's maintenance.

This was in early times; later on a change set in, and one of the complaints made against apprenticeship by eighteenth century writers was the heaviness of premiums charged by the masters upon taking apprentices. The payment of premiums, even became a governmental source of revenue, as a stamp tax of sixpence in the pound was imposed upon sums of fifty pounds or under, and one shilling upon sums of over fifty pounds, affecting the engagement of clerks, apprentices, or servants, placed with any master or mistress to learn a trade. The amount agreed upon had to be named in the indenture, and, as early apprentice history shows, if the master failed in his obligation to instruct, the court, upon presentation of satisfactory evidence, required the restoration of all or a part of the premium.

This old-world custom of the payment of a premium by the apprentice to the master or employer was transplanted to this country, and, although not practiced to the extent that it was abroad, was, nevertheless, a recognized custom for many years—in fact is, even to-day, practiced by not a few employers, who exact a premium from the apprentice under one of three general plans, namely,

(a) By cash bonus.
(b) By deferred wage payment, forfeited for reason.
(c) By tuition fee.

Regardless of the reasons which might properly have been set up for such charges in the past, no reason, aside from long-time custom, can be given for such charges to-day. A cash bonus, or lump sum payment, for the privilege of learning a trade, or the assessment of a tuition fee, has no place in modern apprenticeship system. Private trade schools, conducted for profit, or endowed industrial schools, may properly charge a fee for their instruction.

In reference to a deferred wage payment, this also should not be countenanced by employers. It has been the custom, and it still prevails in many places, of holding back a certain portion of the apprentice's rightful wage until

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[illegible] completed his apprenticeship and [illegible] presenting it to him in the form of a bonus. While this conference board recommends the payment of a [illegible] under present conditions, it does not believe it to be permissible in these modern times that any part of an apprentice's rightful wage should be held back as a coverage for lost or damaged tools, or other possible wastage; nor as a possible penalty for slackness or slothfulness; nor as a means of preventing the apprentice leaving before the expiration of his full time; nor as an installment deposit to assure faithful performance and good conduct; nor for any other cause.

If the apprentice fails to keep his part of the contract, either through carelessness, inherent ignorance, or wilfulness, the employer has but to dismiss him, thereby applying a condition of the indenture.

## THE RETURN OF THE SOLDIER TO CIVIL LIFE

THE process of rehabilitation necessarily involves a complete reversal of habit for the man at the front, and as military discipline trains a man away from individuality and makes an automaton of him for the best interests of concerted action in war, the system employed by the Invalided Soldiers' Commission in the conduct of the convalescent homes for returned soldiers is built upon the understanding that the whole action of a man's mind must be set in reverse if he is to be successfully remade into a civilian. To this end the "King's Rules and Orders" are reduced to the lowest minimum consistent with the welfare of the man and the good order of the institutions.

The military convalescent hospitals are subservient to the man himself. The esprit de corps is splendid and the men are encouraged to look upon themselves as citizens. The breach which may never be spanned between the officer and the man in the ranks in active service is bridged by confidence in the hospitals, a confidence born of heart-to-heart talks in which the man is made to feel that the officer is representative of a civilian government interested in him as a citizen and anxious to see him successfully restored.

### Encourage Initiative

Evidence of the Commission's desire to help the man regain his normal attitude toward life is evident in every phase of its work. The relentless training away from independent action during the long months and years of military service must be broken down, and the man urged to exert his initiative. To this end every facility for popular games has been provided in the hospitals, and recreation halls fitted for dramatic entertainments and musical programmes built. It is a common sight to see the officers and men playing with and against each other in sports.

Through these agencies the men are encouraged to exercise their talents, and the zest of competition sharpens the dulled sense of individuality during convalescence. Vocational training rooms cultivate the same tendencies, and while the manual work is looked upon by the medical officers as primarily curative exercise, it is none the less important for its psychological effect.

### Outside Influence Carefully Directed

Undirected, the interest of different patriotic clubs in the hospitals resulted in an unequal distribution of favors and often ill-considered gifts. To co-ordinate the efforts of the organizations who desire to help in the "humanizing" of the convalescent homes the Commission has established soldiers' comfort branches in the most populous units of the command through whose administration the generosity of the citizens who desire to do something for the returned men is directed into the best channels.

These committees have learned the needs and desires of the men and convalescent homes, and requests for suggestions coming from organizations which desire to help make the lives of the men brighter during their convalescence are met with an exact knowledge of the gifts which would be most welcome. In this way economy in effort has been effected and the maximum of pleasure attained for the men. All members of the comforts committees are volunteer workers.

As the result of their work, cheery chintz curtains have been hung, flowers have filled the wards, cards, games, cushions, smokes, candy, fruit, billiard tables, reading lamps, socks, surgical dressings and Red Cross materials, entertainments, picnics, motor parties, dances, and hundreds of individual desires have been realized without cost to the government.

### Movie Machines

The Commission in its earliest days made provision for the purchase of moving picture machines to be established in the convalescent hospitals. In many instances there are two machines—one to operate in the big recreation room or theatre and a second smaller one for use in the wards where bed patents are confined. The Commission has made arrangements with the various film organizations to supply a certain number of films per week to the institutions.

Lecture courses have been arranged in many of the hospitals during the winter months in which some of the most prominent business men, educators, and lecturers are appearing. This widens the horizon of the man, and in turn brings the returned soldier before other public meetings at later dates when the lecturer, qualified by his inspection of the hospitals which he visited and impelled by the interest close contact with the men inspired, tells of the work of the Commission and the problem of rehabilitation.

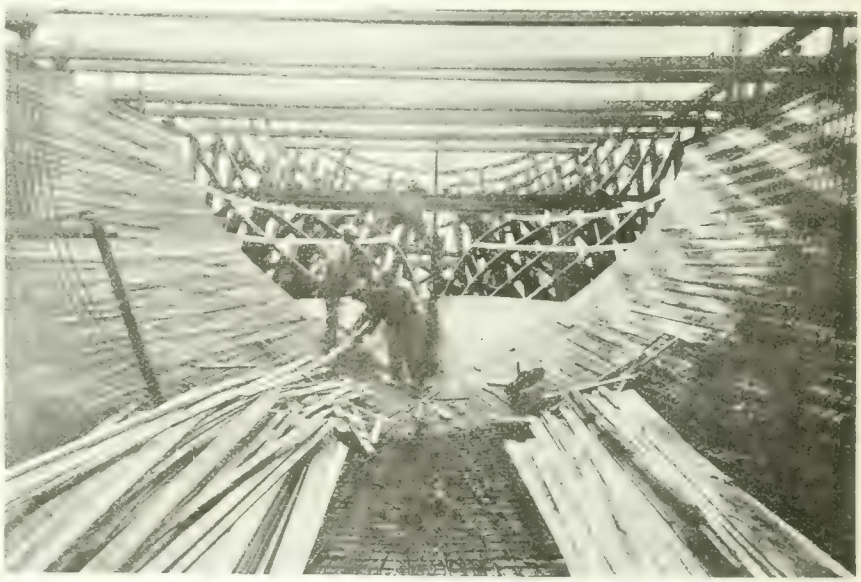
### Interesting "Big Business"

In the middle west one alert commanding officer has made a practice of inviting groups of business men of common interest to luncheon at the convalescent hospital. Before lunch an inspection of the buildings and workshops is made, and with coffee, cigars and after luncheon chat, suggestions are solicited. Questions are answered and the men go away with a new and more intelligent interest in the returned soldier problem and many times voluntarily pledged to arrange to take returned soldiers into their factories.

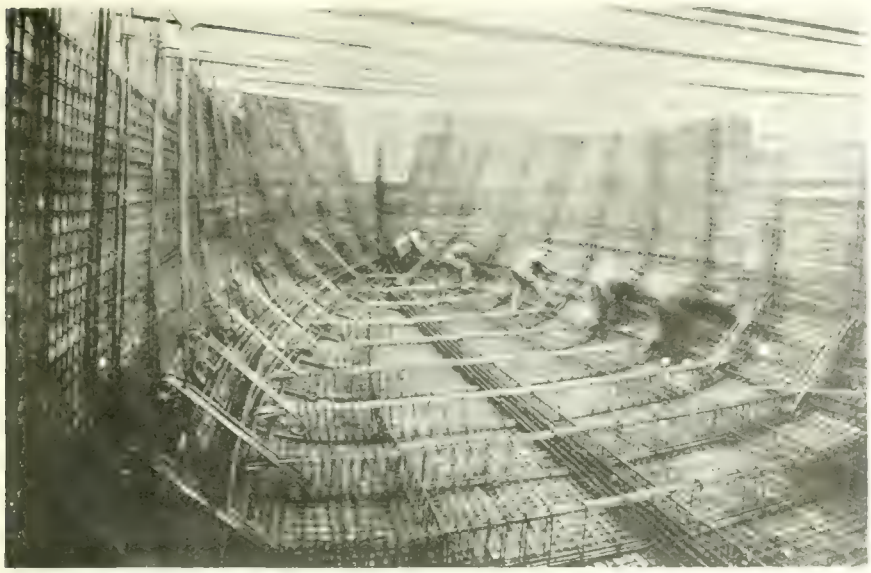
## CONCRETE BOAT BUILDING IN SPAIN

SPAIN, the country in which Columbus contrived to get enough money to buy and equip three wooden boats which were used in a little sea jaunt of more or less historic interest along about 1492, has turned to concrete as a shipbuilding material in 1918.

The corporation known as Works & Pavements, of Barcelona, Spain, has accomplished in a relatively short period of time some of the most important public works of reinforced concrete and in view of the developments that it believes will take place in maritime construction has at the present time a



VIEW SHOWING THE PLACING OF THE FORMING AT STERN



VIEW SHOWING THE REINFORCING STEEL AT BOW

course of construction the first cargo boat in this field, some details of which will be seen in accompanying photographs. This ship, while the initial attempt of this kind of this firm, nevertheless led it to make plans for the construction in 1918 of a gross tonnage of 40,000 corresponding to a displacement of 70,000, and consisting of standard type ships of 300, 500 and 1,000 tons each. Next year they propose to extend their operations and to provide for enlarging their plant have acquired an additional site on the shores of the Mediterranean, having an area of 250,000 square metres with 2,000 metres water frontage. This will permit them to provide ways for the carrying on of the construction of 30 boats at the same time; some of which are planned to be of 6,000 tons capacity.

The company has acquired various patents that will permit it to build rapidly and economically reinforced concrete ships.

It has also been proved that algae and the various forms of sea growths that are developed in sea water may be removed from the surface of concrete very easily.

## A NOVEL SCHEME FOR WRECKING OLD MASONRY

THE expansive force of quicklime has lately been used in breaking up brick [illegible]. It was necessary to remove three foundation piers, each 12 ft. by 20 ft. in area, and 12 ft. high, and similar piers supporting working engines on each side prevented blasting. Cutting and breaking up by hand being too slow and expensive, the new method was tried. Vertical holes three inches in diameter and three feet deep were drilled three feet apart in both directions, and were filled to within six inches of the top with quicklime, fresh and well slaked. Water was poured in and the holes were closed with brick dust, well tamped. Cracks started in ten minutes and soon broke the pier top into three foot cubes, making subsequent hand operations easy.

## STANDARD SPECIFICATIONS FOR MARINE ENGINES

MESSRS. RICHARDSONS AND WESTGARTH, LTD., Hartlepool, have recently issued a copy of their standard specifications for triple-expansion marine engines. This specification is in accordance with the north-east coast guidance specification published this year.

Included in the volume is further interesting and valuable matter. One section gives the north-east coast standard outfit, another the standard demarcation of work between engineers and shipbuilders, whilst in a fourth section the Contraflo system of auxiliaries is described in detail. The volume concludes with a reprint of the North-East Coast Guide Specification. The publication should be of interest to many readers.

## EDITORIAL APPOINTMENT

[illegible] editorial staff of this journal has been augmented by the appointment of A. R. Kennedy to the position of associate editor. Mr. Kennedy was formerly managing editor of the Quelph *Daily Mercury*, and is well and favorably known in Canadian newspaper circles.

# IT'S WHAT YOU DO TO-DAY

*It won't be good to talk of what you [illegible] to be, [illegible] when you've control in regal life. You can't [illegible] dreamed once espoused with ease.*

*The queen and the catcher were one [illegible] ribs that's ten feet tall.*

*And what's the use to tell [illegible] and a barn—or that some other [illegible] high he pulled a spell of gout.*

*Who talks don't care a heck to know [illegible] slid beneath the mill.*

*A hen may have a pedigree that's sixteen feet in length, and all her rooster brothers may crook with all their strength—but how's that feeling [illegible] eggs about as small each.*

*A race horse has a [illegible] all the barnyard talk.*

*But if that bob comes to the scratch to beat all other nags, with jockey decked upon her back in all his fellow rags, [illegible] what's the use of all her [illegible] though she's tied unto a tree?*

*It's just the same as [illegible] or not.*

*It won't the things you said [illegible] what you've done; what's past and done there's only one thing that [illegible] will take you, right or wrong, at what you're worth to-day.—ARK.*

# CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

J. M. WILSON, Editor B. G. NEWTON, Manager

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## CONSCRIPTION OF LABOR

HON. J. A. Calder, speaking at Massey Hall, Toronto, on February 26, intimated that non-essential labor might be taken from the cities, and used on the farms.

Coupled with this should go the determination to see that the farmers now on the farms farm the land. The cry, "I am a farmer," was most persistently used and abused before every military tribunal that held a session in any rural part of the Dominion.

It is known as a matter of absolute fact that farmers' sons, after the tribunal sessions were over, applied at city factories for work, showing exemption papers. These papers were granted to Class "A" men because they were farmers. As soon as the storm blew over they returned to the city under the smoke barrage of an exemption paper granted on the ground that the applicant was a farmer.

Another case is known where a son left the shop in the city as soon as the Military Service Act began to look dangerous. He went back to the farm. He became friendly with the plow handles, and was once again on speaking terms with the barnyard.

But what? Could that good job of his in the munition plant be allowed to go to seed? Not much. His father left the farm and went to work in the place of the son in the factory. The father was a better farmer than the son. The cause of increased production had suffered and the army lost a soldier.

The country will back up any effort to put men on the land, but enough care should be exercised to see to it that this sort of hide-and-seek business is ended at once.

## DON'T TRY FOR AN AVERAGE

ONE point that is being persistently emphasized in connection with the making of shells is that each shell must pass on its own merits.

That's quite an acid test to apply to many other things besides shells.

It simply means putting the hundred per cent. efficient measure up beside everything you do.

It's the very opposite to the theory of getting past when the crowd's going through.

A man may have some good qualities. He may have some bad ones as well. His friends put the good and the bad together, and a process of mental juggling turns out the verdict that he's not such a bad sort.

You can't juggle with good shells and bad shells and produce a carload of shells that, on the average, are fairly good.

Why not apply this to your work—to your business? If you've got weak spots in your organization—if there are limping traits in your own character—don't depend on something that's stronger to come along and strike a decent average.

Put the shell test to it. Good or bad. Which?

Get the crutches out of your system—out of your organization. In the last analysis there can be only two big classes, (1) efficient, or (2) non-efficient.

## MINERS DIDN'T WANT THEM

THE Amalgamated Mine Workers of Nova Scotia did not take kindly to the idea of having Chinese labor employed in the mines with them in order to increase the output.

The Fuel Controller brought up the matter of Chinese labor. The mine workers turned it down.

The Controller offered to allow them to collect a sufficient sum from the Chinese to pay their fare back to China as soon as the need for their services was over. The miners did not entertain this proposition for a minute.

It can hardly be urged that Chinese labor is being received with the open-arm policy in the Dominion.

At the recent meeting of the Ontario Experimental Union held in Guelph at the O. A. C., Dr. Creelman, Commissioner of Agriculture for Ontario, put out the same suggestion. He was of the opinion that the big chance to relieve the labor situation lay with the Chinese coolies.

It was apparent that Dr. Creelman put the suggestion out simply as a feeler. To be quite frank, the response in the agricultural world was at zero.

Agriculture and mining camps are generally favorite pursuits for the Celestials where they are allowed to operate. These two doors have been closed to them here to all intents and purposes.

Canadians don't seem to mind if the Chinese do come in and paint laundry tickets for them. Apart from that their reception hasn't been particularly cordial.

## A SHIPBUILDING NATION

NOT long ago it was considered right and proper to refer to Canada as the "granary of the Empire." There is, of course, nothing wrong about this. The name got its origin in the time when the west was making such strides in development.

But Canada is going to be more than a granary. The Dominion is a machine shop as well.

The Dominion is also striking a pace as a shipbuilding nation that will make one wonder in a short time whether the agricultural interests are not going to be hard pressed to maintain for all time to come their outstanding superiority.

In 1880 the tonnage built in Canadian yards was 65,441. In 1918 it is estimated, on a very conservative basis, that the total tonnage will be 400,000.

A point is raised in connection with the new shipbuilding industry that should not be missed. When there is a rush for any given product, the tendency invariably is to open up new plants, and in this way increase the output.

Keep this in mind—**the big demand now is not for more shipyards, but for more finished ships.**

To establish new yards would simply mean drawing off or lessening the number of men available in each yard, as the supply of men who have the training and skill for this class of work is limited.

The more the men are spread about the fewer the ships that will slip into the water in a given time.

Under the stress of the times it is easy to see that it is much more important to get a few ships into service than have a large number under construction, and none of them immediately available for the work which is so imperatively urgent.

# ANOTHER AMERICAN IS MAKING GOOD IN CANADA

**Mr. W. H. Burgess Is Now Vice-President and Gen. Manager of the Canadian Business of the International Malleable Iron Co.**

"WE DO not anticipate any particular after war problems in connection with our business," stated Mr. W. H. Burgess, vice-president and general manager of the Canadian business of the International Malleable Iron Works at Guelph. He discussed the business situation at some length with a representative of CANADIAN MACHINERY, outlining that the policy of their Canadian business had not been interfered with on account of the war trade. They had not gone directly into the manufacture of munitions, although firms with which they did business had made use of much of the output of their Guelph shop for this purpose. "The first two years we did business in Canada the skidding was a little rough in spots," remarked Mr. Burgess, "we were just getting started when we ran into war conditions, but it has been our policy to stay close to the lines in which we specialize, and we have not departed from it. About 40 per cent. of our business is castings for agricultural implements, and this is developing very nicely. Then 30 per cent. will be taken up in the making of our own line of fittings, while a good deal of the remainder is now taken up with the turning out of castings for several of the large Canadian makers of motor cars.

W. H. BURGESS

### Started in Foundry Work

Mr. Burgess is a native of Lynn, Mass., where he received his early schooling and training. At the age of twenty he entered the foundry of the Laconia Car Manufacturing Co. He had not been in this shop over a year before he was deputed by the superintendent to work out an improved cost system for the foundry end of the business. Five years later Mr. Burgess went to Wilmington, as assistant superintendent of the Malleable Iron Works there, his next promotion being to the position of general superintendent of the Malleable Iron Co., of Trenton, N.J.

His next move was the one that brought him with the firm that was the direct cause of his coming to Canada. Joining the staff of the International Iron Co. of Chicago, he was selected as the man who should take charge of the erection of the plant in Guelph. It was in March of 1913 that the Canadian business was opened. The industry has proved a good one for the city of Guelph. To-day the plant has grown to the stage where there are 375 employees on the pay roll, and we learn from sources close to the International Malleable Co. that the growth of the Canadian business is ascribed in business and trade circles to the sound judgment and sane policies followed by Mr. Burgess and those associated with him.

### Apprentice System Gone

Discussing business in a broader field, Mr. Burgess remarked: "The apprenticeship system is almost a thing of the past now, and I suppose it will continue that way until the war is over. It is rather difficult to make a boy see that it is to his own best interest to stay at his trade, rather than turn to an abnormal occupation that will pay him big money for a time from the start, but which in the end may result in him turning out a laborer or a handyman rather than a skilled mechanic. I believe firmly in the machine shop and foundry training for the man who intends to follow the iron or any other business, and in normal times it can still be successfully worked and will give good results."

In common with all manufacturers, the International Malleable Iron Co. are having troubles of their own in getting supplies through. "It has often occurred to me," said Mr. Burgess in conclusion, "that there is a chance for a great deal more co-operation between the trade department of the government and the Canadian manufacturers. Our experience has been that there is too much effort in general, and not enough of the direct application kind, and this is needed if the Canadian firms are going to go in and take the place they should in the development of an export trade following the war."

Mr. Burgess likes Canada, likes Guelph, likes the Canadians, but that does not prevent him from having a very warm spot in his heart for all things Bostonian. He continues to drop his "r" and would rather eat baked beans than turkey. Guelph puts him down as a first-class citizen, and would like to get a whole lot more like him.

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### WISE AND OTHERWISE

THE price of boots goes up. The price of trousers has joined the procession. Henry Ford shunts the price of his car. Hence, the H. C. of L. has got us, going, coming, riding, walking, standing or sitting, so what's the use?

ACCORDING to the style notes for spring they do tell that the pinch-back suit is going to pass out. But the price we're paying for everything we eat will make it certain that the pinch will simply be transferred to the front.

* * *

IN A book issued on engineering matters in 1882, giving the cost of construction for certain classes of work, we come across this line "Labor at $1 per day." There were giants in them days.

* * *

THE greatest boom the "Made-in-Canada" movement can get is a reputation that the goods give one hundred cents value for every dollar invested. The quality will remain long after you've forgotten about the price.

THE Russian Bolsheviki have a great idea of financing. They borrowed all they could, and now repudiate all their liabilities. If the Bolshe can do this successfully it will be an awful temptation to many another hard-up to take a chance on the same plan.

# Prospects of Continued Munitions Activity in Canada

*Supplement British Shell Orders—Government to Fully Utilize Shipbuilding Resources—Improved Conditions in Steel and Allied Industry—Metals and Machinery Quiet*

IT is not unlikely that further orders for munitions will be placed with Canadian manufacturers by the American Government which in conjunction with the Imperial Munitions Board contracts will result in considerable activity and the expenditure of large sums of money. Capacity shipbuilding production in Canada is probable this year for it is the intention of the Dominion Government to build ships to the full available capacity of the ship yards. All this indicates great activity in the steel and metal working industries during the present year with the result that Canada will benefit as a whole. Steel manufacturers are reaping the benefit of more favorable weather and production will show a steady increase during the coming weeks with the result that normal conditions should soon prevail. There is yet considerable freight congestion on the railways which will not be entirely eliminated for some time owing to the car shortage, but with a continuance of favorable weather, traffic conditions will materially improve and the steel plants benefit accordingly. Merchants report business as being fair but are hampered by slow deliveries and delays in having to obtain permits before material can be shipped. Prices are holding firm and are unchanged. In the United States conditions in the iron and steel trade are improving and production is increasing. An effort is being made by the leading steel manufacturers to have prices increased when the schedule comes up for revision. The scrap metal market continues quiet with little business passing. Consumers are still under the impression that prices will decline. In the non-ferrous metal markets the outstanding feature is a sharp advance in tin due to the great scarcity and unfavorable outlook. The copper market is quiet but it is possible that the price will be raised to 25c in the States to cover increased production costs. Prices of machine shop supplies are holding firm and business continues in good volume. Solders have advanced because of the high cost of tin. Some styles of wrought pipe are higher but the standard lines are unchanged. The machine tool trade is fairly active, chiefly in single tools for munitions plants and shipbuilding.

MONTREAL, Que., March 4, 1918.—Freer movement upon the railroad and a corresponding relief in the congestion of freight has put a more encouraging tone in the industrial situation, the chief factor being the improvement that has developed in the weather, enabling the distribution of material to be made with greater regularity. Considerable disorganization, however, is still evident, and will likely continue for some time yet, as the heavy snows about the country will prevent the complete return to normal until early spring. Shipments of materials from points in the United States are becoming more regular. The feature of the moment is the progress that has been made regarding marine development. During the past 12 months the total value of shipbuilding contracts placed by the I. M. B. is approximately $64,500,000. This has been the biggest year in the history of Canadian shipbuilding; 46 wooden vessels with an aggregate tonnage of 128,000 tons, and 43 steel vessels with an aggregate tonnage of 211,300 tons are the most important part of this programme. At least 8 steel and 4 wooden vessels have already been launched and many others will be ready to take the water when navigation is opened, or when the ice in the rivers is sufficiently removed to permit of launching. The total tonnage output for the present year is estimated at 400,000 tons.

### Steel

Weather conditions have been more favorable during the past week and transportation difficulties are becoming less pronounced, with the result that mills are looking forward to better production. So far, however, the betterment has only been shown in slightly increased output, as the demoralization of the entire steel industry has been so general that some little time will be required before normal operating conditions can again be resumed. Car shortage is still the dominating factor and many of the mills are working, under great difficulties. In some instances, producers who are operating two or more mills have temporarily closed one of them so that the others could be kept working nearer to capacity. The lack of sufficient coal and coke continues to be a constraining factor. Steel manufacturers in the States are conferring with officials of the Government with the purpose of readjusting and re-establishing the prices as now fixed on semi-finished steel products, the date fixed for any change that may go into effect being April 1 next. The consensus of opinion among steel dealers appears to be that any revision of prices will be in an upward direction. The gradual but steady increase in the cost of production is one of the main factors in the recent negotiations, as producers are anxious that prices on different steel commodities should be more stable in character. Before the close of the current month it is anticipated that adjustment will be made that will be more agreeable to steel producers, and also consumers, as the latter are apparently willing to pay slightly higher prices, provided they are assured of more definite delivery. Open inquiries for the requirements of Canadian shipbuilders have been discontinued, as the steel for all vessels constructed in the Dominion, under Government contract, will be purchased through the American Government. In anticipating increased plate production, activity has been stimulated along lines that have been dormant for some time; many oil companies are showing added interest and inquiries have consequently resulted. An urgent need for better car service is shown in the coal regions, as operators claim that another fuel shortage may be faced unless increased facilities for handling the output is an early development. The local market is devoid of features as dealers report a situation unchanged by recent developments with quotations holding firm. Dealers here are looking for improved conditions within the next few weeks. Indications point to a revision of existing prices in the near future and the probabilities are for quotations of a higher character. Recent changesin the freight tariff have resulted in a higher rate on steel products, the rate from Pittsburgh to St. John, N.B., 38.1 and 50.5 cents per 100 lbs. and to Halifax 39.1 and 51.5 cents per 100 lbs.; these quotations being for car lots and less than car lots respectively.

### Metals

Apart from the abnormal condition that still exists in the tin situation, the metal market has developed no feature of particular interest. The situation on the whole is becoming steadier owing to the relief that has been given to the transportation of material on the various railroads, a factor that has resulted in better production and delivery from the refineries to the trade. Copper is steady and firm. Tin is abnormally strong due to the pronounced scarcity of spot metal. Spelter is not active but has a stronger tone. Lead is quiet but firm. Antimony and aluminum are unchanged and quiet.

**Copper.**—In the copper situation there are few interesting developments to report and the market is comparatively quiet and steady. The bulk of the present production is being absorbed by the Government requirements for war pur-

poses so that with few exceptions the domestic consumer is experiencing considerable difficulty in obtaining metal for his normal operations. The American situation is still controlled by the fixed price of 23½c but the trade are looking forward to another revision in prices about the first of June. The market locally continues steady in character and quotations are unchanged at the price quoted last week of 31 and 32c per lb.

**Tin.**—This metal continues to hold the center of interest as the difficulties surrounding the shipments of metal from the source of supply make the market one of extreme uncertainty. The great shortage of metal on this side of the Atlantic has kept the situation in a very nervous condition which has been reflected in the quotations that have been soaring during the past several weeks. The market in New York is very unsettled and nothing definite can be learned as to the actual condition of the market. The nominal price as now asked reaches as high as 85c per lb. Dealers here are reporting a very strong and unsettled situation with supplies very limited. Some dealers have asked as high as 93½c per lb., but the average quotation might be considered at the nominal price of 90c per lb., this being 8c above that of last week.

**Spelter.**—The market is quiet but slightly more active than a week ago. Brass interests are apparently not heavy buyers and are not inquiring very heavily for the covering of their future requirements. The local market is a little stronger and the demand is steady. Dealers here are quoting 11½c per lb., an advance over last week of ½c per lb.

**Lead.**—On a slight increase in the demand for lead the local market has shown a better tone. Dealers here are asking 10½c per lb., an advance over last week of ½c per lb.

**Antimony.**—On decreased demand the market has developed an easier tone and dealers are reporting an undertone of weakness; quotations remain unchanged, however, at 18c per lb.

**Aluminum.**—A slightly firmer market has been shown from the better demand but prices remain unchanged and firm at 55c per lb.

### Machine Tools and Supplies

The demand for machine tool equipment, during the past week, has been comparatively light and inquiries for machinery are light in character. Some little business has been done in connection with munitions equipment but purchases of this class of machine tool, while comprising considerable volume of the total business, is nevertheless much lighter than has been shown for some time. Delivery of equipment, particularly that coming in from the States, is still a feature of much importance and users are experiencing considerable difficulty in obtaining such requirements as are necessary to be brought in from the States. Machine builders in Canada are quite busy, but the activity has fallen off from the abnormal conditions of the corresponding period of last year.

### Scrap

No development of importance has taken place in the scrap or old material situation and the general activity has been below normal. The railroad congestion that has been a feature of the recent market is still more or less a factor in present relative dullness, as the relief has not yet had the effect of removing the uncertainty that continues to dominate the situation. Supplies in dealer's yards are still low as railroads are still experiencing some little difficulty in meeting the full requirements of the iron and steel trade, owing to the large accumulation of freight that has piled up during the past several weeks. Gradual improvement in this connection is, however, practically assured and dealers are looking forward to more stable conditions in the operation of the old metal market. While dealers here are expecting some little changes in the price of certain materials the quotations this week are relatively the same as those of a week ago, although under some conditions the prices may vary slightly one way or the other but those prices quoted are the nominal figure asked in the majority of cases.

### CANADIAN GOVERNMENT WAR PURCHASING COMMISSION

**The following gentlemen constitute the new war Purchasing Commission. Sir George Foster, Minister of Trade and Commerce; Frank P. Jones, Montreal; J. W. McConnell, Montreal; James H. Gundy, Toronto; Charles McNaught, Toronto, and Joseph Gibbons, Toronto. C. A. Magrath, as Fuel Controller, and Hon. H. Laporte, as chairman of the War Purchasing Commission, are members of the board ex-officio. Sir George Foster is Chairman of the Board.**

## Toronto

TORONTO, Ont., March 5.—The outlook in manufacturing circles this year looks decidedly promising, particularly in regard to shipbuilding and munitions. Under the Dominion Government programme all berths as they become vacant will be used for Government ships, and it is hoped that tonnage laid down this year will be in the neighborhood of 400,000, providing, of course, that a sufficient supply of men and materials are available. In this connection there will be a good demand for ship machinery and fittings of all kinds. It appears probable that there will also be considerable activity in the munitions industry. There is a probability of further contracts for munitions being placed with Canadian firms by the American Government.

### Iron and Steel

The general situation in the iron and steel trade is gradually improving, but business is being interfered with by delays incidental to the necessity of obtaining shipping permits, and also because of the freight congestion. The permit situation, while being necessary, due to conditions arising out of the war, is nevertheless a handicap in the efficient conduct of business. No iron or steel can be moved either from mill or warehouse without permission from Ottawa, and, of course, no material of any sort or description can be shipped from the States without authority from Washington. There is consequently considerable delay in getting material shipped from this reason alone. Traffic conditions have improved on account of the more favorable weather, but the shortage of cars continues to be the most important factor in the situation, and it will be some time before any material relief can be looked for. Merchants report steel business as being fairly good in connection with non-war industries, but are hampered owing to the unusual conditions prevailing in the trade. There have been no price changes this week, and the market continues firm.

Operating conditions are steadily improving and production is increasing as a result. The improvement should be progressive now that the worst part of the winter has passed, and conditions soon be normal. There will be a feeling of relief as well as satisfaction when production reaches capacity, as steel is badly needed for war work as well as for the so-called non-essential industries. The Dominion Government is understood to be getting all the plates required for the first lot of ships that are being laid down under the Government programme. The material is being obtained direct through the War Purchasing Commission. The sheet mill which the Steel Company of Canada has installed at Hamilton is operating successfully, with an output at the rate of 20,000 tons of sheets per year. The quality of the sheets is said to be quite satisfactory, comparing very favorably with the best brands from England or the United States.

The leading steel manufacturers in the United States are agitating for an increase in the new schedule of prices, which will go into effect on April 1. Increasing costs and alleged unprofitable contracts will, it is thought, result in the manufacturers' committee advising the War Industries Board that a scaling upward in prices would be warranted for the new period of fixed prices to prevail after March 31. The prevailing prices on steel products became effective on September 24 last, and were reaffirmed on January 1. The steel market awaits with the greatest interest the decision on fixed prices, and it is hoped that the Government will make the next term extend from six to nine months, as it is believed such action will encourage more confident buying by domestic consumers.

### Scrap

There is no change to report in the

on account of the shortage of tin. Consumers still hold to the belief that prices will come down, and because of this they are not buying except hand-to-mouth to satisfy immediate requirements. The freight situation was improving until an [illegible] movement of material.

### Machine Tools

The machine tool market continues quiet, business consisting principally of single tools for munitions plants and heavier machines for shipyards. In regard to the latter there is a fair demand for second-hand equipment. The Dominion Shipbuilding Co. is buying equipment for the new plant on the harbor front. The Curtis Aeroplanes and Motor Co. has taken over the Toronto Furniture Co.'s factory on Dufferin Street and will instal equipment for manufacturing aeroplanes. The Russell Motor Co. are said to have secured a contract for fuse parts from the American Government. It is understood that further orders for munitions are being placed with Canadian manufacturers by the American Government and increased activity is looked for as a result of these orders. It is reported that orders for larger shells than the 75 M.M. will be placed in Canada.

### Supplies

Prices of machine shop and mill supplies are holding steady and firm, while dealers report a satisfactory volume of business. Deliveries of goods manufactured in the States are rather backward, but on lines made in Canada the situation in this respect is improving. New net list prices have been issued on wrought pipe, which provides for higher prices on certain styles of pipe. Standard buttweld and standard lapweld pipe remain unchanged in price. Standard lapweld genuine wrought iron pipe, S/C, shows an advance on sizes 4½ in. to 8 in., both black and galvanized, while extra strong genuine wrought iron pipe, P.E., shows an increase in price in sizes 4½ in. to 8 in. The United States Government has placed an embargo on shipment of higher grades of all refined oils. This provision is not likely seriously to affect the Canadian market. The higher grades of coal oil, such as "Palacine," are practically the only lines to be affected. Compared with amount of other grades of coal oil used there are very small quantities of this class of oil in use. The particular grade noted is refined from Pennsylvania crude. The market for gasoline is holding steady. Mid-continent crude oil has not yet registered an advance, and there is now an accumulation of stock of gasoline on this continent due to lack of tonnage to carry commodity overseas. Gasoline is quoted at [illegible] gallon.

### Metals

The outstanding feature of the week in the non-ferrous metal market has been a sharp advance in tin, due to the acute shortage and great difficulty that is being experienced in obtaining supplies of this metal. There is no change in the copper situation at present, although it is not unlikely that the price will be advanced in the States in line with rising producing costs. Spelter is firmer and a shade higher and solders have also advanced due to the high cost of tin. There is nothing of particular interest to note in regard to the other metals, and prices are unchanged. Business locally continues steady and in good volume.

**Copper.**—The growing demand for copper for Government work indicates a diminished supply for other consumers, although it is believed that there will be sufficient supplies to meet all requirements. It is now more generally believed that the United States Government will allow 25c as the new fixed price for copper when the present agreement expires on June 1. It is estimated that the advance of 1½c will cover the increased production costs. The producers have been agitating for a 25c price for some time. The local situation is unchanged, lake and electrolytic being quoted at 29c and casting at 28c per pound.

**Tin.**—The tin situation is getting more acute and as a result of the great scarcity prices are steadily advanced. The small quantities of tin that are coming in are snapped up, principally for Government work, and many consumers cannot yet buy metal at all. Tin is allowed to come to consignees in Canada from England, but a permit must first be obtained from Ottawa in order to control the ultimate destination of all shipments. Tin has advanced 15c, and is now quoted nominally at $1 per pound.

**Spelter.**—Prices are a shade higher locally, but the market is dull and featureless. The consuming demand is light and considerably below the producing capacity. Local price is now 10c per pound.

**Lead.**—The market continues firm, with a higher tendency. There is some scarcity of lead in the primary market, which has placed the metal in a strong position, and an advance is not unlikely. The trust price is 7.25c New York for spot lead. Local price, 9c per pound.

**Antimony.**—The market continues quiet, with a lower tendency. Available supplies are sufficient to meet the demand. Local price, 17c per pound.

**Aluminum.**—The market is firmer on account of heavier demand, but quotations are unchanged in the meantime at 52c per pound. The price of aluminum in the States has been fixed at 32c per pound.

**Solders.**—Due to strong market for tin there has been a continued strong market for solder, and prices have advanced. Guaranteed is now quoted at a range of 47c to 48c per pound; strictly at 44c to 45c. Demand for solder is reported active, buying evidently being stimulated by the upward trend of prices.

## Sydney

SYDNEY, N.S., March 1.—A settlement of the wage question has been arrived at between the Amalgamated Mine Workers of Nova Scotia and the Dominion Coal Company. An increase of ten cents per day is given to all workmen rated under $3 per day, plus an increase of 15 per cent. This increases the minimum rate for common labor from the former figure of $2.43 per day to $2.91. The attention that has been paid to increasing the wages of the lower-paid men is evident when it is remembered that the common labor rate ten years ago was $1.38 per day. An increase of 12½ per cent. is given to all other day-paid labor and to all contract labor. The bonus given for steady work, which is specified to consist in working 22 days out of each consecutive period of 24 days, is increased from five per cent. to ten per cent. upon the net earnings of all men who produce or handle coal. The A. M. W. endeavored to have the steady work bonus extended to all classes of labor at the collieries, but this the company would not agree to, as the bonus was intended to stimulate production, and was, therefore, limited in its application to the producing class of workmen. The wage rates are subject to a further adjustment should a revision of the costs of living at 1st July next show necessity to still further adjust the curve of wages to that of living costs.

The negotiations on the wage question have been in progress since last November, but under an arrangement made before the close of 1917 the increase in wages now agreed upon is retroactive to 1st January, 1918, so that the workmen will receive the sum of the increase, as it affects the earnings of January and February, in one lump sum.

### To Increase Output

The Fuel Controller met the representatives of the Nova Scotia Steel & Coal Co. and the Dominion Coal Company and the Executive of the A.M.W. of Nova Scotia in Halifax to discuss the possibility of increased production of coal. Both parties expressed their earnest desire to do everything possible under the present serious conditions of coal shortage to increase the output of coal. Co-operation in every possible way was promised between the companies and the workmen, and while the improvement in output is not likely to be as great as has been stated in newspaper reports, a decided stimulus has been given, the results of which are already to be noted. The A.M.W. are also undertaking to work in conjunction with the companies in an endeavor to obtain workmen from Newfoundland. It is to be hoped that this praiseworthy endeavor will at least arrest the continuous decline in production which has been apparent since the summer of 1915. The pressing necessity for some definite action to stimulate coal production will be seen from the fact that the Dominion Coal Company's production for the first two months of 1918 totalled 351,000 tons compared with 417,000 tons in 1917, showing a decline of 66,000 tons.

The coroner's enquiry into the Allan shaft explosion has not yet been concluded, but expert evidence given so far seems to bear out the first theories of the probable cause, namely, that the explosion is attributable to a "blown-out shot." Pressure is brought upon the provincial authorities to institute a further enquiry by a technical or departmental commission. The mine is still idle.

## New York

NEW YORK, March 2.—Great activity is evident in the machinery industry throughout the country. Buying at Washington is in full swing. Several important orders have been placed and large contracts are pending. Most of the large machinery manufacturers have representatives located at the capital to facilitate the consummation of contracts with the Government. The Bureau of Steam Engineering, Navy Department, is buying tools for naval repair ships. The General Engineering Depot is buying equipment for repair shops in France. Several additional contracts for high explosive shells and guns also have been placed which will call for the purchase of additional shop equipment. The Regal Car Co., Detroit, will manufacture 300,000 three-inch shells at its Jamestown, New York, plant. At the behest of the Government steps are being taken for the building of two shell loading plants in this territory. The work is to be undertaken by the T. A. Gillespie Co. and the Atlantic Loading Co. These plants will call for machine tools and conveying machinery in the near future.

The Worthington Pump & Machinery Corporation has decided to utilize its Harrison, N.J., works instead of the Holyoke plant for the manufacture of pumps for submarine destroyers. This change will necessitate the purchase of less equipment. The Liberty Ordnance Co., Bridgeport, Conn., is buying a small list of tools. The Thompson-Starrett Co., New York, which is building a powder plant for the Government at Charlestown, West Virginia, is buying pipe, fittings and conveying machinery, the latter including 49 hand power cranes and 21 hoists. The Air Nitrates Co., which is a branch of the Ordnance Department of the U.S. Army, continues to buy tools and cranes for the nitrate plant at Mussel Shoals, Ala. The Department also contemplates the duplication of this plant at another point in the South.

### Shipbuilding Equipment Demand

Ship builders continue actively in the market for machinery of various kinds. The Federal Shipbuilding Co. has placed an order with a local house for repair shop equipment for each of the ten ships it is now building for the Government. The Virginia Shipbuilding Co. has closed for two cranes and the Sun Shipbuilding Co. has bought two electric cranes from the Toledo Bridge & Crane Co. The Lone Star Shipbuilding Co. is in the market for a locomotive crane for its shipyard. The Submarine Boat Corporation is utilizing the shops of the Lackawana Bridge Co. in which it will install a fitting out crane.

Orders for a large number of tools for portable machine shops to be used in field service in France are being placed by the Engineering Depot. Automobile trucks are being fitted with repairing equipment, including a small power plant, a welding outfit and tools.

### Foreign Arsenal Contract

The Allied Machinery Co., New York, has been given a commission by the Brazilian mission for the purchase of tools and other equipment for an arsenal to be built at Rio de Janeiro for the Brazilian Government. The Pennsylvania R.R. is again expected in the market for the purchase of tools and other equipment for locomotive, car and repair shops. The United Verde Copper Co., Clarksdale, Arizona, is buying 50 machine tools for a blacksmith and repair shops at the copper mines.

There is great activity throughout New England. Many private plants holding Government orders are placing contracts which require the buying of many small tools of almost every type and kind and the prospect is that this sort of buying will continue actively throughout the month. The Connecticut Brass & Manufacturing Co. is buying equipment for plant extension. The Aeronautical Engine Co., Long Island City, a Government plant, has been given an order for Gnome motors which will keep the plant busy temporarily while preparations are being made for the building of a large number of airplane engines. At least this is the interpretation placed upon recent Government action. In the Central West large buying has continued by the Standard Steel Car Co. The Glenn L. Martin Co., Cleveland, is preparing specifications for tools to build airplanes.

## Washington

WASHINGTON, March 2.—Despite pessimistic opinions which are being expressed daily in the United States regarding the possibility of an output of a large ship tonnage during the year 1918, officials of the companies building the ships maintain that they will keep their contracts.

Interest has centered on the Hog Island shipyard, operated by the American International Corporation. This yard, which is planned as the greatest shipyard ever attempted with fifty large shipways, has been under the fire of criticism for the past few weeks and it has been classed as an absolute failure by many. Officials of the company have now come to the front, however, and declare that despite all pessimistic predictions they will fill their contracts.

### Ship Production Prospects

Twenty-five ships will be delivered from Hog Island on November 1, twenty-five ships will be delivered by December 15, and one hundred and twenty additional ships will be delivered in the first six months of 1919, according to Harris H. D. Connick, a vice president of the American International Corporation. Connick stoutly maintains that the Hog Island project will go through and that by the middle of 1919 there will be large ships produced from that plant in large quantities on short time. The labor situation which has appeared to be critical has quietened down and shipbuilders are reporting that more favorable labor supplies are available. With the Hog Island project on the apparent road to success the outlook for a great shipping program from the United States is better to-day than it has been for weeks. Other shipyards are finding little trouble in keeping to their schedules and the first wave of pessimism and the first crisis seems to be safely past.

The lumber industry in the United States is headed straight for government control. Bills have been introduced in the Senate giving the President of the United States the power to commandeer all standing timber and to order specifications for its cutting. This gives the President the virtual control of all the lumber industry. This act has been caused by the alarming shortage of spruce for aeroplane manufacture and a threatening shortage of other timber for wooden ships. It is believed that with the lumber industry under government control, the output of lumber in the United States can meet not only the needs of this country but also those of the Allies.

In order to insure the future of the American merchant marine the War Trade Board has taken steps to make certain that all vessels now building in the United States will fly the American flag. Orders have been issued governing the licensing of bunker coal supplies which will prohibit the supplying of any bunker coal to any new vessels building in the United States unless they are registered under the American flag.

### Coal Prices to be Revised

A general revision of coal prices in the United States by April 1 is now confidently expected. The revisions will be for the most part downward revisions and will have a similar effect on Canada in so far as the Canadian coal supply is affected by the American supply. The Fuel Administration is now undertaking the first wide sweeping attempt at a cost census. It is expected that by April 1 the Fuel Administration will have figures showing the cost of production in every coal mine in the United States. Prices will be revised according to the figures shown in the cost estimate now under way.

A general reorganization of the plan of war production in the United States is expected at date of writing. President Wilson has failed to appoint a successor to Daniel Willard as chairman of the War Industries Board and it is understood that this is due to the fact that he plans a general reorganization which will place the entire powers of control of purchases, production and al-

ant work.

To Develop U. S. Minerals

Secretary of the Interior Lane is putting forward a plan which he declares will [illegible] for the United States. He plans to increase the production of minerals in the United States and thereby save the tonnage used in their importation. At the present time the United States is importing 2,000,000 tons of minerals annually. It is said that the Secretary of the Interior to attempt to curtail the importation of minerals from Canada because of the fact that little or no available ocean tonnage is used for the importation of these minerals and also due to the fact that because of the similarity of conditions in the two countries the cost of production in the United States could not go below that of Canada, since the mineral deposits in the United States would have to be developed and those in Canada are already highly developed.

The bituminous coal production in the United States has now reached a normal state. Latest reports show a weekly production of 1,847,000 tons as compared with a weekly production for the same period last year of 1,753,000 tons.

The general licensing of all imports into the United States went into effect on March 4. Canadian imports are exempted under a blanket license, with the exception of some articles which have been placed under a special ban. These constitute for the most part non-essential materials and things which are not necessary to the conduct of the war.

Building operations in the United States are under the ban unless they are necessary to the war. Secretary of the Treasury McAdoo has issued a statement in which he has officially called upon the business of the country to stop all building operations for the period of the war unless found necessary for the conduct of the war.

## Pittsburg

PITTSBURGH, Pa., March 2. — The United States Railroad Administration's plans for buying locomotives and cars appear to have been put in definite shape, and the steel industry rather expects definite announcements to be made within a fortnight of the placing of orders. The maximum contemplated has been 4,000 locomotives and 250,000 freight cars, but current estimates are that orders placed at this time will be for about 2,000 locomotives and 100,000 to 150,000 freight cars. The steel makers profess positive belief that they will be able to furnish the requisite steel as rapidly as it will be needed. The limitation of the speed of building will rather be the shop capacity that can be made available. The locomotive shops are, of course, fairly busy already with Government and export orders, and they have a great deal of munition work besides, while the car shops in many instances are also working on war orders. Some help to rapid building is expected to be furnished by carrying standardization to the last degree. The railroads are believed to have been over punctilious in the past, particularly in specifying types of locomotives. The congestion of the past few months, when many yards would have been glad to get passenger locomotives and many fancy passenger trains would have been better off for the aid of a couple of switching engines, has given a somewhat new viewpoint.

Prospective Steel Prices

No information of particular value was given out after yesterday's meeting of the steel committees of the American Iron and Steel Institute in New York. A dozen or more representatives of producing concerns met with the committees, being especially invited to give their advice. The purpose of the meeting was to map out a program against the meeting it is expected the War Industries Board will call in the near future, to consider prices. The present set prices were, by the President's announcement of Dec. 28, extended to March 31. It should be noted that last December there were strong prospects that the Pomerene iron and steel price-fixing bill, or some similar measure, would be passed by Congress, perhaps by the end of January. No such legislation is now seriously contemplated, either because Congress has been kept too busy with other matters or because the regulation of prices by agreement between the Government and the producers has worked so satisfactorily. The regulation has certainly been a success, for with inconsequential exceptions the producers have been scrupulous to follow to the limit the letter and spirit of all regulations that have been promulgated. The War Trade Board would, of course, be disposed to seek lower prices if such a revision could be compassed, while for strategic reasons the manufacturers would naturally enter the coming conference with a plea for higher prices. Undoubtedly the real debate will be as to the period of time for which the present prices shall be extended. As changes that might be made in future would be downward rather than upward the producers will contend for the reaffirmation of prices for a long period, or to the end of the present year, using the contention that extending prices for a short period at a time tends to lessen the stability of the market.

The authorities at Washington are presumably too well posted to give much heed to the contention sometimes made, chiefly in the newspapers, perhaps, that certain smaller manufacturers require higher prices. Frequently the contention takes the form that plate mills that must buy their slabs cannot get them at the present set price of $50, or cannot convert them into plates at a profit at the set price for plates of 3.25c. So far as stimulating production is concerned there is nothing in the argument, for there is more plate capacity in the country than slab capacity. The largest producer of all, the Carnegie Steel Company, has not been able to operate its new Liberty plate mill fully because it could not produce enough slabs.

What Curtails Production?

At this time there is some danger involved in accepting the universally given explanation of the light rate of production of finished steel, that explanation being that production is limited by the ability of the railroads to accept shipments of finished steel, the production being correspondingly limited because mill warehouses and yards are already filled and the mills, therefore, are in position to produce only the material that they can ship. Undoubtedly this situation obtained in January. Previously the limitation in production had been the insufficient supply of pig iron, the production of pig iron having been restricted because the railroads were not moving enough coke and coking coal. It is a question, however, whether the situation to-day is the same as it was in January, whether the traffic situation is wholly responsible for the reduced output of finished steel.

New Embargo Rules

There are numerous railroad embargoes, and to ship into or through an embargo a railroad permit is necessary. Formerly the railroad rule was that the permit could be sought by either the shipper or consignee. By a new order, early in February, it is required that the consignee, and not the shipper, apply for the permit. There are no data available as to the proportion of permit applications that are granted, but it is a fact that they are granted with considerable freedom. It will readily be seen that if consignees do not apply for permits they are not granted, and if the total tonnage for which permits are available is small, a semblance of justice can be maintained by claiming the trouble is with the railroads, whereas a considerable part of it may be due to the consignees failing to apply for permits because they do not want the material. The bald fact is that it is a question whether the present light output of finished steel, now about 65 per cent. of capacity against an average of about 55 per cent. in the first five weeks of the year, is due altogether to insufficiency of transportation or in part to insufficiency of demand.

While very little is openly said about the lightness of commercial demand for steel, apart from all war requirements, it is a fact that some of the leading producers have very serious doubts whether there is going to be enough demand to keep them operating at the rate that will be permitted by traffic conditions, which are constantly improving. There is a distinct possibility that in the near future competitive conditions will develop such as to make open market prices lower than the set prices. This would occur first, of course, in the finished steel products that are required in smallest volume for war purposes. By common consent plates are regarded as the greatest war essential, in proportion to supplies available, and yet there is the interesting fact that while

(Continued on page 78.)

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago | 37 50 |
| Standard low phos., Philadelphia | |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 33 00 |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | | |
| Victoria | | 50 00 |

## FINISHED IRON AND STEEL

| Per lb. to Large Buyers. | Cents |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 5 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 5 75 |
| Chequered floor plate, 3-16 in. | 12 20 |
| Chequered floor plate, ¼ in. | 12 00 |
| Staybolt iron | 8 50 |
| Bessemer rails, heavy, at mill | |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | *3 50 |
| F.O.B., Toronto Warehouse | |
| Steel bars | 5 50 |
| Small shapes | 5 75 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

## FREIGHT RATES

Pittsburgh to Following Points

| | Per 100 lbs. C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 38.1 | 50.5 |
| Halifax | 39.1 | 51.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

## METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $32 00 | $29 00 |
| Electro copper | 32 00 | 29 00 |
| Castings, copper | 31 00 | 28 00 |
| Tin | 90 00 | 100 00 |
| Spelter | 11 50 | 11 00 |
| Lead | 10 50 | 9 00 |
| Antimony | 18 00 | 17 00 |
| Aluminum | 55 00 | 52 00 |

Prices per 100 lbs.

## PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¼ to ½ | $10 00 | $10 00 |
| Heads | 10 30 | 10 25 |
| Tank plates, 3-16 in. | 10 10 | 10 10 |

## WROUGHT PIPE

Effective Feb. 5, 1918.

| | Per | Galvanized |
|---|---|---|
| **Standard Buttweld** | Per 100 feet | |
| ⅛ in. | $ 6 00 | $ 8 00 |
| ¼ in. | 5 16 | 7 29 |
| ⅜ in. | 5 16 | 7 29 |
| ½ in. | 6 55 | 8 12 |
| ¾ in. | 8 28 | 10 41 |
| 1 in. | 12 24 | 15 39 |
| 1¼ in. | 16 56 | 20 82 |
| 1½ in. | 19 80 | 24 89 |
| 2 in. | 26 64 | 33 49 |
| 2½ in. | 42 72 | 53 53 |
| 3 in. | 55 85 | 70 00 |
| 3½ in. | 70 84 | 87 86 |
| 4 in. | 83 93 | 104 10 |
| **Standard Lapweld** | | |
| 2 in. | $ 29 60 | $ 36 08 |
| 2½ in. | 44 46 | 54 70 |
| 3 in. | 58 14 | 71 53 |
| 3½ in. | 72 68 | 90 62 |
| 4 in. | 86 11 | 107 37 |
| 4½ in. | 97 79 | 122 56 |
| 5 in. | 114 00 | 142 82 |
| 6 in. | 147 80 | 185 28 |
| 7 in. | 192 80 | 241 57 |
| 8 L in. | 202 50 | 253 75 |
| 8 in. | 233 30 | 292 32 |
| 9 in. | 279 50 | 350 18 |
| 10 L in. | 259 20 | 324 80 |
| 10 in. | 333 70 | 418 18 |

Prices—Ontario, Quebec and Maritime Provinces.

## WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

## OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 22 50 |
| Copper, heavy | 22 50 | 22 50 |
| Copper wire | 22 50 | 22 50 |
| No. 1 machine composition | 21 00 | 21 50 |
| New brass cuttings | 16 00 | 14 00 |
| Red brass turnings | 17 00 | 17 00 |
| Yellow brass turnings | 12 50 | 12 50 |
| Light brass | 10 00 | 9 50 |
| Medium brass | 14 00 | 12 00 |
| Heavy brass | 15 00 | 14 00 |
| Heavy melting steel | 21 00 | 21 00 |
| Steel turnings | 12 00 | 12 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 23 00 | 18 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 23 00 |
| No. 1 machine cast iron | 27 00 | 25 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 17 00 | 13 00 |
| Car wheels, iron | 26 00 | 25 00 |
| Steel axles | 38 00 | 35 00 |
| Mach. shop turn'gs | 9 00 | 8 50 |
| Cast borings | 12 00 | 12 00 |
| Stove plate | 19 00 | 19 00 |
| Scrap zinc | 6 50 | 6 50 |
| Heavy lead | 7 50 | 7 00 |
| Tea lead | 5 00 | 5 75 |
| Aluminum | 25 00 | 20 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, ⅜" and less | 10 |
| Carriage bolts, 7-16 and up | net |
| Coach and lag screws | 25 |
| Stove bolts | 55 |
| Plate washers | List plus 20 |
| Elevator bolts | 5 |
| Machine bolts, 7-16 and over | net |
| Machine bolts, ⅜ and less | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | 40 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | add 25 |
| Nuts, square blank | add $1 50 |
| Nuts, square, tapped | add 1 75 |
| Nuts, hex., blank | add 1 75 |
| Nuts, hex., tapped | add 2 00 |
| Copper rivets and burrs, list plus | 30 |
| Burrs only, list plus | 50 |
| Iron rivets and burrs | 15 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 37½ |
| Wood screws, O. & R., brass | 32½ |
| Wood screws, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

## MILLED PRODUCTS

| | Per Cent. |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil. Head Cap Screws | net |
| Flat But. Hd. Cap Screws | plus net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. & Semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2 in. | plus 10 |
| Studs | net |
| Taper pins | 40 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | list plus 20 |
| Collar screws | list plus 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | 65 |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add 7 00 |

## BILLETS

| | Per gr. ss ton |
|---|---|
| Bessemer billets | $47 50 |
| Open-hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.

F.O.B. Pittsburgh.

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails | $5 25 $5 20 |
| Cut nails | 5 70 5 65 |
| Miscellaneous wire nails | 60% |
| Spikes, ⅜ in. and larger | $7 50 |
| Spikes, ¼ and 5-16 in. | 8 00 |

## ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 41 |
| Plumbers' oakum, per lb. | 0 09 |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila rope | 0 33 |
| New Zealand hemp | 0 33 |
| Transmission rope, Manila | 0 45 |
| Cotton rope, ¼-in. and up | 0 47 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | net |

### MISCELLANEOUS

| | |
|---|---|
| Solder, [illegible] | [illegible] |
| Solder, guaranteed | 0 48 |
| Babbitt metals | 18 to 70 |
| Silver[illegible] copper, lb | 0 53 |
| Lead wool, per lb. | 0 16 |
| Putty, 100-lb. drums | 4 75 |
| White lead, pure, cwt | 16 00 |
| Red dry lead, 100 lb. kegs, per cwt | 15 50 |
| Glue, English | 0 35 |
| Tarred slater's paper, roll | 0 95 |
| Gasoline, per gal., bulk | 0 31½ |
| Benzine, per gal., bulk | 0 30½ |
| Pure turpentine, single bbls., gal. | 0 73 |
| Linseed oil, raw, single bbls. | 1 65 |
| Linseed oil, boiled, single bbls. | 1 68 |
| Plaster of Paris, per bbl. | 2 50 |
| Sandpaper, B. & A. | list plus 20 |
| Emery cloth | list plus 20 |
| Sal Soda | 0 03½ |
| Sulphur, rolls | 0 05 |
| Sulphur, commercial | 0 04½ |
| Rosin "D," per lb. | 0 03 |
| Rosin "G," per lb. | 0 03½ |
| Borax crystal and granular | 0 12 |
| Wood alcohol, per gallon | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

### CARBON DRILLS AND REAMERS

| | Per Cent |
|---|---|
| S.S. drills, wire sizes up to 52 | 30 |
| S.S. drills, wire sizes, No. 53 to 80 | 30 |
| Standard drills to 1½ in. | 30 |
| Standard drills, over 1½ in. | 30 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 20 |
| Bit stock | 25 |
| Ratchet drills | 15 |
| S.S. drills for wood | 30 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 40 |
| Sleeves | 40 |
| Taper pin reamers | net |
| Drills and countersinks...list plus | 30 |
| Bridge reamers | 52½ |
| Centre reamers | 10 |
| Chucking reamers | net |
| Hand reamers | 10 |

### COLD ROLLED SHAFTING

| | |
|---|---|
| At mill | list plus 40% |
| At warehouse | list plus 50% |

**Discounts off new list. Warehouse price at Montreal and Toronto**

### IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 8 00 | $ 8 25 |
| Sheets, black, No. 10 | 11 50 | 10 00 |
| Canada plates, dull, 52 sheets | 9 00 | 9 00 |
| Can. plates, all bright | 9 50 | 9 50 |
| Apollo brand, 10¾ oz. galvanized | | |
| Queen's Head, 28 B.W.G. | | |
| Fleur-de-Lis, 28 B.W.G. | | |
| Gorbal's Best, No. 28 | | |
| Colborne Crown, No. 28 | | |
| Premier, No. 28 U.S. | 9 45 | 9 20 |
| Premier, 10¾ oz. | 9 75 | 9 50 |
| [illegible] | 20 60 | 20 00 |

### PROOF COIL CHAIN

B

[illegible] in., $12.35; 5-16 in., $11.85; [illegible] in., $11.50; [illegible] in., $10.60; [illegible] in., $11.20; 9-16 in., $11.20; ⅝ in., $11.10; ¾ in., $11.00; [illegible] in., $10.80; [illegible] in., $10.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

**ELECTRIC WELD COIL CHAIN B.B.**

⅛ in., $15.50; 3-16 in., $11.70; ¼ in., $8.40; 5-16 in., $7.40; ⅜ in., $6.35; 7-16 in., $6.35; ½ in., $6.35; ⅝ in., $6.35; ¾ in., $6.35.

**Prices per 100 lbs.**

### FILES AND RASPS.

| | Per cent |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 40 |
| Black Diamond | 40 |
| J. Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 37½ |
| Disston | 50 |
| Whitman & Barnes | 50 |

### COAL AND COKE

| | |
|---|---|
| Solvay Foundry Coke | |
| Connelsville Foundry Coke | |
| Steam Lump Coal | |
| Best Slack | |

**Net f.o.b. Toronto.**

### BOILER TUBES.

| Size | Seamless | Lapwelded |
|---|---|---|
| 1 in. | $36 00 | $ |
| 1¼ in. | 40 00 | |
| 1½ in. | 43 00 | 36 00 |
| 1¾ in. | 43 00 | 36 00 |
| 2 in. | 50 00 | 36 00 |
| 2¼ in. | 53 00 | 38 00 |
| 2½ in. | 55 00 | 42 00 |
| 3 in. | 64 00 | 50 00 |
| 3¼ in. | | 58 00 |
| 3½ in. | 77 00 | 60 00 |
| 4 in. | 90 00 | 75 00 |

Prices per 100 ft., Montreal and Toronto.

### OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | |
| Royalite, per gal., bulk | 17 |
| Palacine | 20 |
| Machine oil, per gal. | 26½ |
| Black oil, per gal. | 15 |
| Cylinder oil, Capital | 45½ |
| Cylinder oil, Acme | 36½ |
| Standard cutting compound, per lb. | 0 06 |
| Lard oil, per gal. | $2 50 |
| Union thread cutting oil antiseptic | 88 |
| Acme cutting oil, antiseptic | 37½ |
| Imperial quenching oil | 39½ |
| Petroleum fuel oil | 13½ |

### BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30-5% |
| Standard | 40% |
| Cut leather lacing, No. 1 | 1 95 |
| Leather in sides | 1 75 |

### TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 06 |
| Emery glue | 15 to 20 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 35 |

**Prices Per Lb.**

### BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 38 |
| Brass sheets, 24 gauge and heavier, base | 0 43 |
| Brass tubing, seamless | 0 46 |
| Copper tubing, seamless | 0 48 |

### WASTE.

| White. | Cts. per lb. | | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 18½ |
| Peerless | 21 | X Empire | 17¼ |
| Grand | 19¾ | Ideal | 17¼ |
| Superior | 19¾ | X press | 16 |
| X L C R | 18½ | | |

| Colored. | | | |
|---|---|---|---|
| Lion | 15 | Popular | 12 |
| Standard | 13½ | Keen | 10½ |
| No. 1 | 13½ | | |

| Wool Packing. | | | |
|---|---|---|---|
| Arrow | 25 | Anvil | 15 |
| Axle | 20 | Anchor | 11 |

| Washed Wipers. | | | |
|---|---|---|---|
| Select White | 11 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING.

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

### ANODES.

| | |
|---|---|
| Nickel | .50 to .54 |
| Cobalt | 1.75 to 2.00 |
| Copper | .44 to .46 |
| Tin | .49 to .56 |
| Zinc | .23 to .25 |

**Prices Per Lb.**

### COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | 42 50 | 43 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 46 00 | 44 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 48 00 | 48 00 |
| Copper sheet, planished, 16 oz. base | 57 00 | 45 00 |
| Braziers,' in sheets, 6x4 base | 45 00 | 44 00 |

### LEAD SHEETS.

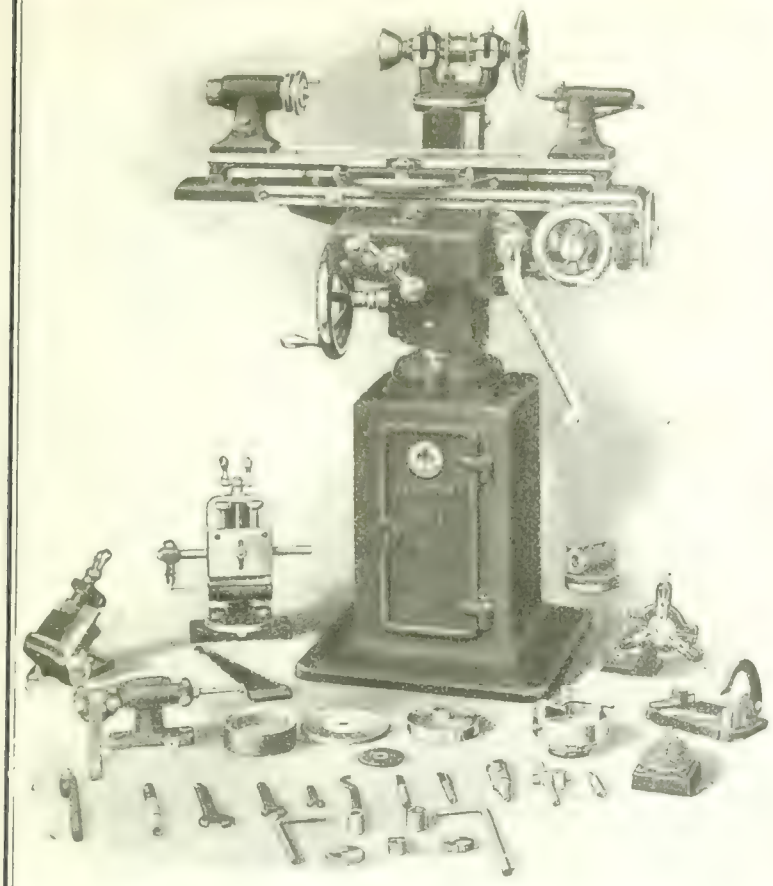
| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $13 25 | $13 25 |
| Sheets, 3½ lbs. sq. ft. | 13 25 | 13 25 |
| Sheets, 4 to 6 lbs. sq. ft. | 12 50 | 12 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS.

| | |
|---|---|
| Acid, boracic | $ .15 |
| Acid, hydrochloric | .05 |
| Acid, hydrofluoric | .14½ |
| Acid, nitric | .10 |
| Acid, sulphuric | .05 |
| Ammonia, aqua | .08 |
| Ammonium carbonate | .15 |
| Ammonium, chloride | .11 |
| Ammonium hydrosulphuret | .40 |
| Ammonium sulphate | .07 |
| Arsenic, white | .12 |
| Copper, carbonate, anhy | .35 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .70 |
| Iron perchloride | .20 |
| Lead acetate | .16 |
| Nickel ammonium sulphate | .12 |
| Nickel carbonate | .35 |
| Nickel sulphate | .15 |
| Potassium carbonate | .75 |
| Potassium sulphide (substitute) | .20 |
| Silver chloride (per oz.) | .65 |
| Silver nitrate (per oz.) | .55 |
| Sodium bisulphite | .10 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .41 |
| Sodium hydrate | .04 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | .14 |
| Tin chloride | .60 |
| Zinc chloride | .60 |
| Zinc sulphate | .09 |

**Prices per lb. unless otherwise stated.**



# A Cutter Grinder that

## IS ALSO | a Cylindrical Grinder<br>a Surface Grinder<br>an Internal Grinder

That's the Le BLOND Universal Tool and Cutter Grinder. It is a complete toolroom machine—sharpens all sorts of cutters, including large face mills and saws.

The AUTOMATIC TABLE FEED enables you to do cylindrical, internal or surface grinding with the greatest facility.

### SPECIFICATIONS:

| | | | |
|---|---|---|---|
| Swings | | 8" dia. x 17" | between centres |
| Table, working surface | | 29" x 5¼" | |
| Longitudinal feed (automatic | | 15" | |
| Vertical feed | 7⅝" | Grinds cutters to | 18" dia. |
| Cross feed | 6¼" | Grinds saws to | 36" dia. |

**IN STOCK TORONTO** *Send for catalog describing this machine.*

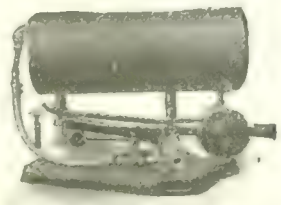
**The A. R. Williams Mach'y Co.**
Limited
64 Front St. W. Toronto

# Morehead
# Back to Boiler SYSTEM

**Gives More Steam Using Less Coal**

Hundreds of steam users have taken our advice. Some are now saving at least 5% in their operations. Others a good deal more. Let us turn the searchlight of our knowledge on your plant. What we have done for others we can probably do for you. Twenty-five years' experience in heating and draining system.

*OUR ADVICE IS FREE. The facts about [illegible] cost us nothing.*



**Canadian Morehead Manufacturing Co.**
Dept. L
Woodstock - Ont.

Special Header for the City of Belleville Water Works
size 21-ft. 3-in. x 30-in. diameter

# BOILERS Upright or Horizontal

# STEEL PLATE WORK

**of any description**

STEEL TANKS for any purpose, any size or shape.

STEEL FLUMES for water sewers, any length or diameter.

STEEL PIPING, light or heavy, straight or curved.

STEEL SMOKE STACKS, Stack Pipe, Smoke Breeching, etc.

STEEL AIR RECEIVERS, [illegible] for any pressure.

*Workmanship Right and Prices Right.*
*Let us estimate on your work.*

**Marsh Engineering Works, Ltd.**

*NOTE NEW NAME*

BELLEVILLE - - ONTARIO

*It will [illegible] interests you [illegible]*

### PITTSBURG MARKETS

[illegible] for the Government, its Allies and the domestic [illegible] has recently been bid on plates for export, a class of trade to which the set [illegible] If [illegible] thing occurs in plates, something still more striking may occur in merchant bars, in which the productive capacity is over 5,000,000 tons a year, while the war demand is relatively light.

There is a heavy demand for oil country goods, while demand for small sizes of pipe is light. There is a moderate demand for sheets, not all of it satisfied, but owing to limited supplies of steel the sheet mills are operating at only about 40 per cent. of capacity.

### PULP AND PAPER EXPORTS

R. A. PRINGLE, K.C., Canada's paper controller, recently addressed the Canadian Forestry Association on "Some Aspects of Canada's Forestry Problem." He said that during the year ending March 31, 1917, the exports of pulp and paper from this country totalled $40,000,000. He called attention to the fact that Canada was supplying one-third of the newsprint used in the United States, partly in the finished product and partly in the raw material, and the requirements of the United States in pulpwood were 600,000 tons a day. Pulpwood has increased in value, he said, and brought from $2 to $7 a cord on the stump.

"A point of extreme interest," he said, "is the fact that the quantity of pulpwood manufactured in Canada is steady gaining on the amount exported unmanufactured. The figures for 1916 show more than 1,700,000 cords to have been manufactured in Canada, while 1,000,000 cords were exported in the raw state. If the latter amount were manufactured in Canada it would have a market value of $40,000,000."

Canada stood third among the countries of the world with regard to forest possessions, he asserted, Russia and the United States having greater forest resources.

### FREIGHT TO GO SHORTEST WAY

SWEEPING changes in freight arrange[illegible] of the railways in Ontario will go into effect as a result of a special report ordered by the Canadian Railway War Board, and due to be presented at an early meeting of the special committee. These will remove the last vestiges of indirect routing in the only part of Canada where this condition exists. Experts are completing the new routings for freight travelling between points in Ontario. A car will then move by the shortest route, irrespective of what lines it covers. It will mean the cancellation of certain tariffs. Traffic men of all lines are watching closely to see the results [illegible] there is a great chance for the board having the work in hand to do a work that will ac-

# Enlarged Canadian Trade Intelligence Service

**Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.**

CHILE—Valparaiso, British Consul General.

COLOMBIA—Bogota, British Consul, General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT—Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General..

INDIA—Calcutta, Director-General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul. Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA—Caracas, British Vice-Consul.

BRAZIL—Bahia, British Consul. Rio de Janeira, British Consul General.

# Canadian Commercial Intelligence Service

**The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.**

### CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address, Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Ploesch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, 73 Basinghall Street, London, E.C.2, England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Anne's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Cantracom.

### CANADIAN COMMERCIAL AGENTS.

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—C. E. Sontum, Grubbegd No. 4 Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

### CANADIAN HIGH COMMISSIONER'S OFFICE.

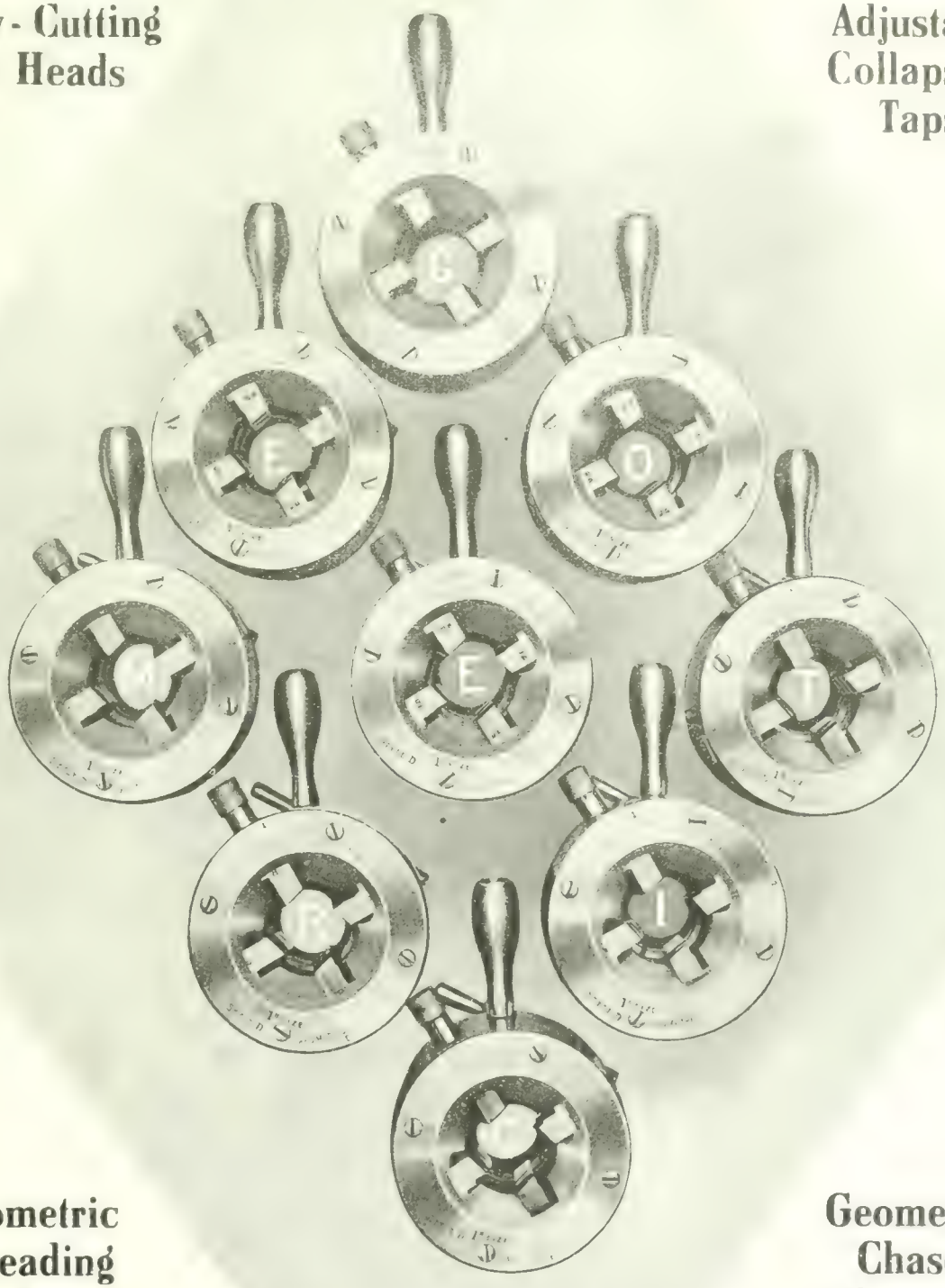
UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

# GEOMETRIC

The Magic Name Among Manufacturers of Screw Threads

**Geometric Screw-Cutting Die Heads**

**Geometric Adjustable Collapsing Taps**



**Geometric Threading Machines**

**Geometric Chaser Grinders**

WE CAN HELP YOU

The Geometric Tool Company, New Haven, Conn., U.S.A.

*CANADIAN AGENTS:*

Williams & Wilson, Ltd., Montreal. The A.R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B.

# INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

## ENGINEERING

**Hamilton, Ont.**—The Imperial Oil Co. contemplate erecting a boiler and pump [illegible] Head office, Church street, Toronto.

**Amherstburg, Ont.** The Brunner, Mond Co. propose the construction of a water works pump house and intake pipe in the Detroit River.

**Port Colborne, Ont.**—The Canadian Furnace Co. had their second ore bridge blown down in the storm last week, the damage being estimated at $100,000. The other ore bridge was blown down last year, and is now being rebuilt.

**Brantford, Ont.**—The Dominion Steel Products Co., will shortly commence operations in their new plant. One building 90 feet by 225 feet is completed and another building 100 feet by 300 feet is nearly finished. The company has on hand some large war contracts from the United States.

**Toronto, Ont.**—H. C. Anderson and C. G. Sheldon, representing the Northern Coal Operators' Association, have arrived in the city to impress upon the people of Ontario that the lignite coal mined in Alberta can be brought into this province in case of emergency. They have come here to arrange, if possible, an Eastern movement from the Western mines. Shipments by rail, Mr. Anderson claims, would be the rule, and the freight charges would be about $5 per ton.

**Fort William, Ont.**—The Canadian Car & Foundry Co. has awarded the contract for the buildings at the new shipbuilding plant at Fort William to the Dominion Bridge Co. The Bridge Co. must, under the contract, finish the building in six weeks. This is an indication that the actual shipbuilding operations will be commenced as soon as possible. The contract was for twelve mine sweepers 143 feet long by 22 feet beam, the price being given as $2,500,000. The company is now turning out 25 box cars a day at the Fort William car works.

**Victoria, B.C.** — British Columbia's campaign for the establishment of steel mills and government assistance in developing her vast iron reserves secured more momentum when a mass meeting, addressed by representatives from the island and mainland, was held here recently. Resolutions were passed calling for co-operation between the provincial and federal governments, and for giving the provincial minister of mines additional power in expropriating mine property in British Columbia, and also urging the British Columbia Government to appoint independent experts to make an investigation and report on the situation.

**Quebec, Que.**—With the exception of the closing of some temporary sluices, the great dam at the head of the St. [illegible] this province the largest artificial water storage in the world. The reservoir has an area of not less than 300 square miles. It is the completion of a work which has involved more than five years of investigation and construction, and an expenditure not far short of $3,000,000. On July 25, 1915, the contract was finally awarded to the St. Maurice Construction Co., who made an arrangement under which the supervision and organization of the contract work was placed in the hands of Messrs. Fraser, Brace & Co. of Montreal.

## ELECTRICAL

**Kingston, Ont.**—The Utilities' Commission has decided to buy four 40 k.w. transformers for the hosiery mill, and a meter for the Campbell power line. A transformer for the street railway will also be purchased from the Canadian General Electric Co., in place of one ordered but not delivered from a firm in the States.

**Vancouver, B.C.**—The C.P.R. is not going to undertake any construction this year, according to Grant Hall, vice-president and general manager of the railway, who is in Vancouver to-day, but he said the company intended spending between $6,000,000 and $7,000,000 in maintenance and betterment.

## BUILDING

**Toronto, Ont.**—Fire at the Hunter-Rose Building at 12 Sheppard street, did damage estimated by the Fire Deparment at $15,000 ($10,000 to the contents and $5,000 to the building). The loss is covered by insurance.

## MUNICIPAL

**Toronto, Ont.**—The Board of Control has placed $50,000 on the estimates for new water meters.

**North Bay, Ont.**—The town council has decided to purchase a steam pump for the waterworks department.

**Three Rivers, Que.**—The city council is in the market for a centrifugal pump of 3,000 gallons capacity and a 200 h.p. oil engine.

**Kingston, Ont.**—Beginning the 1st of March, the price of gas will be $1.50 a thousand cubic feet, an increase of twenty-five per cent. on the present rate of $1.20, and of fifty per cent. on the rate of one dollar which was charged one year ago. The Utilities Commission at its meeting recently decided that an increase was absolutely necessary.

**Kingston, Ont.**—Manager Folger, of the Utilities' Commission, will report at the next meeting as to the cost of rearranging the smoke stack and some other machinery which was in use when the electric generators were driven by steam, which it is proposed to change over to the gas plant now. It was expected that the work would cost about $1,000 and it was thought better to get a closer estimate of the cost.

**Victoria, B.C.**—Public works expenditures in the province for the fiscal year 1918-1919 will be little short of two million dollars if the Legislature accepts the estimates which the Public Works Department has prepared. It is said that the proposed works expenditure for the next fiscal year marks an increase of from ten to fifteen per cent. over the amount spent on public works for the year which will close on March 31 next. The estimates for the year now coming to an end show a total of $1,800,600 for public works, and it can therefore be assumed that the estimates for the approaching fiscal year will be at the round two-billion mark.

## CONTRACTS

**Bassano, Alta.**—The Canadian Allis-Chalmers, Ltd., have been awarded the contract for a pump and 75 h.p. motor for the town council.

**Brantford, Ont.**—The Canadian Westinghouse Co., Hamilton, has secured the contract for motor and electrical equipment for the sewage pumping station here.

**Lethbridge, Alta.**—The Canadian General Electric Co., of Toronto, has been awarded the contract for the new 1,200 kilowatt turbo-generator for the civic power house.

## PERSONAL

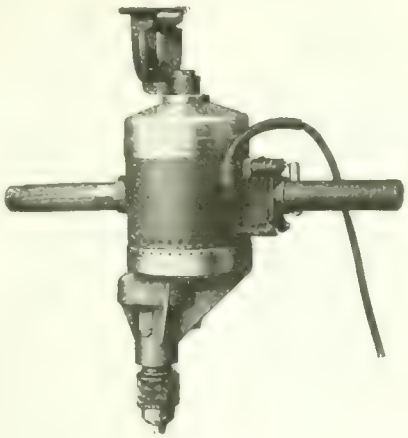
**Bernard Baruch** has been named chairman of the United States War Industries' Board, succeeding Daniel Willard, resigned.

**Edward C. Fry**, for more than half a century Lloyd's agent at Quebec, died recently after a brief illness. He was born at Bristol, England, and was recognized as one of the best informed shipping men in that city.

**Reginald Beaumont** has been appointed assistant manager of the G. T. P. Steamship Lines, with headquarters at Prince Rupert, B.C. Mr. Beaumont has been assistant to the manager at Prince Rupert for the past eight years.

**John G. Kent** has been appointed permanent managing director of the Canadian National Exhibition. Mr. Kent has acted for many years as member of the board of directors, as president, and as honorary manager. He is president of the Toronto Board of Trade.

**J. J. Scullan**, formerly general superintendent of the Davenport Works of Canadian Allis-Chalmers, Ltd., Toronto, and latterly manager of that firm's shipyard at Bridgeburg, Ont., has been ap-



**This Fool-proof Portable Drill**

operates on either Direct or Alternating Current—on Alternating, any frequency from 20 to 60 or 80 to 125 Cycles (Single or Split phase).

The clean, fast way is the Van Dorn Electric Way.

Write to-day for Booklet.

# Aikenhead's

## The Headquarters in Toronto for Van Dorn Drills

# Van Dorn ELECTRIC TOOLS

In the greatest drive for maximum production in man's history, Van Dorn Portable Electric Drills are demonstrating their true worth.

**Capacity in Solid Steel**

| | | | |
|---|---|---|---|
| DAOOO - | 3/16 in. | DA1 - | 1/2 in. |
| DAOO - | 1/4 in. | DA1X - | 5/8 in. |
| DAOOX - | 5/16 in. | DA2 - | 7/8 in. |
| DAO - | 3/8 in. | DA2X - | 1 in. |

**AIKENHEAD HARDWARE LIMITED**

**17, 19, 21 Temperance Street - Toronto, Canada**

# Drill, Ream, Tap

## at Top-Notch Speed

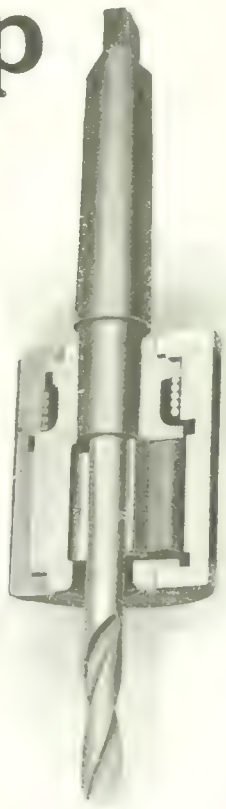
Use the Chuck used in the big machine shops of Canada—in the shops ahead of others, both for quantity output and quality work. Use the

**Wahlstrom Automatic Chuck**
**No Keys No Collets**

It perfectly self-centers the tool automatically, enabling the operator to make tool changes in less than two seconds without stopping spindle.

The cam action is such that the resistance on the tool increases the holding power of the jaws. A tool is never marred or marked, still it never slips.

You need the Wahlstrom Chuck. Made in two styles—one for straight shank tools and the other for taper shank tools.



# Aikenhead's

**17, 19, 21 Temperance Street**
**TORONTO, CAN.**

*Write to-day for Wahlstrom Booklet*

# Canadians Must Be Told Truth About The War

## Dr. Dillon Discovers a New Danger in an Old Shape "Ritzonian" a Menace to Victory.

S truth about the war that they sacrificing our sons, husbands, fathers and resources—piling up taxes blindly—kept in darkness because of a few weak-minded, excitable editors, who see things through dark spectacles, or because old party hacks in Cabinet jobs fail to recognize their own incapacity; or because some big profiteers wish things to continue as they are?

FINANCIAL vital importance to Canadian business, authorities are with THE POST in its

**POST Readers NOT "Ritzonian"**

In this special article appears Dr. Dillon's definition of a "Ritzonian"—the type of man who is "muddling through" the war —"one who loves indolence and luxury, loathes system, shuns effort, feels an insolent contempt for merit and labor, and fancies himself fitted to undertake a task of any magnitude." Here you have a type which is the very opposite to the type of readers of THE FINANCIAL POST.

**A Real Business Newspaper**

Accurate, readable, concise, complete, THE FINANCIAL POST is pre-eminently the business newspaper for alert men of affairs with Canadian interests. From this brief list you will get a fair idea of the range of business news contained in this week's issue of THE FINANCIAL POST.

Outlook for Continuation of Shell-Making
The Exchange Situation is Brightening
Chinese for Canadian
Railway Halves its Dividend
Effect of Victory Loan on Bank Statement
Precarious Future of Street Railways
Bond Market Still Absorbs Large Issues
No Tax Relief for Halifax Sufferers
Improvement in Position of Steamships
Steel Merger on Par Basis With Boats Out
War Business Not to Prevent Other Business
Halifax Power Co. Has Changed Plans
Must Meet Cost of War by Daily Savings
Encouraging Showing by British Trade

While these headings by no means cover the entire contents of this week's FINANCIAL POST, they will indicate to you the wide field thoroughly covered by this outstandingly good business newspaper. To gain a more intimate knowledge of the value of THE FINANCIAL POST to you in your business send for a sample copy, or if you prefer to make a still more extended test, order a subscription. The little coupon below will help you. You have only to sign and send it.

The MacLean Publishing Co.,
153 University Ave., Toronto.

Send me THE FINANCIAL POST each week till further ordered. I will send subscription price ($3.00 per year) on receipt of bill, or you may draw on me

THE FINANCIAL POST (current issue). Cross out if not required.

C.M.


pointed manager of hull construction for the Marine Boat Corporation of New York.

**James Lynn Rodgers**, recently appointed Consul General in Canada for the United States, has taken up his duties at Montreal, replacing Vice-Consul Bradley, who retired some weeks ago. Mr. Rodgers was consul-general at Havana. He is a native of Columbus, Ohio, and entered the U. S. service in 1915, as consul-general at Shanghai.

# TRADE GOSSIP

**Marsh & Henthorn Ltd.**, of Belleville, Ont., announce that the title of the concern has been changed to the Marsh Engineering Works Ltd.

**Platinum Commandeered in the U. S.** —Orders have been issued for the commandeering for war purposes of all crude and unworked platinum in the hands of importers, jobbers and wholesalers.

**Montreal, Que.**—In order to obtain more factory space for their increasing activities, the Mason Regulator and Engineering Co. of Montreal are vacating their present factory for more commodious quarters at 135-153 Dagenais Street. The head office of the company will still be maintained at 380 St. James Street.

**Mining, Metallurgical and Chemical Supplies.**—A London (England) firm of engineers and contractors, manufacturing designing and engineering plants and supplying machinery and materials of every description, desires to correspond with Canadian companies to whom its services may be of interest. (Address, British Trade Commissioner in Canada, 363 Beaver Hall Square, Montreal, referring to British Trade Inquiry No. 2934.)

**Customs Receipts Show Big Increase.** —An increase of $15,382,197 in customs receipts for the 11 months of the fiscal year ending Feb. 28, as compared with the same period last year, is shown by the monthly statement of the Customs' Department issued at Ottawa recently. Customs receipts for the 11 months of the present year were $146,122,186, while last year they amounted to $130,739,989. Receipts for the present month were $9,559,480.

**Locomotive Building Steel Requirements.**—Locomotive builders in Canada and the United States will require about 76,000 tons of forged rolled and cast steel for the building of 383 locomotives, orders for which have been taken since the first of the year. The largest contracts have been placed with the American Locomotive Co., while the Montreal Locomotive Works and the Canadian Locomotive Co. have also secured important contracts.

**Browning Gun Adopted for U. S. Army.** —Without a single malfunction, the Browning automatic machine guns, light and heavy, which have been adopted for use by the American army, were publicly demonstrated and tested by the Ordnance Department of the U. S. army on Feb. 27, on the Government rifle range at Congress Heights, several miles southeast of Washington. They have been finally approved and adopted as the official light and heavyweight machine guns for the United States army.

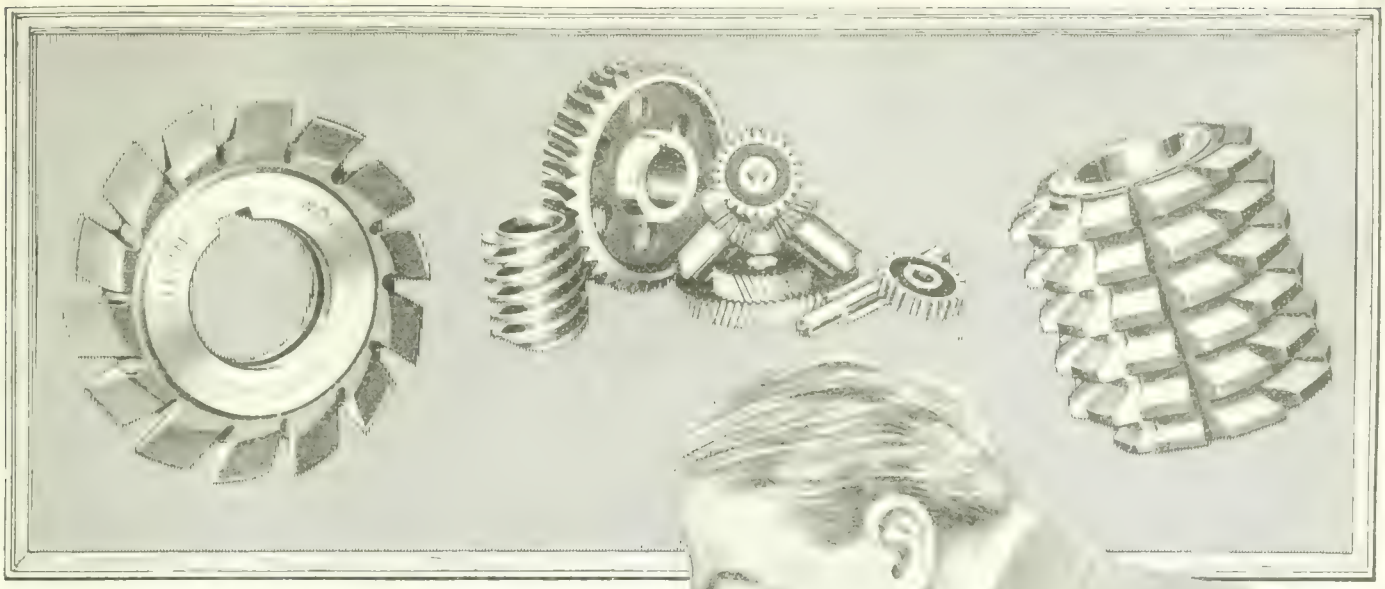
**Mining Institute Will Meet in Montreal.** Keen interest is being shown by mining men and metallurgists in the coming meeting of the Canadian Mining Institute to be held in Montreal on March 6, 7 and 8 next. Special significance is attached to the meeting due to the number of problems of national importance that have been introduced for discussion. Among others affecting this district will be a paper on the groch system of flotation, and a paper by Alfred Whitman, entitled, "Restudy of the Cobalt area."

**Large Freight Car Orders in the U.S.** —The prospective Government orders for between 100,000 and 150,000 freight cars will be the largest contract ever placed in the history of the equipment business in the United States. Even at the estimated average cost of $3,500 per car, something like $350,000,000 would be involved in an order for 100,000 cars, and it is understood that there are also under consideration orders for something like 2,000 locomotives to be placed when the car contracts are out of the way.

**Hydro Commission Gets Extra Power.** —The Ontario Hydro-Electric Commission has secured from the Canadian Niagara Power Co. 20,000 horse-power which they have been deprived of for a month or two as a result of the breaking down of two generators at the Canadian Niagara plant. When the machines went out of commission the Hydro asked the Canadian Niagara Co. to supply the power by cutting down on exportations to Buffalo. The company refused, and the Hydro, in spite of appeals to the Power Controller, was unable to get its way.

**Peter Lyall Construction Co. Busy.**— A statement recently issued by the Peter Lyall Construction Co., of Montreal, states that the company's plants have been working practically to capacity throughout the year, and orders on the books are said to be sufficiently large to keep the plants busy for many months to come. At the present time work is going ahead on contracts for the American Government, and shipments will go forward before a great length of time. No particular activity is reported in the construction department, but the company is steadily working on the Parliament Buildings at Ottawa, as well as on the terminals in that city.

**Canada Copper Corporation Developments.**—The Canada Copper Corporation is reported to be speeding the advance of the tunnel which is to become the avenue of development as well as for removal of copper-bearing ore. General Manager Lachmund stated that the tunnel will tap the ore at a depth of 1,000 feet below the highest outcrop. Operations were started on Oct. 10, 1917. The total length of the tunnel on Jan. 31 last was 2,067 feet, and the total length timbered was 200 feet. The dimensions of the tunnel are 9 by 11 feet. The aver-



# A Helpful, Technical Service for Gear Makers

THIS Company maintains a completely equipped department for the designing and execution of SPECIAL hobs and cutters: a broad, constructive work which our engineers have been developing since the founding of this business. It has become an important, permanent feature of our service, now at the disposal of all who are confronted with perplexing tool problems, especially hobbing.

We would welcome the opportunity to demonstrate how you could use this service to advantage, and cordially invite you to confer with our Engineering Department in person or by letter.

## ILLINOIS TOOL WORKS

MANUFACTURERS AND DESIGNERS OF

CUTTERS · HOBS · REAMERS

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*If any advertisement interests you, tear it out now and place with letters to be answered.*

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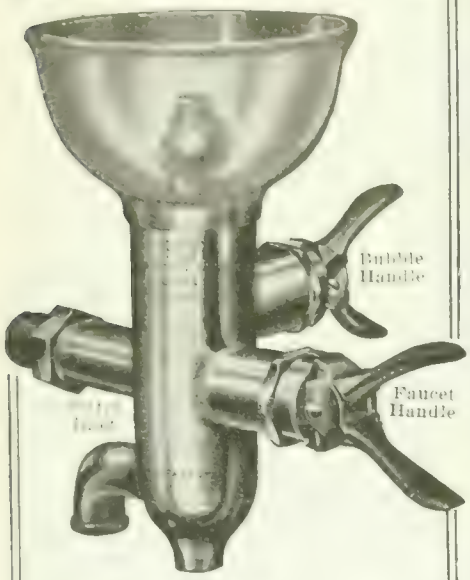
MADE IN CANADA
Saves Dollars

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YOUR WATER SUPPLY
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THE IRON WORKS
LIMITED
Successors to
Owen Sound Iron Works
Owen Sound, Ont.
Engineers
Boiler-makers
Founders
Machinists
Tank Work
Smoke Stacks,
Grey Iron and Brass Castings,
Special Machinery
Made to Order

age rate of advance was 18 1/2 feet a day.

**Plan Big Outlay on Hydro System.**—Estimated expenditures of over $9,000,000 for Hydro Electric extensions, of which $4,175,000 is to pay for work on the Chippawa Creek development, are included in the Ontario Provincial estimates totalling $9,741,662. For Niagara system extension the sum of $2,865,000 is being voted, for the Central Ontario system extensions $588,000, for the Severn system $105,000, Eugenia Falls system $233,000, Port Arthur system $150,000, St. Lawrence system $251,000, Rideau system $117,000, Nipissing system $60,000, and for service buildings and miscellaneous, the sum of $100,000 is asked.

**Vancouver, B.C.**—This city's first bulk shipment of grain has arrived safely at a British port, according to word received here. A steamer which was loaded at the Government elevator here in November with 100,000 bushels of wheat from the prairies, made the journey safely to the United Kingdom via the Panama Canal, and now word is awaited anxiously as to the condition in which the grain in this test shipment reached its destination. The shipment was accompanied by A. W. Alcock, of Winnipeg, grain expert, and assistant chemist of the Canadian Board of Grain Commissioners, who is to observe the condition of the grain at all stages of the voyage.

**Canadian Locomotive Co. Secures Government Contract.**—President H. J. Harty of the Canadian Locomotive announced recently that the company had closed a contract with the Department of Railways and Canals at Ottawa to build ten new locomotives to be used on the Canadian Government railways. Of the ten engines, six are to be six-wheeled switchers, the engine and tender to weigh when in working order about 251,000 pounds, and four are to be ten-wheeled narrow gauge ones, the engine and tender to weigh when in working order about 162,900 pounds. The latter four engines are to be used on the Prince Edward Island railways. The ten engines are to be completed for delivery in June.

**Conference on International Standards.**—The arrival in England of delegates from Allied nations for a conference on international standards was announced recently by the Aircraft Board at Washington. The conference will undertake, it is said, a standardization of manufacturing materials as related to the production of machinery, motors, aircraft, etc. The American delegation is headed by F. G. Diffen, of the Aircraft Board, and included members from all the prominent engineering societies of the country, of the Aircraft Board, the advisory committee for aeronautics, the signal corps, the navy and the original international aircraft standards board, of which the conference is said to be an outgrowth.

**Will Start Building Government Ships.**—The Canadian Vickers Co., which has commenced work on the first steel steamer of 4,350 tons burden, is to lay down a second of 8,200 tons and it is expected a contract for a third ship of 9,500 tons will soon be made with the Collingwood Shipbuilding Co. The Government's shipbuilding programme contemplates the laying down of the keels of some forty ships to June, 1919. Of this number, four of 5,000 tons and 6 of 8,200 tons are to be built on the Pacific coast. Arrangements have been made whereby the Government is assured of a supply of ship plates and steel materials for its programme. Orders for steel for the Canadian Government would, it is understood, be placed by the United States Purchasing Commission with various American steel companies.

**Traction Engines and Parts Admitted Duty Free.**—By order-in-council, under the War Measures' Act, now in effect, it is provided that:—"During the period of one year from Feb. 7, 1918, remission and refund of duty is hereby authorized in respect of traction engines costing not more than one thousand four hundred dollars in the country of production, designed to be moved by steam or other motive power for farm purposes, and parts thereof for repair; and traction attachments designed and imported to be combined with automobiles in Canada for use as traction engines for farm purposes and parts thereof for repair." In order to expedite importation and delivery of the above articles, they must be entered at the custom house as free of ordinary duty and war tax, on the usual form of entry for home consumption (B-1) until Feb. 8, 1919. The articles should be set forth in the entry in the words by which they are above described.

## TENDERS

**Chatham, Ont.**—The city council contemplate undertaking extensive improvements to the waterworks system.

**Fredericton, N.B.**—The city council are considering calling for tenders for pumps for the waterworks.

**Verdun, Que.**—Tenders will be called this year for repairs and reinforcements to waterworks and electric plants at a cost of $50,000 for the town council.

**Melbourne, Australia.**—Tenders for the following may be addressed to the Director of Navy Contracts, Navy Office, Melbourne: Supply, delivery and erection at Garden Island, of one (1) 200 horse-power prime mover set of either semi-Diesel type or other heavy oil engine direct coupled to 2-65 K.W. 240 volt D.C. electric generating set. All accessories, tank and fittings to be supplied by tenders as per specification. Date of closing, June 7, 1918. Tender forms are open for inspection at the Department of Trade and Commerce, Ottawa. File No. 20117.

**Ottawa, Ont.**—Tenders will be received until March 25, 1918, for the switchboards, panel boards and transformers required in the reconstruction of the Parliament Buildings. All tenders to be based on the execution, completion, and

delivery on the site, together with the furnishing of all material, tools, appliances, labor, etc., for the work as required and described by the plans and specifications for switchboards, panel boards and transformers. Plans and specifications and any other information required can be obtained at the office of the general contractor, P. Lyall and Sons Construction Co., Ottawa.

**Ottawa, Ont.**—Tenders will be received until March 18, 1918, for rolled steel casements and bronze covered frames and sash for the Parliament Buildings. All tenders to be based on the execution, erection and completion; together with the furnishing of all materials, tools, appliances, labor, etc., as required and described by the plans and specifications for (a) rolled steel casement; (b) bronze covered frames and sash. Separate tenders to be submitted for "a" and "b." The work included under this contract shall be commenced immediately on the signing of the same or at such time as may be directed, and be carried out in such a manner as to insure the completion thereof by Sept. 30, 1918.

**Ottawa, Ont.**—Tenders will be received until March 18, 1918, for heating and ventilating equipment required in the reconstruction of the Parliament Buildings. All tenders to be based on the execution, erection, and completion, together with the furnishing of all materials, tools, appliances, scaffolding, apparatus and labor required for the installation of the heating and ventilating equipment as called for in the plans and specifications. All information can be obtained at the office of the general contractors, P. Lyall & Sons Construction Co., Ottawa. A set of plans and specifications may be had by depositing an accepted bank cheque for twenty-five ($25.00) dollars, made payable to the Honorable the Minister of Public Works, which will be returned if the intending bidder submits a regular bid.

**Toronto, Ont.**—The city architect has issued to the Toronto Harbor Commission a permit for the erection of ferry sheds at the foot of Bay street to replace those destroyed by fire. The new buildings will cost $10,000.


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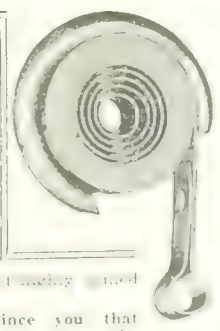
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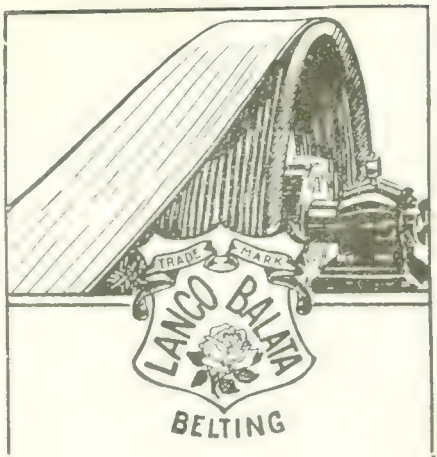

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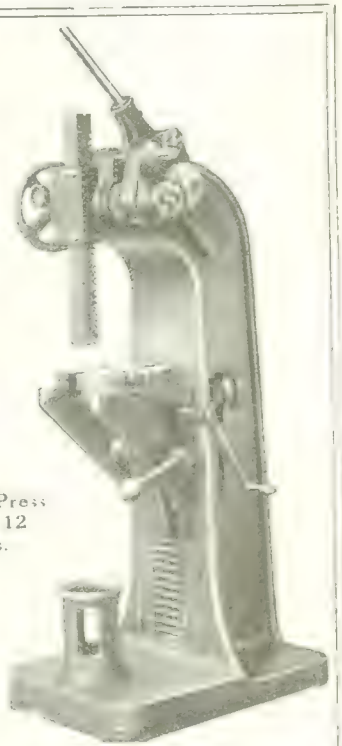
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# Lloyd George

## and the War

COL. JOHN BAYNE MACLEAN contributes to the March issue of MACLEAN'S MAGAZINE a strong article dealing with the need for efficiency in the Lloyd George Government and giving interesting information with reference to the young man who is rapidly coming to the front in Imperial affairs—Sir Eric Geddes, the head of the Admiralty. This contribution is one of a notable series.

### "SIXTEEN MONTHS IN GERMANY."

**What a Canadian Prisoner saw and heard there and how he escaped," By John Evans**

This article presents a picture of conditions in Germany and gives many new facts with reference to what is going on in that country. The writer worked for sixteen months in the mines of Westphalia and came in close contact at all times with the miners. The story of his escape is a thrilling one.

### "CANADIANS IN MESOPOTAMIA."

**By a Canadian Medical Officer.**

Little has been known heretofore of the campaign in Mesopotamia. This article gives details of the campaign and of the part which Canadians are taking in it. It shows how the inefficiency of the first campaign has been done away with and how splendidly organized the British army now is. The article contains many interesting anecdotes of adventure on that front.

### "LABOR THE DOMINANT FACTOR."

**By Agnes C. Laut.**

This is an article on the war situation as it is developing on this side of the Atlantic, showing that labor is becoming a dominant factor. In the United States the antagonistic attitude of the labor union is dying out and being replaced by a strong desire to assist in war measures.

### "CANADA'S NEW BOSS."

**By H. F. Gadsby.**

A political article, dealing with the "man behind" Union Government. It gives interesting and exclusive information with reference to the political situation at Ottawa as it is developing since the election.

### "A CASUALTY."

**By Robert W. Service.**

A war poem which tells of an experience which actually happened to Service while driving a motor ambulance on the Western Front. It will be illustrated by C. W. Jefferys.

## Fiction in the March Number

"BY THE TIP OF AN EYELASH," by A. C. Allenson, illustrated by R. M. Brinkerhoff. A bright story combining business, love and horse racing.

"THE GARDEN OF SPICES," by L. M. Montgomery, illustrated by F. Weston Taylor. This is a most unusual and charming love story.

Two long instalments of the two serials "THE PAWNS COUNT," by E. Phillips Oppenheim, and "THE MAGIC MAKERS," by Alan Sullivan.

"THE GIRL ON THE VERANDAH," by Arthur Beverly Baxter, who wrote "The Man Who Scoffed," and "Mam'selle Butterfly."

## Regular Departments and Features

There are the regular features and departments: Review of Reviews; Business Outlook; The Investment Situation; The Nation's Business; Books; Women and Their Work. A food article by Miss Chapman is a feature, and a new Spring Department on Seeds and Garden Culture starts in this number.

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# CANADIAN MACHINERY

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Vol. XIX. TORONTO, MARCH 14, 1918 No. 11


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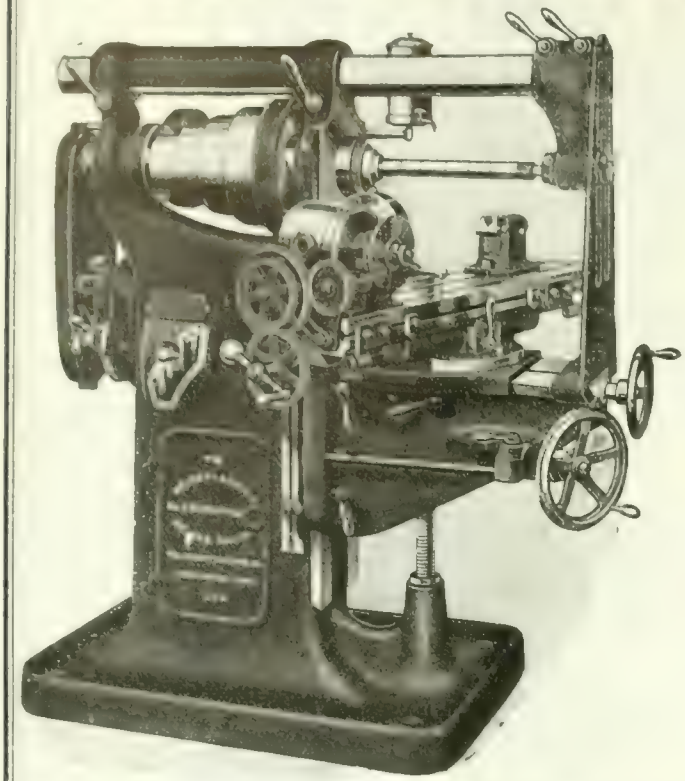

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# Some Considerations Regarding Modern Plant Organization-I.

By M. H. Potter

*The factors which enter into the successful manufacturing business of to-day are interdependent to an ever-increasing degree. Location, type of building, transportation facilities, staff organization and plant equipment are features which require to be considered both singly and as a whole in relation to the particular product to be undertaken. A clear and concise idea of such considerations is necessary before entering any one line of manufacture.*

IN the present day progressive manufacturers must exercise every caution in choosing the site for a proposed plant. In the proper location of a modern plant and the construction of the various buildings required a number of features must be taken into consideration. Probably the first question to draw the attention of the owner or builder would be that of the cost. Many locations, admirable from other standpoints, are wholly out of the question when the cost of purchasing or renting is considered.

Fortunately for the manufacturing interests, land suitable for factory sites can be obtained in suburbs or suburban towns practically as suitable for the purpose and at a great deal less than metropolitan values. In many instances municipalities have offered houses and privileges to large concerns to induce the location of a factory in their town, considering that the benefit of the increased population and the consequent trade such would attract, and the prestige which would accrue to them, would be sufficient return for any bonds or privileges granted.

Although it is very seldom nowadays large manufacturing plants are centrally located in a large city, in some instances where skilled workmen are required Canadian manufacturers have made the mistake of locating in isolated localities, where they have experienced considerable trouble and delays in keeping their force at full strength. The welfare of the employees also has a direct bearing upon the question of location. All manufacturers, however, are not influenced to the same extent by this consideration.

Many large concerns of the present day will not locate their manufacturing plants in, or even near, a large city, but would secure a site with adequate means of communication, either by rail or water, with the outside world.

### Features of the Modern Plant

Modern practice in factory buildings adheres to the plan of making the majority of the buildings not over one storey in height, although the office building may be two, or three stories high, with the upper floors used as quarters for the engineering or drafting departments. In the buildings erected for the actual work of manufacturing, more than one floor is seldom employed. Quite frequently skylights are made in the roof, which admit light to all parts of the building, especially in the centre.

Additional floor space is sometimes obtained by increasing the height of the walls, permitting the construction of galleries which do not obstruct the entrance of light into the body of the room. The plant is not housed in one building unless it is comparatively small, but even here special quarters are assigned to machines the operation of which is accomplished by an element of danger or of unpleasant odor.

While the general architecture of a factory building is governed to a great extent by the character of the business, a feature frequently noticed in any modern factory is the size and number of the windows. In the great majority of manufacturing plants where no special menace to safety is encountered, fewer buildings, each covering a greater area, are more commonly employed.

### Transportation Facilities

Too much stress cannot be laid on the desirability of placing a factory where raw materials can be received and the products placed in the hands of the consumer with the least expense for carriage and handling. Remoteness from a means of transportation has frequently been a serious obstacle to overcome, particularly when the nature of the business was such that its location could not be changed.

The ideal location, from the standpoint of transportation facilities, would be one having a dock frontage, and also connected with either the main line or a branch line of a railroad. The ability to run freight cars into the plant is practically an absolute necessity where very heavy articles are manufactured. Usually in such cases, a spur of the track traverses the length of the erecting shop, and is so situated that the cars may be loaded through the agency of the travelling crane. Tracks are also laid connecting the various departments, so that heavy articles may be moved from one shop to another with the minimum of labor. Cars used only in the plant are made small and light so as to be propelled by small motors, or by the workmen themselves.

### Executive

In the executive office of a manufacturing plant, as well as in its practical work, changes have been made in order to satisfy the modern demand for accuracy and rapidity. Formerly an official, carrying the title of superintendent, bought all the supplies and raw materials, inspected them and distributed them to the foremen. In addition to these duties it devolved upon him to exercise a general supervision over the work. Countless other duties would also arise to take his time, with the consequence that any oversight he was able to give to the work was of the most cursory kind.

The drawbacks of such a system became apparent in time, and in the majority of factories the duties of the superintendent are now limited to those to which the name would apply. The buying is given into the hands of a purchasing agent, and an inspector is employed to examine the purchases. Receiving clerks, storeroom clerks, etc., are appointed and held responsible for the receipt of goods and the proper care of goods in stock. The selling end of the business is given into the hands of the sales department, the financial standing of prospective customers is investigated by a credit and collection department; a production engineer determines the amount of work to be performed, and the sequence to be observed in filling orders, and an assistant superintendent is detailed to oversee minor features about the plant.

By this systematization of duties the superintendent is relieved of the routine details that formerly had occupied his time, leaving him free to exercise a more thorough supervision over the plant, and direct the heads of departments in their work.

### Departments

The departments of a manufacturing plant vary, of course, with its size and with the nature of the goods manufactured. In a large plant they are usually seven in number: (1) power plant; (2) process department; (3) foundry; (4) forging department; (5) pattern-making shop; (6) assembling and erecting shops; (7) engineering department.

1. The power plant is usually placed in a separate building, and furnishes light, heat, and power. It consists of the usual arrangement of boilers, engines, dynamos, pumps, etc. Formerly no choice was permitted regarding its relative location. It had to be where the transmission of power by shafting and belting could be most easily accomplished. Since the advent of electricity, however, the ease with which electric power may be transmitted any distance has made it possible to locate the power plant where most convenient, usually by the side of the railroad track, where there are facilities for unloading fuel and removing waste.

2. The process, or general manufacturing department, usually occupies a number of separate buildings, each, or part of each, being devoted to some particular process. These buildings may be situated side by side, with sufficient space between them for a passage, and to admit light from all sides.

3. The foundry is usually located at some little distance from the rest of the plant, so that the dust and smoke may not interfere with work in other depart-

ments. Connection is made with the other departments by means of the shop track, and it is so advisable that the railroad track be permitted to enter the building for greater convenience in loading heavy castings. A branch of the same track extending along the side of the buildings is a great convenience for delivering fuel, pig or scrap iron and sand.

4. The forging shop is usually connected with the manufacturing end, and may be of large or small capacity, according to the character of forgings required. In some plants it may be connected with the foundry.

### Pattern Shop

5. The pattern shop provides all patterns required by the foundry or elsewhere, as well as special pieces or castings of experimental or other nature. This should have a well-lighted room or series of rooms, not too far removed from the engineering department.

6. Assembling or erecting rooms are connected with the various branches of the manufacturing departments by tracks and traveling cranes, and also admit a spur of the railroad for facilitating heavy work.

7. In the engineering department the engineers, draftsmen, etc., are engaged in preparing the plans, drawings and specifications for the work, and are usually assigned a floor in the main office building.

In addition to the above-mentioned departments a plating department may be necessary, wherein all plating with brass, zinc, nickel, or precious metals is effected.

There may also be a carpenter shop, a paint shop, storerooms for supplies, and completed products, a tool room, and an experimental room, each of which should be located so as to be most convenient for their purposes. With small articles it is usually sufficient if the shipping room is so arranged that a track or a number of tracks can be placed where they may be loaded from a platform with the least possible handling.

Large and heavy articles should be loaded by being deposited on the cars in the erecting room. In such an event, the clerical work connected with the shipping could be performed in the office building.

The general office or administration building may have any number of floors, the first one or two reserved for the work of the administration and accounting, while the upper floors are given over to the engineering and drafting departments.

### Following the Work

Tracing the work in its progress through the various departments may be of interest. Granted that the engineering and drafting departments have performed their duties, the pattern maker is furnished with all the necessary plans, drawings and specifications, from which he is to construct the pattern. This work calls for a high degree of skill, and requires absolute accuracy in its execution. When [illegible] completion it passes into the hands of the foundrymen, who use it to form an impression in the sand, into which molten metal is run. This, when solidified, has the same form as the pattern, but is comparatively rough and may require machining. Perhaps a part is required possessing a greater degree of strength than a cast article. In this case, the forge shop is called upon, and through the agency of hammers, anvils and other tools of the trade, the metal is beaten into the shape desired. When quantity production is required, dies are used. The forgings and castings next pass to manufacturing department, where all the processes of planing, shaping, filing, drilling, turning, and polishing are performed, resulting in the production of a finished part. Meanwhile the other parts of the finished article have been undergoing similar treatment, and all are passed along to the assembling room, where the various parts are joined in the proper manner into the completed product. This is tested in various ways, and if found perfect, and a customer is awaiting, is loaded upon a freight car and shipped, and so far as that particular construction is concerned, the duties of the manufacturing end of the plant are finished.

### Grades of Employees

Noticing briefly the personnel of the force of the average factory, one finds in direct control a factory manager, who gives his orders through a superintendent. The superintendent passes the order along to the foreman, of whom there may be a number, one over each department. Under the foremen are a number of gang bosses, who in turn oversee the work of a number of men. If a report has to be made when work is completed, it passes, step by step, from gang boss to foreman, and from foreman up until it reaches the factory manager.

This has a strong resemblance to red tape, but a certain procedure must be adhered to if business is to move along smoothly, and by following such a method dissatisfaction is seldom created by one official going over another's head. The only exception to this unwritten law applies to cases where an important official may detect a breach of discipline, careless or injurious use of tools or machines, waste of materials, or actions which endanger life, in which event he may demand that the action, whatever it is, should cease immediately, bringing notice to the person in charge of the offending workman.

All official communications should be written, and duplicate copies preserved, as in this way alone an accurate record of events is available, and responsibility can be traced to the proper place.

### The One-Building Plant

While we have here considered plants of several buildings or departments, the same general rules will govern the factory confined to a single building. The first requisite is to receive and assign material so as to eliminate unnecessary handling. How often have we seen shops of the older type, whose receiving and delivering rooms were at some out-of-the-way corner of the building, thus necessitating long carrying distances and inconvenient distribution. The modern shop will have such points located in some central room, convenient to the hauling platforms on the one side and to the workrooms on the other.

Materials received at this central point go the round of the building, from machine to machine, finally emerging from the finishing room direct to the stock room, which in turn adjoins the shipping department. A little care in planning a building with reference to the particular line of work, route to be followed in manufacture, size of finished product, location of elevators, etc., will work wonders in reducing costs, promoting efficiency, and last, but not least, keeping the force of workmen in good humor.

### Plant Efficiency

The prime object of the model manufacturing plant, whether large or small, is reduction of the cost of production. And this may be secured only by a combination of desirable quantities, known as plant efficiency.

The actual work of manufacturing in its bearing up efficiency, may be classed under two heads: general and special. General manufacturing has to do with the duties of the department heads, upon whom it devolves to produce results through the exercise of their special qualifications. Special manufacturing applies to the actual operations involved, and is of maximum importance. Any machine or contrivance that simplifies an operation or increases production is a factor in increasing efficiency.

In conclusion, it may be said that the problem of economical production is solved only through the agency of an efficient tool in the hands of an efficient workman—both being housed in a convenient plant.

## POWER FOR ELECTRIC SIGNALLING PURPOSES

WHEN in the early days of railway telegraphy electric repeaters were first introduced to indicate the working of signals, everyone seems to have agreed on an instrument which would work with a single cell of a primary battery, and to this day the efficiency of signalling apparatus is largely limited by the output which can be obtained from primary batteries. Moreover, there is an enormous number of these primary battery cells in use, as each signalling circuit usually has its own individual battery.

In large centres, at any rate, it should be more economical, and, what is of more importance, improved apparatus from the signalling point of view would result if, in place of individual batteries with limited output, current were to be obtained from a central battery of accumulators. There are also cases where it might be an advantage to use an alternating-current supply.

THE asbestos output of the United States has decreased 15 per cent., though the demand is greater than ever before.

# Developing a Self-Served Lunch System

By Gustave Keuchenmeister *

*The welfare of the employee is being considered by the progressive manufacturer to an extent unheard of a few years ago. It is a recognized fact that anything promoting the welfare and happiness of the employee is not only a credit to the manufacturer on humanitarian grounds but has a direct monetary and commercial value to employer and employee.*

THE steadily-increasing cost of food is felt as quickly by the workman as any other class. It becomes quite a problem for wage earners to meet expenses with prices constantly rising. Payments on homes, rent, and other fixed expenses must be met, so usually the first place retrenchment commences is on food, which often results in serious trouble. A well fed, well nourished man is better natured and more efficient than the man with an empty stomach, or, what may be worse, a stomach filled with poor food.

The problem of arranging a satisfactory lunch-time service at the plant of the Dominion Forge and Stamping Co., Windsor, became quite serious, as there were no restaurants or lunch rooms nearby for some time. A lunch room was finally opened next door, but the proprietor, however, soon realized that in order to hold the price down to meet a workman's pocket book, both quantity and quality had to be sacrificed, with the result that the lunches were edible and that was all.

Taking these things into consideration, and looking to the welfare of the employees, a lunch room was provided for, when the plans for rebuilding the plant were drawn.

### Tentative Arrangement

At first a small equipment—enough to serve tea, coffee, and milk, to the office force of about twenty men—was installed and experimented with. Sandwiches and pastry were bought ready to serve. Each day the order was telephoned to a bakery, and it was sent up in separate packages; also, any man could bring his own lunch and buy coffee, tea, or milk in the kitchen if he so desired. This worked out fairly well, except that almost every day some man found that he had not ordered enough and promptly began begging from his neighbors.

The experiment soon showed that the plan for a large equipment was feasible, and as the shop men pleaded to be served, a restaurant outfit was purchased. The kitchen as it now stands is equipped with the following:

One 10-gallon coffee urn.
One sideboard for dishes.
One refrigerator (white enamel lined).
One counter.
One counter truck.
One gas plate.
Two dozen white cups and saucers, plates, spoons, knives and forks.
100 1-pint white enamelware cups.

DINING ROOM FOR OFFICE STAFF.

100 black enamel trays (8 in. x 14 ins.)
Miscellaneous kitchen utensils, etc.

The lunch room for the office adjoins the kitchen, and the serve-self plan is carried out. The men of plant No. 1 are served from the counter truck ("a la cart," as one man jokingly remarked), which is loaded, put onto the elevator, and raised to the third floor. The men at plant No. 3, about a block away are served by carrying a large can of coffee and baskets of sandwiches, pie, and buns, to the plant.

The first week the shop men were served on the lower floor and they ate their lunches at their benches or any place they chose. One of the foremen, however, suggested placing tables in a vacant space on the third floor, and the suggestion was quickly acted upon, and found to be more satisfactory. Smoking is permitted during the lunch period on this floor only, and it brings the men together in a sociable way as well as providing a suitable place to eat.

### Typical Menu

No complaints about the quality or quantity of the food have been heard. A typical lunch consists of:

| | |
|---|---|
| Coffee, about two-thirds of a pint | .03 |
| 2 sandwiches, ham, tongue, or salmon | .08 |
| Pie, mince, raisin, or apple (cut in quarters) per cut | .04 |
| Jelly bar, doughnut with jelly inside | .03 |
| 1 sweet roll, various kinds | .02 |
| Total | .10 |

SHOP MEN AT TABLES ON THIRD FLOOR.

*Superintendent Safety and Welfare Department, Dominion Forge & Stamping Co., Walkerville, Ont.

COUNTER TRUCK LOADED READY TO PUT ON F FAV R

kept in store for the convenience of the men, and greatly appreciated.

By close buying, and watchfulness on the part of the cateress to prevent waste, the lunch room is self-sustaining, and consequently a successful venture, although not intended as a profit-paying investment.

## WATERS AND WATER-POWERS

THE ninth annual report of the commission of conservation contains extended references by the chairman, Sir Clifford Sifton, to numerous phases of conservation throughout 1917. Speaking of electric power plants he states that the preliminary survey of the water-powers of Canada is now practically completed. During the past year special efforts have been made to secure detailed information with regard to electric power plants and systems throughout the Dominion.

### Power Progress in Ontario

The development of hydro-electric power in Canada, and especially in the provinces of Ontario and Quebec, during the last ten years has been almost incredible. At the beginning of the work of the Ontario Hydro-Electric Power Commission, the late premier, Sir James Whitney, stated that the Commission would not require so much as 10,000 h.p. At this moment, the immediate requirements of the Hydro-Electric Power Commission in Ontario may be conservatively stated at 296,000 h.p., upon which demand there is a present shortage of about 70,000 h.p. A conservative estimate of the amount of power actually in use in the city of Montreal and its environs is 225,000 h.p. The position with respect to the province of Ontario, and especially with regard to Niagara Falls, is one which should be considered with great care. At the present time, the Hydro-Electric Power Commission is about 70,000 h.p. short, and it is not too much to say that this shortage will rapidly increase. I understand that Sir Henry Drayton has reported to the Federal Government that it is not practicable to withdraw this 70,000 h.p., which is presently in demand, from the United States to which it is now being exported, for the reason that the power is necessary for the use of plants which are producing essential war material for Great Britain and her allies. The position is, therefore, that, whereas, 12 or 15 years ago, it was not thought that the Hydro-Electric Power Commission could make use of 10,000 h.p., and, accordingly permits to export were more or less freely given, there is now, in round figures, an immediate demand for 300,000 h.p., and the demand cannot be satisfied.

### St. Lawrence Power Situation

A situation analagous to that in which Niagara power stood fifteen years ago now exists on the St. Lawrence river. A very large capacity for the development of power exists upon the St. Lawrence. There is a considerable development in the neighborhood of Montreal, but the greater portion of the power still remains undeveloped. Attempts are constantly being made to fataly complicate the position with respect to St. Lawrence power by securing the privilege of private development, which will be followed by contracts for the exportation of the power developed. I understand that the Cedars Rapids company exports something like 60,000 h.p. per annum. An attempt was made some years ago to secure the privilege of developing the Long Sault power, the purpose being to export the greater portion of the power in the interest of a manufacturing corporation on the United States side of the line. This project was defeated, largely through our efforts. A similar project is now being promoted, and wew are resisting it with all our energy and we trust with fair prospects of success. It is almost incredible that any responsible man should be so short-sighted as to favor this project in the face of the experience which we are now undergoing at Niagara.

### International Development Proposed

Within a very few years, there will be a demand for every horse-power that can be developed on the St. Lawrence river to which Canada is entitled for use upon the Canadian side. The situation with regard to Niagara will undoubtedly be duplicated, and if we are foolish enough to allow vested interests to be created upon the other side of the line, we shall inevitably find ourselves handicapped and embarrassed as we now are with respect to Niagara power. For myself, I have no doubt at all what ought to be done with respect to the great powers dormant in the St. Lawrence river. The United States Government is not interested in the corporations that are endeavoring to get possession of the St. Lawrence powers from the other side. Neither is the Canadian Government interested in the fortunes of the gentlemen who are promoting their projects on the Canadian side. They are very few in number, and their interests are confined entirely to themselves. What the United States Government and the Canadian Government alike are interested in is that there should be a fair division of this power, that it should be developed in such a way that the neighboring and tributary population should have the use of it upon fair terms.

PART OF KITCHEN, COUNTER AND COUNTER TRUCK

# PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

## GRINDING FIXTURE FOR 6 INCH SHELL-BORING CUTTERS

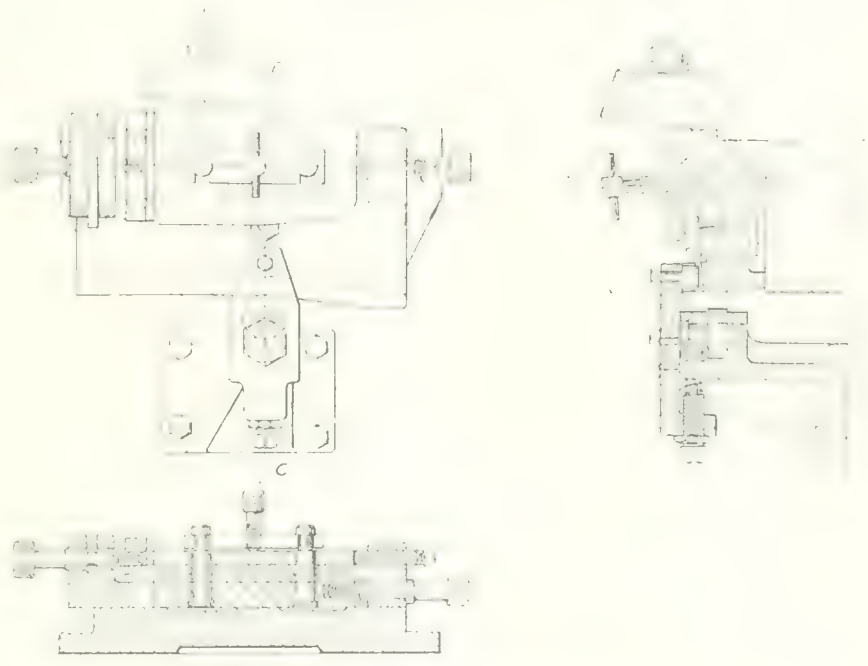
By Geo. M. Dick

IN the manufacture of almost all types of shells the most expensive part of the tool equipment to keep up is the boring cutter. This, no doubt, is the reason why it is given more consideration regarding manufacture than any other tool. Manufacturers of 6 in. shells will agree that the hardest part of the manufacture of the boring cutter for this particular shell is to get the radius right where the straight profile runs into the taper.

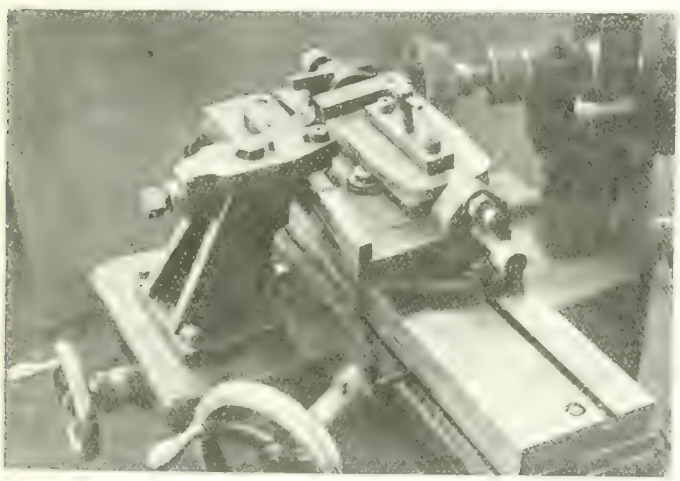
Various fixtures, etc., have been published lately, but none for this operation. The fixture illustrated has been used for some time with success, and should interest all manufacturers of this size of shell.

It consists of two parts, the lower being bolted to the movable table and the upper pivoted on it. A double cam is fitted to the upper plate to engage the rollers which are supported by the bracket in front. The rollers are adjustable to give easy travel to the fixture, as the table is moved across the wheel. The cam is arranged to turn the fixture on the pin as it passes the centre line, and runs off on the taper. The clamp pins are on a separate adjustable plate, which can be moved to take worn cutters, which require grinding further back. The cutter is first ground on one side, then turned over and ground on the other.

This fixture can also be used to grind the lip on the cutter by using a plain convex-faced wheel and setting the table and fixture lower. The fixture is set on the table in such a way as to grind a slight clearance on the rear end of the cutter.



DETAILS OF GRINDING FIXTURE.



VIEW OF GRINDING FIXTURE

## THE JOYS OF A MILLWRIGHT

By D. Middleton

THE Milo mill of the United Paper and Pulp Co. was a sort of dumping ground for the machinery that had outlived its usefulness in the company's other plants. And yet they were supposed to, and did, turn out the finest grade of tissue paper—which was a silent tribute to the men who would put up with such conditions and made a go of things discouraging.

Machinery of this class is heavy and is subjected to all sorts of sudden strains and unfavorable conditions in the way of location and dampness. The buildings of this plant were all of wood, the floors were wet most of the time, and the foundations were none too solid. Thus it was that shafting got out of line about every so often, and if it wasn't discovered in time the word would come that "the 4½ in. shaft in the beater room just broke close up to the hanger by the driving pulley." That being the only piece of that size on hand, and the orders being to get no new material where old could be used, it was up to the shop crew to shift the remaining length of 4½ in. along and splice out the gap with a piece of 4 in. or 5 in., whichever could be found out in the yard. Often this meant changing a couple of old-fashioned hangers that seemed to weigh a ton to the boys working up against the damp ceiling, and always it meant filling up one or more of the numerous keyseats in the shaft so they could run in the hangers at that spot. And then new keyways had to be cut by hand. The job had to be done at once, and there was no rest for the crew until it was finished.

### Fitting Keys

The showing that the plant made was due in no slight measure to Frank Maclay, the machinist, who would have done even better if there hadn't always been three months' work ahead of him which he had "to keep him busy," and to work on when something wasn't actually breaking. Maclay was the best man at fitting up keys that the writer has ever known, and it is from the experience gained while working with him that the writer has always since been able to guarantee a job of this kind that had been done according to instructions. Surely Maclay was right, for I never knew a pulley or gear in that plant to come loose, and the drives were of the hardest—and it gave one a sick feeling to be told to take a pulley or gear off a shaft that he had once keyed up. Some of Maclay's key maxims were: "I never expect to see a key that fits. If it doesn't fit the shaft; if you want me to put it up, I'll come to [illegible] put in a sleeve that will fit.

"I don't want any key put in that doesn't bear all around, top and bottom and sides; if it's going to drive more than two dog power, it won't last if fit-

[illegible] other way. Make it [illegible] enough [illegible] your keys so the [illegible] don't swell the key proper.

"Your hammer ought to weigh about [illegible] to the inch shaft, so a 3 lb. hammer on a 1 in. shaft, a 4 lb. hammer on a 1½ in. shaft, etc.

"If you're going to expect a key to stay in a shaft or hub, you've got to drive it home with something besides a chipping hammer. If the hub is too light to stand that without cracking it is going to give you trouble sooner or later anyway.

"I don't want any keys with a taper of more than a thirty-second in four inches. Give a man a taper key and he depends on that for a fit every time—thinks because he drives the key till it stops it is fitted; if he makes that kind of a pob tight he splits the hub at the top of the keyseat. When you are fitting keys by driving and trying and filing, use twice as heavy a hammer for driving [illegible] for driving in. If you see that you won't get the point end all swelled up. A heavy hammer drives, it does not swell locally. Put oil, just a little, all over a key every time you drive it in a hole, and you won't have stuck keys.

"The smoother your keyway faces are the tighter you key will be; a rough side on a keyway will impress its roughness in the key and may go so far as to loosen up the fit. Take time enough to fit your key all over for the full length—do that, get a tight fit, and you won't have to be doing the job over again every second Sunday. Make your key long enough so that you can drive it in further and tighter in about a week if the key is subject to a pull both ways or from

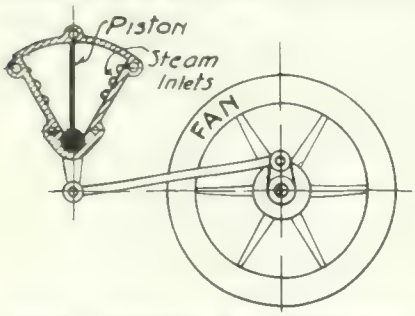



FIG. 1 PRINCIPLE OF NOVEL ENGINE.

right to full load and the strain is a heavy one."

### Unique Steam Engine

Supplementing the water power at this paper mill were several engines, rejected at other plants but doing fair service at Milo. One of these, Fig. 1, was a curiosity, to me at least. It had a "cylinder" of triangular shape, apex down. In this cylinder a piston-like fan oscillated on the shaft at the bottom. The valve admitted steam alternately on the sides of this piston, and the movement was transmitted by an arm outside the cylinder, through a connecting rod to the crank. They had shut down this engine at the time I was there—said it wasted too much steam. Another of the antiques had the cross-head guides made of wood; they were worn just as smooth as glass, and certainly presented a fine surface.

The best engine of the bunch was the 300 h.p. Corliss, on which a never-to-be-forgotten job was done. In shutting down for supper one night the engineer forgot to open the cocks—a fatal mistake, as the steam came a hundred and fifty feet through uncovered pipes. The back stroke caught the water and the connecting rod—of wrought iron—buckled, Fig. 2. On the forward stroke the rod failed to straighten out entirely when the cylinder head was reached, and the momentum of the flywheel crushed the key in the crank and everything stopped dead, for the key did not shear off. That was some key, and it was my job to get it out.

After two days of drilling with a ratchet, we were able to drive the key loose and get the crank off. The latter was sent to a shop in the nearest town

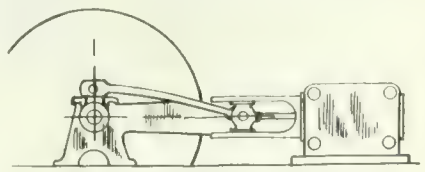


FIG. 2 BENT CONNECTING ROD ON CORLISS ENGINE.

to have the keyseat squared out and a key made. I started with hammer and chisel to re-cut the shaft end. By the time the crushed portions had been dressed up, a 2 in. x 3 in. key was needed—originally it had been about an inch less each way. Every inch of the fifteen-inch length of the shaft meant another blister for the fortunate chipper, and on top of that "old Moran," the superintendent, insisted on having a 1½ in. key put in at right angles to the other one to make the job doubly secure. And one afternoon he brought in a friend who said he could show us a way to cut the keyways in a jiffy. He suggested using a dentist's drill and boring the metal away. I told him steel was tougher than teeth, and old Moran looked at the 3 x 15 of steel and the husky pile of chips on the floor and suddenly thought of something in the office he needed, leaving me and dragging the dentist with him.

The forge was out in the barn, up the lane, and it was necessary to wade through the snow to go there and draw out the chisels. A diamond point was used to cut the path at the edge, then the center was readily cut out with a flat chisel without breaking the corners. A cape chisel and files were used to straighten up the sides and the bottom.

When the new keys came from the shop they were found to be two inches too long. We had no power saw, so they were chucked in the lathe and reduced with a cutting-off tool. The keys were fitted in good shape and finally driven home with a twenty pound sledge. We left a half inch—all that would clear the rod—projecting, and the Sunday following the starting up we managed to drive that all the way in. That was fifteen years ago, Maclay and old Moran are both dead, but the keys go driving on, and have never needed attention.

That lathe was a 20 in. affair that served the plant as lathe, shaper and drill press. An extension had been added at one time that allowed it to take 15 feet between centers. Somehow they managed to do a job on it that would pass, but when it came to turning the work that was over the extension, the lathe hand had to feed by hand for the screw had not been lengthened. A sharp watch had to kept of the size, too, when using the extension, to offset the persistent taper produced by the sagging back end. In the spring when the brook was high, the legs were awash, and the lathe man had to wear boots. In spite of these handicaps, all the lathe work of the shop was done here; it had to be, in fact, for Moran wouldn't give an order for any outside work "with a good machine out there standing idle."

## GRIPPING AND DRIVING METHODS FOR LATHE WORK—III.

By F. Scriber.

A group of small chucks and holders which are suitable for quite a variety of work and are mostly used on speed lathes and wood turning machines are shown by Fig. 17. Each of these chucks of which there are eight shown is used for a specific purpose as its name implies. All of these are held in the spindle of the lathe and those which are split are drawn back to grip the work. The shellac centre drives the work by having the same held to it by means of shellac. The screw centre usually has a wood screw end and wood is screwed on it while being turned, although this type of centre may be used with machine screw centre for holding nuts, etc., the block holding chuck has a centre pin and one or more driving pins in it, three being shown in this instance. The vee centre or holder is more often used in the tail-stock of the lathe for drilling cross holes

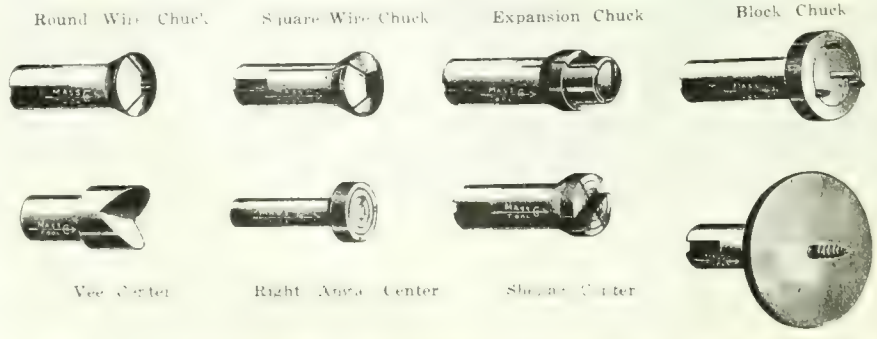



FIG. 17 A GROUP OF SMALL CHUCKS AND HOLDERS

and other similar operations. The work holding methods described in the foregoing article are of the simpler type and a number of more complicated tools used in the same field will be shown in the articles that are to follow and will include some face plate fixtures.

When mounting face plates with work or fixtures on a spindle nose where they are to revolve care must be taken to have them balance when the work is in position, otherwise it will be almost impossible to keep the work running true. In this connection it is also apparent that the faster the speed at which the machine is run the more accurate is the balance necessary to eliminate the pounding action which is in evidence when things are not in balance.

In this article considerable reference will be made to the face plate type of fixture and work holding methods, with a few notes on truing up work.

Fig. 18 shows a method for holding a gear segment; this segment has an arm hanging down the opposite side at X. When this part is set upon a face plate, as shown, with straps and holding devices in place, it runs in good balance and, consequently, need not be weighted. The face plate shown is of a type regularly furnished with lathes, the block A is put on the face plate under the two supporting arms of the segment. On top of the segment over this block a

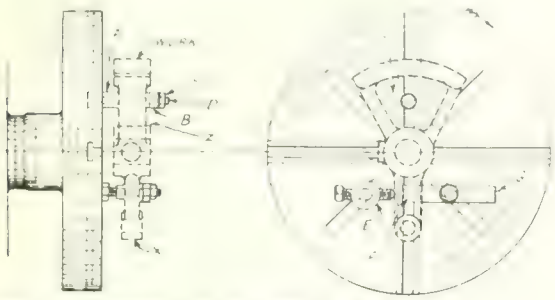


FIG. 18. METHOD OF HOLDING GEAR SEGMENT ON FACE PLATE.

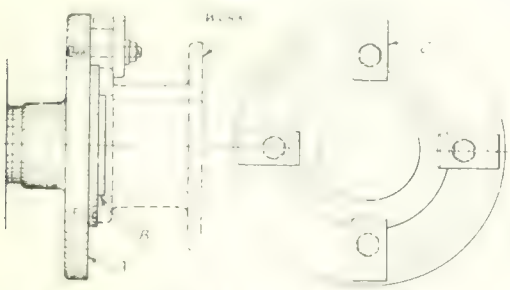


FIG. 19. FACE PLATE WITH RING FOR LOCATING WORK.

clamp is placed, and by means of the nut and washer C, together with the tee bolt D, the work is gripped on one side. At the opposite side on the arm the stud E with screw in it is placed; this takes the thrust of the cut which is in the direction of the arrow, while a jack screw F is placed under the arm; over this screw the strap G is used for clamping. This securely holds the work in place, and the same is trued up from the short boss Z. The method shown for gripping this piece is not one which would be good for manufacturing purposes, as it is a rather slow set up, but is a good practical method for handling small lots.

Fig. 19 shows a special face plate mounted on a lathe spindle; this is used for holding the work shown while performing the second operation, the first operation having been performed in a chuck. This fixture consists of a suitable cast iron plate A, which can be screwed on the spindle nose. On this plate a steel disc B, that has been machined the correct diameter to fit into the recess at the

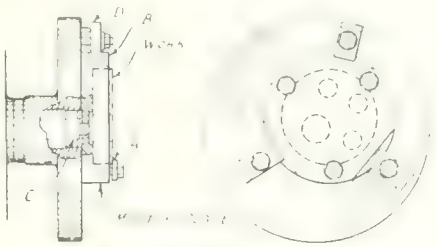


FIG. 20. ACCURATE BORING WITH MASTER PLATE.

end of the work, is securely held in place by screws and dowels. Four clamps C are also provided for holding the work in position on the face plate.

The use of a master plate for boring work accurately is often resorted to where a number of holes have to be bored. An example of this is shown in Fig. 20, where it will be noticed that the work is a round disc with four holes bored in it. This is held by means of the screws and washers A, which are three in number, in a round plate bored out to receive it, this being designated as B. In the centre hole of the machine a plug C is placed and the plate which holds the work has four holes in it bored to receive this plug. In setting the work up on the machine one hole in the face plate is set over this plug, thus locating the work in the correct position for boring. The plate is held to the fixture by means of the three clamps D. When one hole has been bored the disc is removed and again slipped over the plug in the position where another hole should be, and by continuing in like manner until all four holes are bored, each piece can be made a duplicate of its predecessor as far as centre distance is concerned.

### Test Indicators

In boring work on face plates it is often necessary to use test indicators to find out when it is running true; a group of these tools is shown at Fig. 21. The first of these in the upper left-hand corner is used in the tool-post of the lathe and the short end is placed in contact with the surface of the work which we wish to indicate true, and, as the opposite end of the rod is so much longer than the point end, slight inaccuracies at the indicated surfaces are much multiplied. Two extra rods are shown with this indicator.

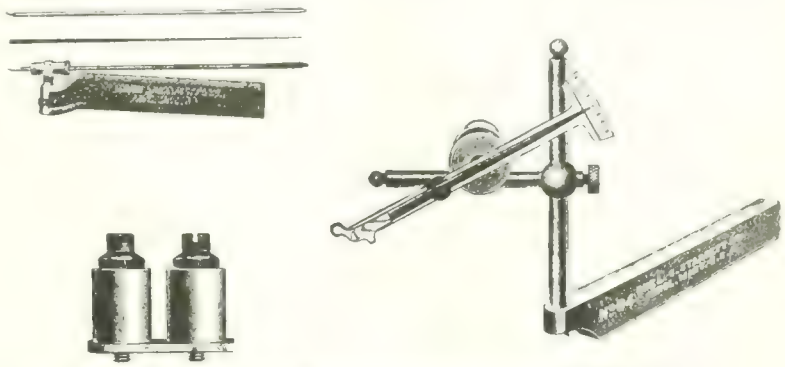


FIG. 21. TEST INDICATORS AND BUTTONS FOR LATHE WORK

In the right-hand view an indicator is shown, which is used in somewhat the same manner as the above, and has a scale which tells when the work is true. This indicator may be used for quite a variety of purposes: The indicator shown at the right is quite universal in its application, and is particularly good for outside indicating. With this tool inaccuracies are read on the scale.

The use of buttons for setting up work

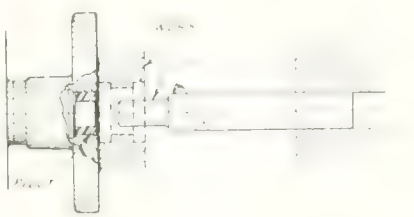


FIG. [illegible]. METHOD OF USING PILOT FOR BORING BAR.

is quite general where accuracy is required, and two of these are shown in the lower right-hand corner of the illustration, Fig. 21. In using these buttons the holes are located approximately by means of the dividers and scale, following which a small hole is bored and tapped in the work. The buttons are then put in position and by calipering from

are better to the next the pattern can be located accurately. The battens are held in place by screws, and as the hole inside of the buttons is bored out larger than the screw, they may be moved slightly one way or the other. When set

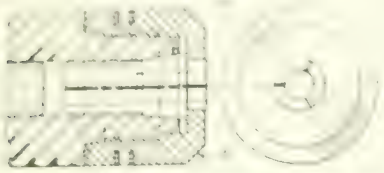


FIG. 21. SINGLE CHUCK ON SPINDLE NOSE.

in position they are securely held by tightening the screws, and with the work set on the face plate they are indicated true by means of one of the test indicators before described.

When taking heavy cuts on work, as in manufacturing, it is often desirable to pilot the boring bars or facing tools in some manner. This is quite conveniently accomplished, as shown in Fig. 22. A hardened steel bushing is ground, and is forced in the face plate of the lathe or automatic chucking machine. A pilot is turned down and ground on the boring bar at A. This pilot enters the bushing before the boring tools start to cut, thereby steadying the same and permitting heavier cuts to be taken than would otherwise be possible.

Spindle nose chucks in quite a variety of forms are used for gripping work in lathes or chucking machines; these are generally operated by similar principles, various methods being employed for drawing back the spring chuck A (illustrated in Fig. 23) to make it grip the work. This illustration shows a common spindle nose cap B used to force the chuck back, thereby collapsing the same and causing it to grip the work. The chuck is hardened and spring tempered, so that when the spindle nose cap is released the chuck will spring open. The beveled surface A is the part that closes the chuck when it is forced in the spindle.

## PATTERN MAKING NOTES

By J. W. Broadbent

WHEN turning patterns on the face plate it is essential, in the majority of cases, to use an intermediate face plate of wood. The design and method of building up these wooden face plates are exceedingly numerous, some even approaching the ridiculous. The main object is to have the face plate strong enough to hold the work to be turned and sufficiently stiff to prevent the possibility of warping and twisting out of shape; at least, during the period when the pattern to be turned is secured to the face plate.

### Face Plate Construction

For small jobs up to 12 inches in diameter, a plain circular piece of wood from 1 in. to 1½ in. in thickness may be used, and if further strength is required a batten may be screwed to the back as shown in Fig. 31; this batten being wide enough to take the iron face plate. Fig. 32 illustrates a face plate suitable for turning work up to 24 inches in diameter, three or more boards being joined together with cross pieces. This face plate is simple and inexpensive, and at the same time will be found to be more rigid for practical use than one built up in a more elaborate manner. No glue should be used on the cross-bars of the face plates Fig. 31 and 32; screws alone being sufficient to hold the different sections firmly together and yet allowing the wood to swell or shrink with the changes of the temperature or the humidity of the atmosphere, without distorting the flat surface of the face plate to any appreciable extent.

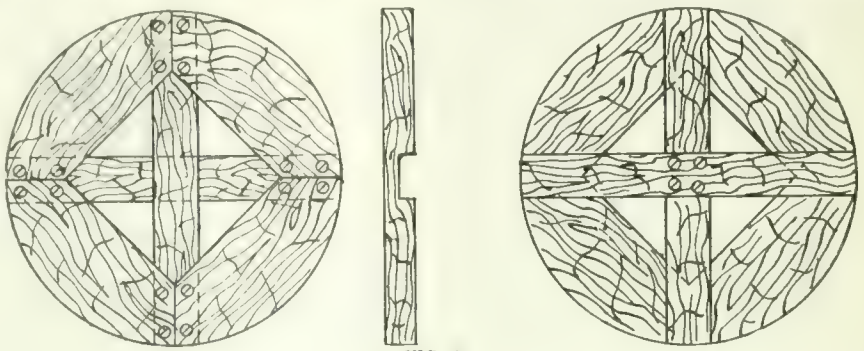


FIG. 33.

Fig. 33 shows a sketch of a face plate built up of four segments glued and screwed to two cross-bars, these bars being joined together at the center by a half-lap joint as shown. This makes a very substantial face plate for work up to three feet in diameter, as it maintains its shape and is easily trued up. The cross-bars should be made out of stock 1½ in. thick and 4 in. wide, and the segments of 1¼ in. material. A face plate built up of sections as shown in Fig. 34 keeps its shape very well, but being rather heavy is not suitable for work over three feet in diameter. It is obvious that the joints of the sections in each course should overlap. For work of large diameter a face plate as illustrated in Fig. 35 is probably the strongest method of construction, the number of arms and segments being increased proportionately with the diameter of the plate; the one here shown is quite suitable for work up to eight feet in diameter.

### Rechucking of Work

There are very few examples of patterns which being turned on one side, and then removed from the face plate to be rechucked for operations on the opposite side, necessitate the mutilation of the face plate for the purpose of centering the work. When a rush job comes into the shop and there is no suitable face plate available, or the face plate has been turned down so thin that you could read a newspaper through it, there is a liability of language being used by the workman who is doing the rushing. The only sane method of rechucking work is to nail or screw several pieces of wood upon the flat surface of the plate, these being afterwards turned so that the job is a snug fit, and therefore centering itself sufficient to allow the holding screws to be driven.

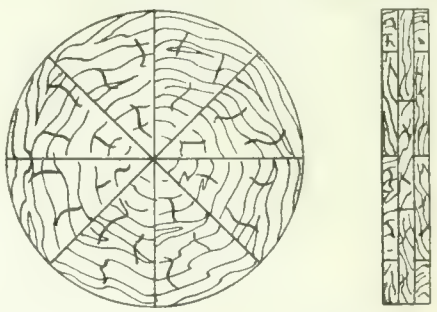


FIG. 34

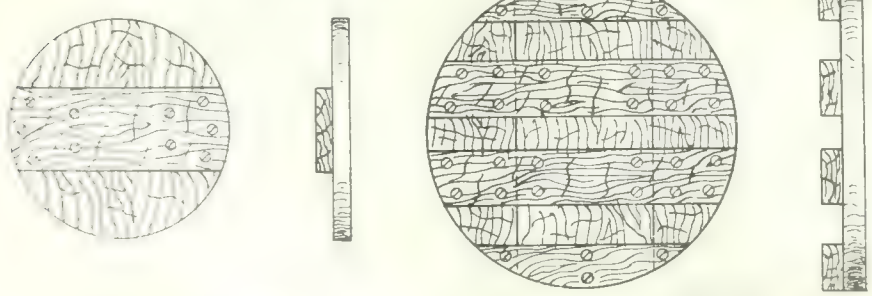


FIG. 35

### Turning Tools

The turning tools used by the pattern maker are not very numerous, and the best results are obtained by the use of those having a scraping rather than a cutting action. The only exception among the hand turning tools is the skew chisel shown in Fig. 36. It requires considerable skill to use this tool effectively, the cutting edge being held tangentially to the piece to be turned so as to get the real cutting action. For

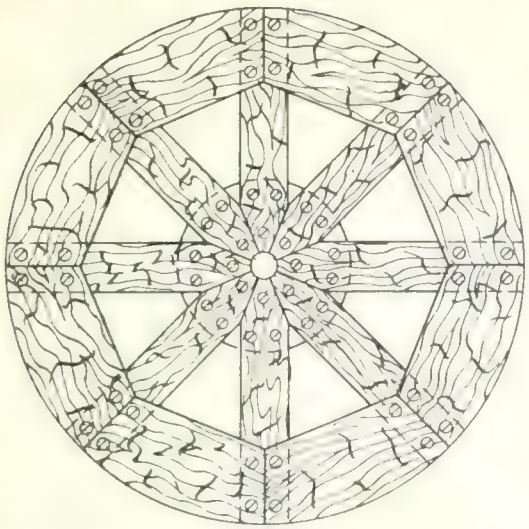


FIG. 35

comprise part of the kit, and another very useful tool is shaped as in Fig. 42 which may be used for turning the inside of hollow patterns. It is a well known fact that if a crowbar is held against a rapidly revolving piece of wood that the crowbar will tear off chunks of wood, making the piece to be turned—in appearance round. A well turned piece of wood is to be admired that the uninitiated look with a certain degree of wonder at the comparative ease with which the pattern maker manipulates his tools, producing the even, smooth surface so much desired in a good pattern. The secret of successful wood turning is in keeping the tools sharp and in good condition, and by no other means can a smooth finish be obtained.

getting a smooth finish on the work this tool is admirable but for accuracy the scraping tool is to be preferred. The turning gouge with its rounded cutting edge is shown in Fig. 37, this tool being adapted for roughing down the work, and in the hands of a skillful operator very little finishing is required after using this tool. When turning hollows or fillets the gouge has a "mulish" habit of kicking, and for operations such as these the round nose Fig. 40 should be used. Fig. 38 is the square nosed tool for finishing flat surfaces, and Fig. 39 the spear point for end turning. Right and left hand side tools Fig. 41 should

FIG. 37. FIG. 38. FIG. 39. FIG. 40 FIG. 41.

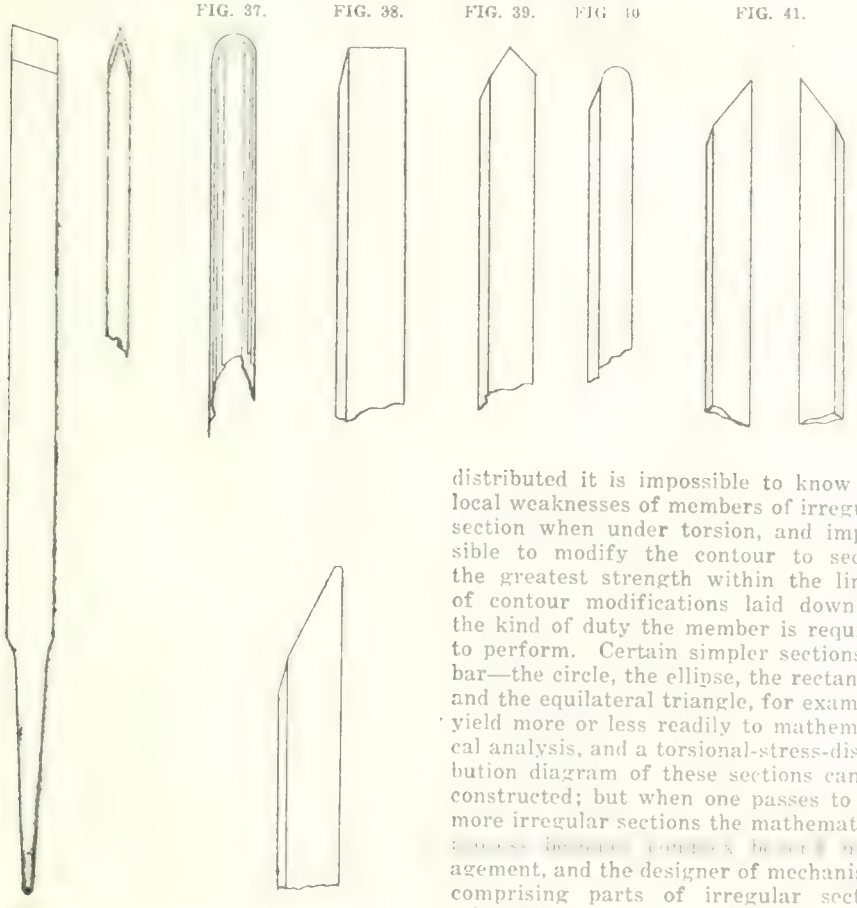


FIG. 40 FIG. 42

## A NEW METHOD OF SOLVING TORSION PROBLEMS

THE ascertainment of the distribution of stresses in members subjected to torsion is a problem that has occupied many mathematicians and physicists, for without a knowledge of how such stresses are distributed it is impossible to know the local weaknesses of members of irregular section when under torsion, and impossible to modify the contour to secure the greatest strength within the limits of contour modifications laid down by the kind of duty the member is required to perform. Certain simpler sections of bar—the circle, the ellipse, the rectangle, and the equilateral triangle, for example, yield more or less readily to mathematical analysis, and a torsional-stress-distribution diagram of these sections can be constructed; but when one passes to the more irregular sections the mathematical [illegible] agement, and the designer of mechanisms comprising parts of irregular section subjected to tortional stresses has had to work very much in the dark. A leading modern instance is afforded by the case of the aircraft propeller. The propeller blade is subjected to a particularly complex combination of stresses, among which is the torsional stress set up by the greater air pressure on the following portion of the curved face of the blade being greater than that on the leading portion. The shape and dimensions of the blade section at any point are determined within limits by considerations other than resistance to torsion, e.g., by the requirements of streamline and propulsive efficiency contour, and by resistance to bending, but there remains a certain latitude within which modifications can be made to secure the maximum resistance to torsion. It is of extreme importance that design should take cognisance of this factor, not so much because risk of fracture is thereby diminished as that, unless the distribution of the torsion stresses is known, it is impossible to forecast how the blade will deform in use, and consequently impossible so to shape the blade in its unstressed condition that it will present the desired features when under working stress. About a year ago the design department of the Royal Aircraft factory at South Farnborough came up against this problem and the authorities called in Major G. I. Taylor, R.F.C., for assistance in solving it. Starting from a suggestive hint given by Professor Love in his treatise on elasticity to the effect that the equations for the torsion of an elastic bar are of exactly the same form as those for the displacement under evenly distributed pressure of an elastic membrane, the shape of which corresponds to the cross-section of the bar, Major Taylor saw that if he could devise a calibrating instrument based on this remarkable parallel his problem would be solved. The essentials of the required instrument were first a thin metal plate, out of which a section corresponding to the cross-section of the blade could be cut, next a thin membrane stretched across the slot, next a slight excess air pressure on one side of the film, and finally a means of registering the contour of the surface of the bulged film. The first requirement was easily satisfied. For the second, a soap film stretched across the slot suggested itself as the ideal membrane. The pressure on one side of the soap film was provided without difficulty by clamping the plate over a box within which the air pressure could be delicately adjusted. The real difficulty came in determining and recording the contour of the film, and this was solved by the use of two particularly ingenious expedients, first the reflection in the film of a suitably placed single electric lamp filament, this for determining the inclination of the film to the plane of the plate at any given point for the determination of stresses, and, secondly, the use of a steel needle point- [illegible] as to depth by micrometer—this for tracing the contour lines of the film and recording them by pin-pricks on a sheet of paper. By cutting in the plate, alongside the slot of the section it is desired

stresses in the circular bar represented by the round hole, their actual value. The film analogy, as brought within the do- genius of Major Taylor, and translated into a working instrument by Mr. A. A. whole credit for devising the apparatus, opens out at one stroke a whole range of precise knowledge on a subject hitherto obscure, and constitutes one of the most beautiful inventions in scientific method that the world has seen for many a day.

## GAUGE FOR TESTING THE THICKNESS OF BASE-PLATE

By G. Barrett

THE gauge or marker described below has been found of considerable use and merit, as by its use a permanent mark may be made on the outside of the shell, indicating the depth of base-plate. Previous to the making of this gauge the only check the Government inspector had was his stencil stamp, and this being faced off at times, necessitated the removing of several base-plates and their replacement by screwed ones.

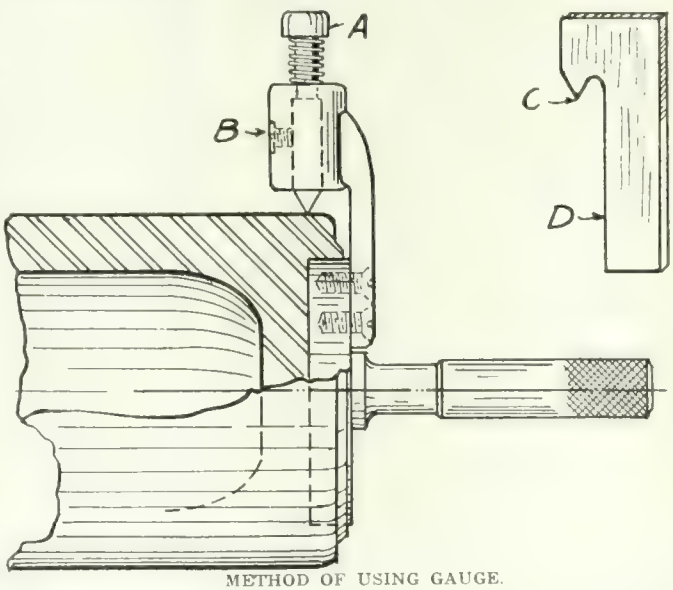
The gauge is used during preliminary inspection and is very simple. The shells are laid flat on the bench and the plug gauge is placed in the recess with one hand and given a light tap with a hammer at A, Fig. 1, which leaves a small mark at any given distance from the bottom of the base recess. In this case it has been arranged to mark .490 in. to correspond with the low thickness. There is a grub screw in the boss B to compensate for any looseness which may occur. The spring is provided to keep the punch clear of the work while being placed in position.

After the shells have been faced on the base and there is no symbol mark to be seen they are tested with the gauge, Fig. 2.

This gauge is made from 3-16 in flat steel, and the point C is made 60° and rounded to suit the pointer, Fig. 1. Also the distance from D, Fig. 2, to the point has to check with the low thickness of the base-plate after being faced off. If the base-plate is under the low the gauge, Fig. 2, will fit beyond the prick mark made by the punch.

## JEWELLERS' ROUGE

[illegible] have to be finally polished with rouge, and this is not easy to obtain in the finest condition, although the purchased material is good enough for the ordinary plate cleaning. For this reason, where actually the finest and best is needed, it should be made by Vogal's process as follows:—Into a solution of sulphate of iron, made with boiling, distilled or rain water and carefully filtered to remove any accidental solids, pour a concentrated solution of oxalic acid until no more precipitate is formed. When precipitation ceases, and the whole is quite cold, the precipitate is collected on a fine cloth and washed with hot water until the washings cease to give an acid reaction on blue litmus paper. When well drained, the precipitate in its partially wet state is placed on a clean iron plate over a slow fire, or preferably a brass ring, and heated, decomposition beginning somewhere just above 390° Fah., and the red oxide is formed at a rather higher temperature, jewellers' rouge being merely finely-divided red oxide of iron. By this process the finest possible division of the particles is secured, and, although troublesome to make, this should always be used. The finest putty powder—tin oxide—is also prepared in a somewhat similar manner.



METHOD OF USING GAUGE.

## STREET VACUUM CLEANER

A vacuum street cleaner has been purchased for use on streets in the Panama Canal zone and was placed at work this week. It is a motor propelled vehicle carrying a sheet steel bin divided into two compartments. A large blower is driven by a 18 horsepower gasoline motor, and by this means dust and dirt are lifted from the street just as a vacuum cleaner for house use does its work. Stiff brushes mounted in front of the suction-head stir up the dirt so that it may easily be lifted by the suction. The cleaner covers 12½ feet at each operation, and runs at from three to five miles an hour. It operates on dry streets, does away with the cost of sprinkling, and saves in labor cost, as it cleans about 200,000 square yards in eight hours, and is operated by one man, the chauffeur.

## IMPROVISED SAFETY COLLAR

By J. E. McCormack

WHERE no safety collar of the right size is available, an old-fashioned one may sometimes be used (for light duty) by marking the set screw at a point even with the surface of the collar when screwed home against the surface of the shaft. Then remove the set screw, saw it off at the mark and slot with hacksaw or file. In tightening the screw down on the shaft use a bit shank screwdriver and a carpenter's brace.

This is sometimes useful when rigging up additional shafts or refitting machines not yet conforming with safety-first requirements.

## WILL RELIEVE GAS SITUATION

THE Ontario Legislature has unanimously passed the Natural Gas Act, giving the Ontario Railway and Municipal Board wide powers to control and regulate the production and transmission, distribution and sale, disposition and consumption of all the natural gas produced in Ontario.

This was an emergency measure taken to relieve within the next twenty-four hours the serious situation existing in various parts of the province which depend on natural gas for heating purposes, but especially the city of Windsor and district.

The Ontario Railway and Municipal Board is now in complete control of the situation, and has power to brush aside all private corporations, and the Minister of Lands, Forests and Mines, who introduced the measure, made it clear that the people of the province are to have first call on the gas supply for the purpose of heating their homes, and that important industries engaged in the manufacture of war supplies and the production of food supplies are to come second.

## U.S. STEEL PRODUCERS EXPECT COMPETITION

THERE are many well informed steel producers in the United States who do not hold the opinion that a heavy foreign demand for steel will follow the close of the war. On the other hand, they believe that the United States will be confronted with severe competition from European steel manufacturing centres.

The statement has been made that Europe will need millions of tons of American steel for rebuilding purposes. This view is not taken seriously by steel men who have watched the development of the foreign steel industry since the beginning of the war.

Great Britain, Canada, Germany and other countries have not only greatly enlarged their steel capacity, but have made remarkable headway in the matter of economy and efficiency. The increased capacity has not been fully reflected in production since the war, as demand has been confined largely to war needs requiring high-grade steel. After the war, however, Europe will be in a position to show its capacity as a producer of strictly commercial steel.

# Fundamentals of Apprenticeship: National Interest Grows-III.

Special Correspondence

*Industrial education is today the principal educational problem in this country. Employers, business managers, superintendents, thoughtful craftsmen, educators, economists, social workers, men and women in a hundred walks of life, have focussed their attention with growing earnestness upon the problem. Discussions, proposals and theoretical and practical experiments are gradually leavening the great mass of our industrial life.*

THE question of apprentice wage is important. Investigations have shown a wide variation in amounts paid to apprentices, not only during the first year, but for the succeeding apprentice years; also that these variations were as great in a given industry as among industries in general, and, what is even more interesting, the wage differences were as great in the same locality in a given industry as they were throughout the country. Out of a total of 451 shops in a certain trade that made report upon the wages paid to apprentices, the following table of first year payments will show the extent of this variation:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4 | shops | paid | $1 00 | 101 | shop | paid | $5 00 |
| 2 | " | " | 1 50 | 1 | " | " | 5.50 |
| 10 | " | " | 2 00 | 66 | " | " | 6.00 |
| 9 | " | " | 2 50 | 10 | " | " | 7 00 |
| 76 | " | " | 3 00 | 5 | " | " | 8.00 |
| 10 | " | " | 3 50 | 8 | " | " | 9 00 |
| 8 | " | " | 4 00 | 1 | " | " | 9 50 |
| 22 | | " | 4 50 | | | | |

[illegible] averaged $4 81 per week

In discussing the question of apprentice pay the Conference Board was presented with a considerable number of "customs" and "rules" that prevail among American industries and a consideration of the data furnished brought up the following questions:

Shall the wages be paid by the hour, day, or week?

Shall any piece-work rates apply?

Shall the wage be uniform in the same trade in all localities?

Shall it be uniform in the same trade in the same locality?

Shall the rate be based on a specific proportion of journeyman's wages usually paid in the same locality?

If so, what is the proportion during each year of apprenticeship?

Shall wages be paid during the total period, and how much?

Shall wages be advanced uniformly to all apprentices or shall special merit be considered?

Shall a bonus be given for faithful service; and if so, on what basis, and when?

Three of the above questions, those referring to trial period, piece-work, and bonus, are specially discussed hereafter. Concerning the other questions the following is offered:

The Conference Board believes that the best interests of all concerned, employer, apprentice, and industry, will be best served by the payment of a standard apprentice wage. While it is readily admitted that apprentices, under the thorough training system advocated by the Conference Board, will acquire a fund of information that will prove to be a most valuable asset throughout life—yet, because the apprentice is in the industry and a producer, he therefore is entitled to receive pay and upon a basis as near standard as the conditions and customs of the trade will permit.

### Apprentice Wage Should be Standardized

The Conference Board does not believe that the method of payment, whether by the hour, day, or week, is of great importance, although it would be desirable if the method of payment could be uniform in each industry. The Conference Board does believe, however, that the apprentice wage should be standardized wherever possible, and recommends that the employers of a given industry in each general locality come to an agreement thereon. While it may not be possible to standarize the apprentice pay throughout a country as vast in extent as the United States, due to local and journeyman wage conditions (for instance, the rate at New York might quite properly be different from that prevailing at New Orleans), nevertheless the apprentice wage in a given industry in New York should be uniform, and the apprentice wage in a given industry in New Orleans should also be uniform.

A uniform locality wage for apprentices will prevent discontent upon the part of boys working in one shop where the rate may be lower than in another similar shop in the same community. It will also prevent the "stealing" of boys—that is, one employer offering an apprentice of a competitor an increased wage if he will come to him. This "stealing" or enticing of boys from an employer is unlawful in some states, but it is nevertheless practiced, as many employers have good reason to know. The Conference Board does not believe that anyone should be prohibited from seeking employment wheresoever one desires to work, nor that an employer shall not employ whomsoever he may wish to employ, but inasmuch as an apprentice-student is receiving instruction under a definite agreement to teach and receive upon the part of the employer and boy, it would be greatly to the boy's disadvantage to have this relationship of teacher and student broken, even though it be for a temporary financial gain. Consequently, it should be impressed upon the apprentice that he should honor his contract and fulfill it—afterwards he may do as he desires.

That the apprentice shall receive periodical increases would not seem to need discusion, because as he progresses in his work and studies he will become more productive. Although he may not earn his first period wage, nor possibly his first increase or two, nevertheless, if he has been selected for mental, physical, and moral fitness and has been carefully trained in both the practical and technical things of the trade, he will eventually develop to a point where his earning capacity will fully repay the employer for the time and money spent upon him.

In reference to the wage rate to be paid, this Conference Board, as a result of its investigation, is led to make the following suggestion:

That the apprentice wage have a definite relation to the normal journeyman's wage; that the first payment be about one-fourth of the recognized journeyman's wage; that periodical increases be graduated during the period of apprenticeship until it reaches about one half of the journeyman's wage during the last apprentice year, and that these increases be made each six months.

It must not be overlooked that as a matter of fact the apprentice receives additional compensation in the special attention paid to him and the selected training given to him.

As an example of the above-suggested wage rate an apprentice would receive, under a four-year apprenticeship, in a trade where the journeyman rate was 40 cents an hour, the following payments:

Ten cents an hour for the first six months.

Eleven cents an hour for the second six months.

Twelve cents an hour for the third six months.

Thirteen cents an hour for the fourth six months.

Fourteen cents an hour for the fifth six months.

Sixteen cents an hour for the sixth six months.

Eighteen cents an hour for the seventh six months.

Twenty cents an hour for the eighth six months.

At the end of his apprenticeship term the apprentice should be paid at least the prevailing journeyman's wage.

### No Piece-work Payment During Apprenticeship.

The great Scotch political economist, Adam Smith, says, in his discourse upon the Wages of Labour,—"The produce of labour constitutes the natural recompense or wages of labour." While this is undoubtedly true for the adult worker, and is the basis of piece-work payment, it could not apply to immature youths whose living necessities approximate those of the adult but who have neither maturity of judgment nor dexterity of hand to provide those necessities.

*Copyright, "Conference Board on Training of Apprentices."

will follow if instruction has been given, but the employer must recognize the fact, as previously stated, that the apprentice cannot be expected to earn his wage and his instruction expense until he has been developed for a certain period, varying with the individual boy.

Piece-work payment to apprentices, as generally practiced, has two unfortunate tendencies: it specializes the boy, as neither boy nor employer is anxious to generalize the boy's work when he has developed special proficiency in a given operation, and it retards technical or class-room instruction, as neither boy nor employer is desirous to interrupt productive labor. It may have the advantage of impressing on the boy the true value of his labor, but this can be done in other ways.

### A Trial Period With Pay.

Apprentice training as recommended by the Conference Board is based upon an indentured apprenticeship, a written agreement for a specified time, for the performance of mutual duties at specified wages. All this is duly set forth hereinafter. As an agreement of this kind binds the employer to fulfill certain obligations, and as the performance of these obligations requires the expenditure of both time and money, it is not to be supposed that the employer will enter into such a contract until he knows the sort of boy-material with which he will have to work. Consequently, the Conference Board recommends that two or three months be considered a trial period, during which time the employer can judge the qualifications and capabilities of the boy, and this period also gives to the boy and his parents an opportunity to judge if the trade is congenial to him.

This trial period should be a part of the apprenticeship term during which all the conditions on both sides would apply, including wage payment as previously discussed. The indenture should not be executed until the boy shall have proved his fitness.

### Periodical Examination of Apprentices.

Just as the trial period should determine the boy's fitness to continue in the learning of the trade, so should there be periodical examinations of apprentices. One of the troubles with most apprentice training, particularly where there is no applied technical instruction, is that there are no regular check-up periods when the apprentice must demonstrate his progress or non-progress. Because of lack of such examination the apprentice is allowed to drift, often passing from one detail of work to another before he has theoretically and practically mastered the one he was working upon.

When the apprentice realizes that he must regularly prove to his employers, through examinations, that he has improved by observation, study, and trade practice; also that his continuance in the trade and his wage advances are dependent upon a fair percentage of progress, then will he apply himself the more diligently to his mental and physical tasks.

Where the apprentice department is under a competent supervisor and instruction is organized in both shop and class room, periodical examination of apprentices would naturally be a part of the system. Where there is no organized apprentice department and apprentice instruction is carried on in simpler form, more under the immediate supervision of the employer, the periodic examination can take place at convenient times, but it should not be omitted.

The Conference Board suggests that a form similar to that below could be used to advantage, this form to be signed by the foreman of the department in which the apprentice receives his practical trade training (or other authorized person), and that the half-yearly increases in the apprentice's wage be given upon the basis of this certification.

### Length of Apprenticeship.

From earliest times to the present, the term of apprenticeship has varied, dependent upon the age of the apprentice, the nature of the industry, and the skill of the boy or girl.

In olden days a boy was usually "bound out" under indenture papers until he was twenty-one years of age, a girl until eighteen years of age, or marriage. In modern American plants the term varies from one to seven years.

Certain industries as a whole have, through committees, studied this subject for the purpose of arriving at a time that would be best for the trade and the boy and have adopted a standardized apprenticeship period. The organized employing printers, for instance, have recently adopted five years as the standard apprenticeship period for their industry.

In some cases the apprenticeship term is based upon a total number of hours instead of a number of years.

---

This is to certify that . . . . . Punctuality . . .

the apprentice herein named has . . . . . Industry . . . . . .

fulfilled the condition of his employment for the past Intelligence in work.

six months and is entitled to the stipulated Efforts at improvement

increase in wages

Signed . . . . . Studies . . . . . .

Date Foreman General conduct . . . . .

---

### Cash Bonus at Completion.

The giving of a bonus to the apprentice upon successful completion of the apprenticeship term dates back to the old apprentice laws, in vogue not only in Western Europe, but also in many of our own States. It was specified in statutes just what the bonus must be. The following brief abstracts may be interesting:

"Fifty dollars in gold and two new suits of clothes to be worth in the aggregate at least $50.00."

"A new Bible, and two new suits of clothes to be worth respectively $15.00 and $25.00."

"A small allowance, the amount to be left to the master's generosity . . not less than $100.00."

This ancient custom has been applied in a modern way by many employers and with hardly an exception they agree that it is a beneficial thing to do.

To earn the bonus the apprentice realizes that he must have a high rating in attendances, morality, shop practice, and class-room work. It is a prize to work for, a preventive of restlessness. The Conference Board suggests that the amount of the honus be at the rate of $25.00 for each year, payable at the end of the complete apprenticeship term.

It should be borne in mind, however, that a bonus (as stated on foregoing page) should not, in the judgment of the Conference Board, be understood as a part of wages to be paid. It should be a voluntary reward for special efficiency attainment, in order that the apprentice, who is working under agreement upon a uniform wage scale with other boys, may have an incentive to develop his individual capabilities.

There is no gainsaying the fact that some trades are simpler than others and consequently easier to master; but it should not be forgotten that while the manual and machine operations that make up a given industry may be relatively simple, nevertheless the boy or girl and the future mental state of each must be considered, as well as the profits to be derived from his or her service.

Merely to teach an apprentice the motions of machinery and the part he must perform to keep the machine productively employed is not apprenticeship.

In addition to the machine and manual motions every trade has its mathematics, mechanics and science, all of which should be taught, and, moreover, an insight into the history of the craft and of related industries.

The teaching of these subjects will take time, but this time is necessary to develop manipulative skill and intelligence. This is an economic as well as a patriotic necessity.

As a result of inquiries and deliberations upon the subject of "Length of Apprenticeship," the Conference Board suggests the following as illustrative cases:

All-round machinist, four years.
Tool and die maker, four years.
Pattern maker, four years.
Carpenter, three years.
Blacksmith, three years.
Steamfitter and plumber, three years.
Sheet-metal worker, three years.
Moulder, three years.
Printer, five years.
Lithographer, five years.

# PROGRESS IN NEW EQUIPMENT

## A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

### GAP LATHE WITH QUICK CHANGE GEARS

THE gap lathe illustrated herewith has several improved features which render it suitable for work requiring strength and extreme accuracy, and in the design of the gap and gap plate a feature has been incorporated which allows the large face plate and thin work to swing without the removal of the gap plate.

The bed is deep and rigid and is provided with three V's of liberal proportions, the head-stock and tail-stock each resting on one V and on one flat surface, and the saddle on two V's and the flat surface. The box leg is hollow and is provided with a shelf for extra parts.

The head-stock is of the three-step cone double back-geared type and is equipped with phosphor bronze bearings. For convenience in operating, the back gear shifter is located on the front of the head.

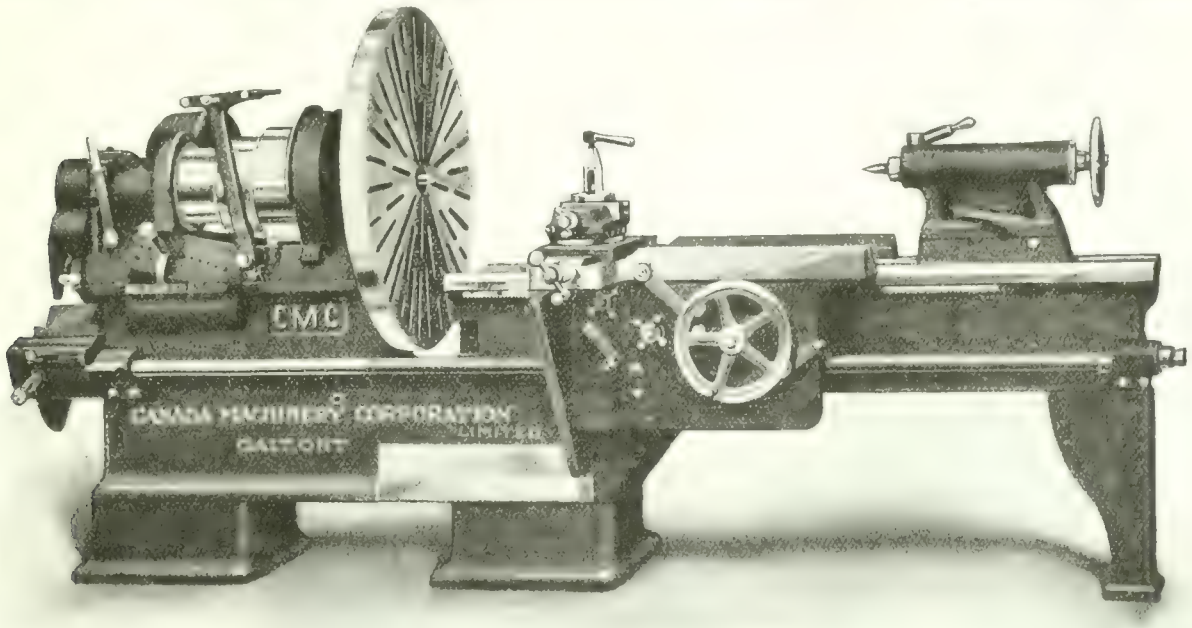
The belt shifter shown forms a standard part of the equipment, and the arm on the lathe with a corresponding arm on the counter-shaft provide a rapid means of shifting the belt to any cone without danger to the operator.

The feeds and screw cutting changes are obtained by the movement of a lever to any of the different stations as shown on the index plate. It is impossible to engage either the longitudinal or cross-feeds when the lathe is set for screw cutting and vice versa. The feeds may be instantly reversed in the apron by a convenient lever, and the saddle is securely clamped when using the cross-feed. The lead screw is reversed for right and left hand threads by means of a reverse plate on the head. All gears are securely guarded.

A thread-chasing dial is provided for indicating the correct point for engaging the nut for thread cutting.

The tail stock is rigid and heavy [illegible] is so shaped as to permit of the compound rest being set at right angles without interfering. The tail-stock is adjustable across its base by means of a screw to permit of its being set over to turn tapers, the base being graduated for this purpose.

The Canadian Machinery Corporation manufacture this lathe in 18 in., 20 in., and 24 in. sizes, which swing 32, 38 and 44 in. over the gap respectively. The width of the gap, clear of the face plate is 12 in., 15 in. and 16½ in. for the three sizes.




IMPROVED GAP LATHE WITH QUICK FEED CHANGE GEARS

### MULTIPLE SPINDLE DRILLING MACHINE

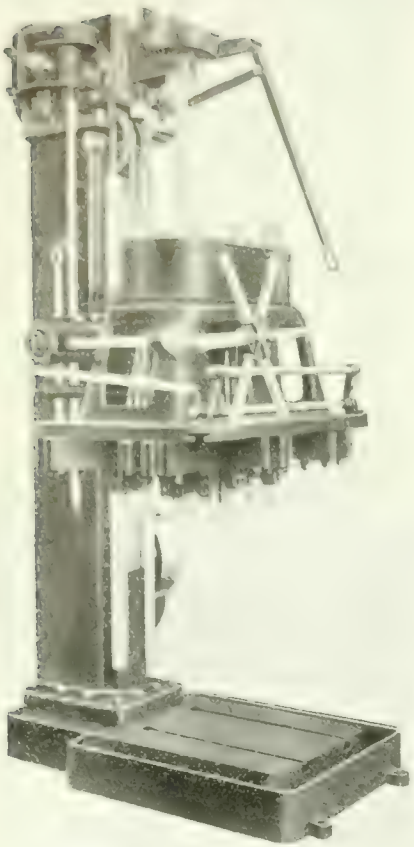
THE machine illustrated above has several features which render it particularly suitable for quantity production. Quick change speed gear boxes and quick change feed gear boxes have been eliminated. These features have permitted the operator to change the speeds and feeds against the wishes of the foreman. The speed and feed change gears are located in boxes with hinged covers, and with the machine are furnished extra gears so that speeds and feeds can be changed as reuirqed for different pobs.

The lever used in starting and stopping is also used for reversing in tapping operations.

The main driving pulley is located on the side of gear box on top of column. Power is transmitted direct to bevel gear which is used in conjunction with an internal expansion friction clutch on both forward and reverse speeds. These clutches are adjustable for wear and operate in an oil bath. The power is transmitted to the speed change case, from which point it is transmitted to bevel gears to the head.

The feed of machine is taken from main drive shaft, and when the drills are stopped the feed also is stopped. The changes of feed are made by changing of gears on the machine. The power is transmitted from the gear cases to a vertical shaft, which drives a feed worm located on the traveling head. This worm in turn engages a worm wheel, which works in conjunction with the feeding mechanism of the head. The engagement and disengagement of power feed is accomplished by a positive clutch of the "saw tooth" type. The pilot wheel for raising and lowering the head, and the lever for engaging or disengaging power feed are located at the front of machine, thus keeping all operating levers close to the operator.

The standard construction provides two speeds for each spindle in the head.



MULTIPLE SPINDLE DRILLING MACHINE.

The two speed features are part of the standard equipment of every machine.

This machine is manufactured by the Fox Machine Co., Jackson, Mich.

## BORING, REAMING AND FACING MACHINE

A SPECIAL boring, reaming and facing machine, built by the Reed-Prentice Company, Worcester, Mass., to bore, ream and face a steel forging used as an engine support in an automobile is illustrated herewith.

The work is held in quick acting clamps mounted on the revolving triangular turret of carriage. All of the operations are automatic, with the exception of placing the work in the machine and indexing the turret. Each time the work holder is revolved 120 degrees the finished piece at the top is removed and another rough forging is placed in position with little loss of time.

There are four spindles—two on each of the opposing heads.

Two pieces of work are operated on simultaneously. The cycle of operations is as follows:—The carriage moves toward the right; during its travel one piece is drilled and a second piece faced on one side. The carriage then automatically moves toward the left, during which travel one piece is reamed and the second piece faced on its other side, after which the carriage returns automatically to its neutral or starting position, at which point the feed is tripped automatically.

The turret is now indexed by the operator; the finished piece removed, and a new piece of work placed in position. The feed is then manually engaged and the cycle of operations begins again.

A 10 horse-power Westinghouse type S.K. direct current motor is used to drive this machine.

## FLUID GAUGE COMPARATOR FOR PITCH DIAMETER

ONE of the most difficult problems before the country at large to-day in connection with the manufacture of aeroplanes, motor trucks, ammunition, ordnance, guns, etc., is interchangeable and accurate screw threads. These are particularly important on account of the large scale upon which the manufacturing operations are being planned, and also because the different parts of the large production necessary will be manufactured in widely separated and diversified plants, and in no way can interchangeability be assured, except by a positive and accurate means of comparing working guages and master gauges, one with the other.

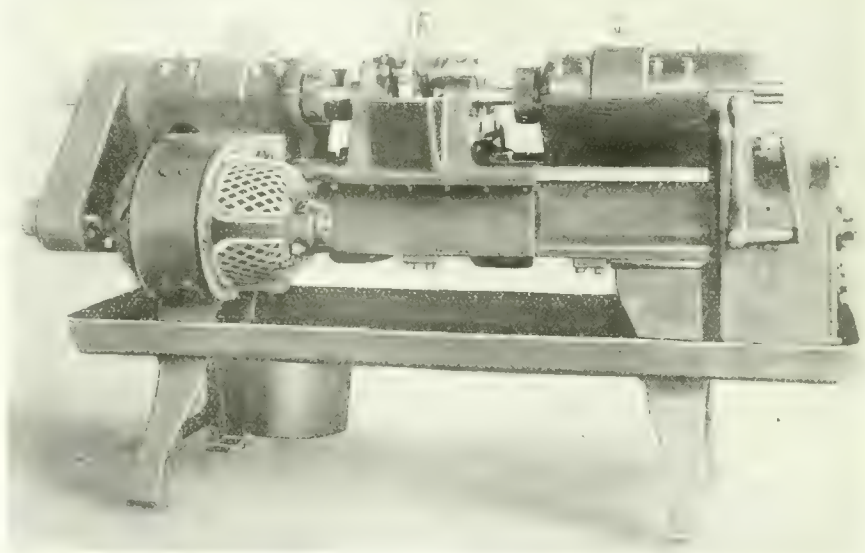
This comparator was originated by Mr. J. H. Wilhelm in charge of the Gauge Division in the Ordnance Department of the United States army, and is so designed that it can measure the pitch diameter on all thread gauges ranging from ¼ in. up to 10 ins. in diameter, and with equal facility and accuracy. It furnishes a handy, accurate, rapid method of comparison between working gauges and master gauges, giving the differences to the most minute quantity, and may be used for establishing the value of a master gauge by its use in combination with the Swedish gauges or other standard blocks which have been properly verified by the Bureau of Standards.

The elements of the machine are a base and an upright overhanging standard. In the base is carried a perfectly true lapped steel plate, which is set absolutely square with the hole through the center of the standard through which slides a bar carrying the upper measuring points which are in the form of a double roll and which rest on both walls of the upper part of the thread to be measured. Underneath the thread gauge to be measured are placed five-sided parallel blocks made with the same accuracy as standard space blocks, the two upper surfaces coming together in an angle equalling the angle of the thread to be measured. These are set on the lapped steel base plate and the gauge to be measured rests upon them, the walls of the thread being in contact with the angular upper sides. This method gives us an accurate and convenient pitch diameter comparator.

Extreme accuracy in reading is obtained by the use of the Prestwich Fluid Gauge. The upper thread measuring contact or roll is carried on the lower end of a vertical sliding spindle. The upper end of this spindle rests against the bottom of the diaphragm of the gauge, and the slightest movement of the upper measuring contact, in this way gives a certain reading on the column of the Prestwich Gauge, while the thread gauge being measured rests on the lowest angular parallels and passes under the upper measuring contact.

A second thread gauge passing through, if it is the same size, will give the same reading on the gauge, if it is larger it will cause the column to rise proportionately higher, if it is smaller, the column will not rise as high as before, and the difference may be directly read from the scale on the gauge to a great degree of accuracy, this scale being graduated to one ten thousandth part of an inch.

In order to establish the size of a



BORING REAMING AND FACING MACHINE

thread gauge by this comparator, in conjunction with the standard space blocks, the required size is first built up with the blocks, one of the angular five-sided blocks placed on top of them, and then the arm carrying the upper thread measuring contact is vertically adjusted, so that the contact fits over the angular sides of the blocks and the gauge column is at a mean specified height.

In this way the comparator may be set for any size absolutely without recourse to any other measuring machine or a master gauge, and the amount that a gauge is above or below on pitch diameter as set by the standard space blocks may be readily read on the scale of the fluid gauge.

The Coats Machine Tool Company, Inc., 30 Church Street, New York City, manufacturers in the States of the Prestwich gauge, has this comparator for sale as one of their specialties. It is a precision instrument, and one which is absolutely needed for the accurate measurement of pitch diameter of thread gauges, as ordinary methods of measurements on threads, such as with the ordinary pitch micrometer, three wires, ball point micrometer, etc., are only good enough for ordinary work, and cannot be used to check precision thread gauges.

The Government has had one of these built, and it will be advisable for the manufacturers to have some means of measuring the gauges which they may have to supply to the Government.

PRESTWICH FLUID GAUGE

## CANADA ATTRACTS SOLDIERS

### Many Veterans of the European Conflict Will Cross the Seas to Share in Development of the Dominion, After the War

"There will be many time-expired men from my regiment who will want to come to Canada when the war is over" writes Major D. Hector Pearson of The MacLean Publishing Company's staff, who is now a prisoner of war in Turkey. Major Pearson's words bear out the belief which gains strength from many similar indications from every camp and fighting front, that after the war the hardy men who have held the lines against the Hun will still want to be in the forefront of the economic battle called "after-war trade." Canada's place in that fight as in this is over the top every time, and the attractions of the Dominion for the soldier-spirit are immense. Immigration will certainly re-

## AMERICAN NAVAL PROGRESS

ACCORDING to the 1917 annual report of the American Navy Department, there are upwards of 800 vessels being built for the navy, ranging from battleships to small petrol craft. It is also stated that a considerable number of 3-in. anti-aircraft mountings have been completed and supplied to ships in commission. Gratifying progress generally is recorded. The rate of production of armour-piercing projectiles has greatly increased and the quality of the projectiles now being delivered is better than it has been in the past. The almost unlimited capacity of the country for projectile making was indicated when sixty-nine firms bid on one proposal and at prices lower than any previous tenders.

*He started in a humble way, all freckled, country made, he dropped into a suit of jeans and went to learn his trade. He took a hammer and a wrench, a measure and a rule, and made a scrape at everything that harkened like a tool.*

*He wasn't much to gaze upon, he wasn't five feet high, but had a strong and honest look and a twinkle of fun in his eye.*

*And every little job he got he did the thing up brown, he went from bottom to the top and from the top came down. He'd try a thing up every way, he'd see it right and left, and all the time he heck, his fist was growin' trained and deft.*

*He didn't stay long in the class of guesser at a thing, nor did he ever take a chance, or waste out a string.*

*He met each day that came along on Time's and a bit's edge—he met each thing it bore, no deal was matter small or big, he never dodged the little job, he seized it in his paw, he licked it to a finish and whacked it on the jaw.*

*And he never did a crazy trick, he never bid a man to make some chap feel cut and cry, and was to be spoken.*

*He's coasted up a peg somewhere, he just couldn't stay in the shop, he's bolstered up with praise many an able prop.*

*And some fine morning from the shop he'll step, and while others talk and argue, though they was he'll know what he can tell you, he'll step right up without a word, for all was this "THE MASTER OF THE JOB" WERK*

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## THE NEW STANDARD

MORE and more are the biggest men in every country turning their attention to the problems of the human side of industry. It's an encouraging sign, too, to notice that there's a deal more common sense being put into the discussion than there ever has been before.

There has been nothing short of a plethora of material about the hackneyed topic of "capital and labor." Formerly it used to be "master and servant." The change in name is simply indicative of the change in years.

The hopeful part of the situation is that the moral side of the matter is coming more to the front. True, it has only taken the form of academic discussion, but the element is showing itself in more ways than one.

It is coming to be recognized that men are more than the human part of mechanical equipment.

Quite surely we're getting pried loose from the idea that a man is good for only what can be squeezed out of him.

As large a man as Charles M. Schwab has said something very pointed on this matter. The very fact that Schwab is behind these words make them more forceful:

> "My good fortune is not the money which I have, but the fact that I am able to say that my possessions are for the good of my fellow-citizens."

Again, in reference to the place that labor is going to occupy in the future Mr. Schwab goes as far as to state that it will dominate the world. If a man of less size than Schwab said this he might be put down as a fanatic. But here it is:

> The coming aristocracy is to be composed of men who have done something for their country and the world at large."

That's a pretty broad plane on which to stand the people of this and every other age. And it's hard to see how any man can complain about it. If he gets crowded off the edge it will be because he's done nothing worth while that justifies standing room for himself.

If the future measurement is going to be on the basis of doing something worth while, there's quite a few people who will have to get up on their toes in order to make a showing big enough to justify their vocation and life work.

## STRIKING A STRIDE.

CANADIANS are rather slow in realizing that they are absolutely and really developing along industrial lines. It is an easy matter to note such growth in single, local cases. It is an entirely different thing, and certainly more difficult, to get a nation-wide view of the case.

The Wall Street *Journal* of recent date has the following. Canadians should read it and get the drift of what it means:

> "Canadian foreign trade for ten months of 1917 approaches $2,000,000,000—a per capita of $2,500. Of but recent development, the volume of commerce for the whole year will doubtless nearly equal in dollar value our own foreign trade for 1900, when we had 97,000,000 people. With but one-thirteenth our man-power, Canadian exports and imports will exceed one-fifth of our own.
>
> "At least $500,000,000 of war bonds have been purchased by Canadians. The Ministers of the Crown were justified in the implicit confidence which they placed in the Canadian instinct of thrift. There are racial and political differences in Canada, but thrift in common, homely household terms, is a Dominion-wide virtue, characteristic of the passive and the inaggressive, as well as of the industrious and ambitious. There is in Canadian thrift a saving grace, an indistinguishable attribute of the Scotch Presbyterian Ontarian and French-Canadian Habitant."

Canadian export trade is not a dream. For a long time we were content to pay visits to big American and British plants, and spend a couple of months after trying to figure out how it happened.

Canadians are developing. They are getting an aggressive, industrial nerve they never had before. They are beginning to believe in themselves.

And as yet the Dominion is only scraping on the industrial surface.

## CAN'T DOWN THIS MAN

CANADIAN railroads are much the same as railroads any place else. They run into problems they can meet—and they come across others that floor them.

The Weatherman can tie railroads up in a knot. He can wink at their organization and snap his fingers at their efficiency. The figures go to prove it.

On February 4 the Canadian railways moved from the Niagara frontier 1,082 cars. That is not high—in fact, it's rather low.

Then came the cold weather. The engines lost their punch and the snow piled in the switches.

The number of cars moved fell to 745. On the 6th it was worse, and the number went down to 720. In a few days the worst was over. These figures show the "comeback" the railroads had:

| | | |
|---|---|---|
| February | 7 | 1,130 |
| " | 8 | 1,164 |
| " | 9 | 1,274 |
| " | 13 | 2,000 |

NO life is worth living, no death worth dying, unless behind these there are unnumbered days of exertions and strivings in world-betterment accomplishments.

# Indenture Apprentices To Secure Best Results

## Gives a Stability to the Whole Plan That Makes for Complete Success—This Has Been Tried for Twelve Years at the Factory of the Dodge Mfg. Co.

THE question of apprentices, their treatment by the firm, their obligation to the company, and also the obligation of the company to the apprentice, are all matters that are receiving an increasingly great amount of attention. In many places this matter is still looked upon in the light of a fad used by some men who want to hang a system on every department of their shop. Fortunately this idea is getting more remote every month. War conditions have interfered seriously with the apprenticeship system. At the same time the scarcity of apprentices has brought many a manager or superintendent to think more seriously over the matter than he has ever done before.

### A Wholesome Sign

To one who gives any amount of thought or study to the matter at all, it becomes apparent that the two sides of the apprenticeship problem are receiving a more evenly distributed consideration than they ever did before. Managers and superintendents are taking a keener interest in the boys that come under their care. They are in many instances urging them to supplement their work in the shop with study at night in some technical training school. There are cases where these heads of firms insist on this being done. They want their apprentices to go out from their shops properly equipped to make their way in the industrial world, and they want them to have the training that will make it possible for them to go ahead and fill the best positions that are opening up in their line of work. Not only so, but if the mechanic remains as a journeyman in the shop where he was an apprentice, it is also in the interest of the firm to have him a thoroughly capable workman.

### The Dodge Co. Plan

Particular attention is paid to the apprentice system at the plant of the Dodge Mfg. Co. in Toronto. In fact, their whole apprenticeship system is based on the indenturing of apprentices. Unless a boy goes in as an indentured apprentice, the Dodge people do not encourage his employment. They realize that the signing of the paper constitutes a binding agreement between the boy and the firm and the boy's parents or guardians, and they find that it has a good influence in making the boy take a serious and continuous interest in the work which will in all likelihood become his life's vocation.

Mr. J. Shand, the factory superintendent, has been with the Dodge Co. for fifteen years. He takes a very great personal interest in the working out of the apprenticeship system, as does Mr. Wheaton, the general manager of the company. Mr. Shand discussed the matter with a representative of CANADIAN MACHINERY.

In answer to a question concerning results, Mr. Shand said: "We get the best results from the indenture plan. In fact, we will not take an apprentice any other way. If there are other boys taken on here it is only for temporary work, and we do not feel under any obligation to teach them a trade or any part of it. We always try to make them see the advantage of entering the shops in the regular way as a duly accepted apprentice.

### The War's Influence

"Then we have a number of our apprentices who had served part of their time, but who are now overseas with the Canadian forces. We will be willing to make allowances for these fellows when they come back," continued Mr. Shand. "They will be older and capable of doing more work, and I don't think we will have any trouble in arranging each individual case so that the soldier can start in and complete his training where he left off." The Dodge Co. take on apprentices for machinists, tool makers, molders, core makers and pattern makers, and many of the boys who have passed through their shops are now in positions of responsibility with some of the best concerns on the continent.

### How It Works

The Dodge Co. do not pay the apprentice his full wages during the time he is serving his four years' training. They hold back each pay an amount which is equal to about one cent per hour. At the termination of the apprenticeship period this amount, small as it may seem, has amounted to approximately $100, which the firm pays over to the newly-made journeyman. Not only is the apprentice that much to the good, but he has had a practical and a real demonstration of what small amounts will amount to if regularly saved. It has been a good lesson in thrift, as well as an anchor to hold him down to business during the period of his training.

### Well Satisfied With It.

"From your experience, would you say the system used here is quite satisfactory?" queried the visitor.

"Decidedly so," replied Mr. Shand. "I have had a chance to watch the operation of this plan for a period of twelve years now, and that has given a good chance to prove my statements. We also try to get our apprentices to keep on with their studies. We like to get lads here who have passed the entrance examinations. That gives them a start, but they must keep on with their studies. We encourage them to attend night school and technical classes. It is almost impossible to put too much stress on the importance of apprentices keeping up their studies apart from their work in the shop."

The war has taken a number of good men from the Dodge factory, especially when the call came from England for mechanics a year or so ago. It has also interfered with the apprentice system, but not permanently. The company have a carefully prepared document, setting forth in detail every obligation resting on the firm and on the apprentice. They try to live up to their part of the agreement, and make it worth while for the boys to live up to their end of it. They get results, and that's what they're after.

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SOME apprentices have stayed with their firms and forfeited better pay in munition shops. They have made a temporary sacrifice, but they will gain in the end. The big call for the future in Canada is going to be for trained men in all lines. And by trained men we mean those who are going beyond the stage of handymen.

* * *

RAILROAD men are now engaged on the task of making their rolling stock work more days per year. In 1916 it is known that an average of four days was required to load a car, and the same time was again consumed to get it under way again as an empty. These figures, on the face of them, are staggering, but they are given out by the railway board as absolute facts. The higher demurrage charges have caused a tumble in the figures. It's a pretty stiff and hopeless proposition to expect Canadian roads to make a showing against this condition.

EFFICIENCY is a term frequently used, but as often difficult to define. In no place is this more in evidence than in the average industrial plant, and one of the chief reasons is probably the vagaries of the human mind—a factor that is a relatively unknown quantity in the problem of manufacture and production.

# The United States Buys Much War Equipment in Dominion

*United States Contracts Expected to Continue on Large Scale—Production to Increase With More Fuel and Raw Materials—Steel Industry Prices to be Discussed at Washington—Markets Generally are Quiet and Firm.*

IF the development in the engineering industry during the past few months is any indication of what may be expected in the future, Canadian concerns will benefit considerably by the influx of orders from the United States. It is estimated that orders to the value of $50,000,000 have been placed in Canada by the United States during the past five months for munitions, marine engines and other war equipment. There is apparently no reason to doubt that this business will increase as the necessities of the situation arise. This business in addition to the contracts placed by the Imperial Munitions Board will in the aggregate represent a very large sum of money and add to the wealth of the country. Conditions in the iron and steel industry have improved on account of the more seasonable weather enabling supplies of fuel to be shipped in heavier volume to consumers. This will be reflected in an increase in production which will soon be normal. An effort will doubtless then be made to obtain larger supplies of raw materials so that the output of iron and steel may be further increased to meet the extraordinary and pressing demand for steel. Capacity output is assured for the steel plants for the remainder of this year. Prices are unchanged and the market is firm, although a decline in steel plate is expected shortly. The situation in the iron and steel trade in the United States is gradually improving and output is steadily increasing. The War Industries Board and leading producers will meet in conference next week to discuss the question of prices. It is understood that the producers are in favor of continuing the existing prices after March 31. The scrap metal market continues dull and unchanged with consumers buying on a hand-to-mouth basis to satisfy current requirements only. There is a scarcity of cast iron and heavy melting steel scrap. The export of scrap iron has been prohibited by the Government. Prices are unchanged. In the non-ferrous metal markets lead has advanced slightly on account of scarcity. The tin situation continues acute and prices are entirely nominal. The position of copper is unchanged as is also that of the other metals. Prices of solders have advanced, reflecting the high cost of tin. Prices of machine shop supplies continue firm with an upward tendency in some lines. Cotton duck belting and linseed oil have advanced, the market for the latter being particularly strong. The machine tool trade is still rather dull, enquiries being principally for munitions equipment.

MONTREAL, Que., March 11, 1918.—Steady progress has been made in the movement of freight upon the different railroads, although a temporary setback has been experienced due to the recent storm. The congestion at the terminals is less pronounced and a gradual return to normal is taking place. The steel problem is still one that is occupying the attention of both the Government and the producers here and in the States. Every effort is being made by the Canadian authorities to obtain all necessary requirements for the activities now under way, particularly those pertaining to the construction of steel vessels, negotiations having been successfully completed whereby an ample supply of plates will be available for those vessels that have been laid down by the Dominion Government. The possibility that some large shell contracts for the American Government may be placed in Canada has revived the interest of shell manufacturers, but developments in this direction are still in the negotiation stage. The general condition of the industrial situation promises a renewal of activity when more favorable weather is assured.

### Steel

Gradual improvement has become an encouraging factor in all branches of the steel and iron industry but some time must yet elapse before operations are of a normal character. The severe storm over the week end has temporarily renewed the difficulties under which the railroads are still working and the movement of freight has again been disorganized in some districts. Many of the blast furnaces in the States are still seriously affected by the inability to obtain sufficient coke to operate at capacity and consequently production remains below normal. Nothing definite has as yet been learned as to any revision of prices contemplated by the American Government in connection with the steel situation. Feeling is becoming general, particularly among the smaller producers of steel, that existing conditions warrant a higher selling price on semi-finished material, owing to the present high cost of production, which is considerably higher that at the time the Government regulations went into effect. With the prevailing heavy demand it is anticipated that some concession may be granted to producers to stimulate production of essential steel requirements. A developing feature of steel activity is the probability of the American Government standardizing of freight cars, which if put into effect would ultimately result in the corresponding regulation of prices for all car parts. The Canadian Government has recently purchased approximately 500 miles of rails, (through the United States Commission), that had been manufactured for the Russian Government. Owing to recent developments this material has been withheld from its initial purchasers, so that the negotiations just completed will enable the rails to be used in the very near future for the Government roads in Canada. The steel interests are awaiting any action on the part of the American Government regarding their attitude towards a revision of the regulations now in force respecting the prices of steel. Jobbers are looking forward to better recognition in the future. The requirements of Government contracts often necessitate the securing of steel on relatively short notice and the jobbers are invariably resorted to in obtaining this material. Co-operation in this connection is therefore essential and some steps should be taken whereby jobbers may be assured of equal consideration with other contractors working on a priority basis. This, however, is a feature of government control but nevertheless a factor in the better distribution of steel supplies, as under existing conditions the needs that might be classed as non-essentials are relatively very few. Local conditions are unchanged and dealers report a very quiet situation; delivery of materials is still acute as considerable difficulties still surround the transportation upon the various railroads. Prices are unchanged.

### Metals

Tin continues to be the dominating feature in the metal situation owing to the acute condition that has arisen through the inability to obtain sufficient metal to meet the trade requirements. The general metal market is steady in character although the difficulties contingent to transportation and production are still factors in the uncertainty of the market. Copper is in increasing demand owing to the heavier requirements of the American Government. Spelter has remained firm although the demand is light. Lead has again advanced but the

demand is falling off. Antimony and aluminum are both showing a weaker tendency.

**Copper.**—Despite the fact that the U.S. Government requirements for copper are steadily increasing, the supply is apparently ample to meet the growing needs. Some inconvenience is experienced by domestic consumers in obtaining supplies but this is to be expected in view of the abnormal developments in other directions. The open market is not very active and the trade seems to be waiting the outcome of negotiations that are contemplated for a revision of prices that are likely to be considered before the first of June. Many arguments are being advanced as to why the present price should be raised, the principal one being the marked advance in the cost of production over what it was when the regulation was put in force. The difficulties under which the refineries have been operating during the past six months have made it almost imperative that higher prices should prevail. A fair demand for copper is reported on the local market and the supplies are comparatively plentiful, the market is easier than last week and dealers are now quoting 30c for lake and electro, and 29c for casting, these prices representing a decline of 2c per lb.

**Tin.**—The tin situation continues to be the feature of the present metal market in view of the acute condition that surrounds the securing of metal from England and other points in the East. The London market continues to be in a very strong position and prices continue to advance. The inability to obtain sufficient metal for immediate requirements has placed the New York market in a very strong and likewise difficult position with nominal quotations the dominating factor in an unsettled and nervous market. Dealers here report that supplies in Canada are of fair volume considering existing conditions and the demand is very active, but dealers are guarded in the alloting of tin, being unable to foretell the trend of the early future. The market here has been rapidly climbing for the past several weeks and the century mark has almost been attained; the present nominal quotation of 98c shows an advance over last week of 8c per lb.

**Spelter.**—Difficulties surrounding the shipping of spelter has retained this metal in a relatively steady position, although the demand has not been exceptionally active. The New York market has shown a slight decline but the undertone is one of returning strength. The local situation has been rather quiet and dealers report an easier market with quotations lower. A decline of ½c per lb. places the present price at 11c per lb.

**Lead.**—The activity that was pronounced earlier in the week has fallen off and the demand has declined. The market is, however, still in a strong condition and the advance has been maintained. The quotations on the New York market indicate a strong position; trust prices show an advance of ¼c while the independent price has been advanced ⅜c during the week, the quotation of the latter being 7½c per lb. The local situation is a steady one and the demand is regular; dealers report no change in prices and are still quoting 10½c per lb.

**Antimony.**—The market for this metal has not been active and a light demand continues. The New York market is weaker with lower prices asked. Local dealers report a light but steady demand with prices holding firm at 18c per lb.

**Aluminum.**—The market is generally quiet with American prices declining. Local situation is unchanged with prices steady at 55c per lb.

### Machine Tools and Supplies

Present activity in the machine tool industry is not very brisk, owing largely to the fact that users of machinery are pretty well supplied for current requirements. While the demand for munition machinery has fallen off considerably there are still some scattered inquiries for individual tools of medium weight for the six inch shells. Some activity has been shown in forging equipment in connection with the manufacture of the 75 mm. shell, this resulting from the inability of firms doing the machining to obtain forgings in sufficient quantities for the capacity operation of their plants. Some little business has been done in heavy tools for shipyards, but on the whole the week has been comparatively quiet in all directions.

Post-war possibilities are apparently interesting a number of machinery men, as it has been reported that several machine tool interests are taking steps to improve the conditions under which machinery may be manufactured so as to enable better concentration along certain lines with the purpose of bettering the efficiency in connection with production. Some interest has been developing in the prospect that American orders for larger shells may come to Canada, in which event a renewal of activity may be expected in machinery circles. The demand for all classes of general supplies continues to be quite active and prices are invariably well maintained.

### Scrap

Nothing has developed to alter the general tone of the scrap situation and dealers are apparently waiting improved conditions on the railroads for increased activity and likewise better conditions. Consumers are not buying for future needs, only purchasing sufficient to cover their immediate requirements; the supposition being that any regulation that may be put into effect will lower the present prices, particularly on certain iron and steel scraps. In the Pittsburg district, the government has set a price of $35 on No. 1 cast (for cupola use) and a similar price on No. 1 wrought iron. These prices, however, represent a $5 advance over that ruling a couple of weeks ago on the open market. Steel scrap has shown a general tendency to become stronger in the States. The local situation has not been featured by any particular development and dealers report business comparatively quiet. Some little difficulty is still experienced in getting supplies from the source to the destination, but improvement is becoming more pronounced, although the recent snow has temporarily affected the movement upon the roads. Regarding prices, dealers here are uncertain and present quotations are nominal and unchanged.

**CANADIAN GOVERNMENT WAR PURCHASING COMMISSION**

**The following gentlemen constitute the new war Purchasing Commission. Sir George Foster, Minister of Trade and Commerce; Frank P. Jones, Montreal; J. W. McConnell, Montreal; James H. Gundy, Toronto; Charles McNaught, Toronto, and Joseph Gibbons, Toronto. C. A. Magrath, as Fuel Controller, and Hon. H. Laporte, as chairman of the War Purchasing Commission, are members of the board ex-officio. Sir George Foster is Chairman of the Board.**

## Toronto

TORONTO, Ont., March 12.—Developments during the past five months have been such as to further consolidate the engineering industry in this country. Orders from the United States have been placed during this period for munitions, marine engines and other war equipment to the value, it is estimated, of $50,000,000. Of this amount $35,000,000 have been placed by the Imperial Munitions Board, which includes the seven million 75-m.m. shells, two million cartridge cases and ten million forgings. These orders, while being of the greatest benefit to the engineering industry, will have an important influence in adjusting the balance of trade and equalizing exchange between Canada and the United States. The Imperial Munitions Board is also expending about $25,000,000 a month in Canada on behalf of the British Government. Such a large expenditure cannot help but have a very beneficial effect on the industry and on Canada as a whole. Indications point to this activity continuing for the remainder of the year. Plans have been completed for the supply of rails for the various railroad systems in Canada, which are badly in need of new tracks and replacements. The Dominion Government has placed a contract on 100,000 tons of rails with the Dominion Steel Corporation, to be rolled at Sydney. It is understood that rolling will begin on April 1st. During that month 10,000 tons will be produced, and it is expected that deliveries will reach 30,000

[illegible] month in May, June and July. The [illegible] May [illegible] probably 85 pounds.

### Iron and Steel

[illegible] situation in the iron and steel [illegible] continues to improve steadily and production is gradually increasing in volume. More reasonable weather is having [illegible] effect on trade, and the steel plants are able to obtain heavier supplies of fuel, which will be reflected in an increase in output and afford marked relief to the prevailing shortage of iron and steel. Production should soon reach normal tonnage, which will likely be succeeded by an effort to still further increase the output, as suggested some weeks ago. Arrangements are doubtless being made to secure sufficient supplies of raw materials to enable the required tonnage increase being produced. The intention is to have all steel plants in Canada operating at capacity this year in order to take care of the enormous demand for steel. This, however, will not be easy to accomplish owing to the shortage of lake tonnage, cars and labor, but doubtless the 1917 record will be beaten.

Locally the iron and steel trade has been rather quiet this week and deliveries are still backward. Traffic conditions, which were improving, received a temporary set back by the snowstorm on Saturday, which considerably hampered the movement of freight in some districts. The local strike of freight handlers has also aggravated an already difficult situation for the railways to cope with, and has also inconvenienced merchants and distributors. There have been no price changes this week, and the market is holding firm. The only change likely in the near future is in steel plates, which will probably be reduced in price about 1c a pound. Good progress is being made in this district on the new Government ships. There appears to be no difficulty in getting plates and shapes for these ships, as arrangements have been made with Washington to facilitate shipment of material for this purpose. Available supplies of pig iron are being quickly absorbed at current prices, which are holding firm. The demand for basic pig iron continues heavy, and there has recently been more inquiry for foundry grades.

The majority of the steel manufacturers in the United States are in favor of the present schedule of prices being continued until the end of the year, although some are agitating for higher prices on some products. It is quite possible that the War Industries Board will seek reductions in prices. The whole question will be considered at a conference between the board and the producers to be held next week. It is possible that existing prices will be ordered continued after March 31 for an indefinite period, but not to the end of the year. Prices do not constitute the sole concern of the steel industry by any means. The possibility of an insufficient demand to engage all capacity, in case transportation conditions permitted, was recognized long ago by a few observers, and is now being recognized more generally. The highest estimates of total war requirements of all descriptions run from 50 to 60 per cent. of the full productive capacity. Meanwhile with steadily, though slowly, improving traffic conditions, the production of steel increases, shipments of finished steel in the past week representing about 70 per cent. of capacity. This month is expected to show a more rapid increase, and thus bring to a decision the question whether there is to be a demand for all the steel industry can make. Unfilled orders of the United States Steel Corporation on Feb. 28 were 9,288,453 tons, according to the corporation's monthly statement recently issued. This is a decrease of 189,400 tons, compared with orders on Jan. 31

### Scrap Metals

Conditions in the scrap metal market are unchanged, and inquiries have been very light for some time. Dealers' stocks continue low, although it is believed that sellers are holding back in anticipation of higher prices. Consumers, on the other hand, look for lower prices, and are in the meantime only buying on a hand-to-mouth basis to satisfy current requirements. There is a scarcity of good cast iron scrap and also of heavy melting steel, which is keeping the market firm in these materials. All prices are unchanged. Export of scrap iron has been prohibited entirely by the Government with a view to conserving in Canada the limited supplies of iron and steel raw material easily convertible for manufacturing purposes. The United States prohibited export of scrap iron some time ago, and in view of the prevailing scarcity of supplies for the iron and steel trades in Canada it was found necessary to stop in Canada issuing further licenses permitting export of scrap iron to the States.

### Machine Tools

Another rather quiet week has been experienced in the machine tool trade and conditions in the market are unchanged from last week. The demand continues to be principally for munitions machinery with occasional enquiries for equipment for shipbuilding plants. It appears probable that further contracts will be placed in Canada, these will, it is reported, include shells up to 12-inch calbre. Tentative enquiries only have as yet been made as to the ability of the Canadian plants to produce a shell of this size, but it is not unlikely that ultimately some contracts will be placed. The market in the States is less active and deliveries will likely improve as a result.

### Supplies

Prices of machine shop and mill supplies continue steady and firm with an upward tendency in some lines. An advance of about 7½ per cent has gone into effect on "Maple Leaf" cotton duck belting, and the discount now in effect is 20 per cent. as against 25 per cent. formerly quoted. The demand for leather belting is good and a firm undertone is evident in the market. A strong undertone to the waste market is reported and that an advance is almost sure to be made effective in the near future has been gathered. In some quarters it is felt that present prices are too low. Stocks are reported to be in good shape and equal to heavy demands which may soon develop. At the present time, shipments are limited. Oakum held steady and no change is anticipated at the present time. Linseed oil has again advanced due to the short supply of flaxseed, the price now being $1.95 for raw and $1.98 for boiled oil.

### Non-Ferrous Metals

The situation in non-ferrous metals has become more interesting by reason of the uncertainty surrounding developments in the market, more particularly in regard to cotton, tin and aluminum. The revision of copper prices will come up for consideration some time in May and it is understood that the producers will induce the U.S. Government to agree to a higher price after June 1. There is no improvement in the position of tin, the scarcity still being acute with practically no supplies obtainable. Although the price of aluminum has been fixed in the States, there has been no change locally, a condition brought about by the scarcity of metal in this market. The price of lead has advanced because of the scarcity of metal in the East on account of the traffic congestion. Spelter and antimony are both unchanged, but solders have advanced. Business in Toronto and district is very good and the outlook continues favorable.

**Copper.**—There is no new development in the copper situation and the market continues very quiet. At the present time there is somewhat of a shortage in the United States due to a heavy and sudden demand by Government who cut off supplies from outside consumers for the time being. However, no fear is expressed that there will be an ultimate shortage of the red metal. It is reported that a movement is on foot among the producers to induce the U.S. Government to agree to a higher price after June 1. Lake, electrolytic and casting copper is still quoted at 28c per pound.

**Tin.**—There is no change in the position of tin which is very scarce. The entire situation seems to be growing more serious each day, and inquiries and demand for the metal far exceeds the ability of supply. The demand extends for deliveries far into the future. There is no Straits tin offering and only limited quantities of Banca and Chinese. In this market there is practically no spot tin to be had and the price is entirely nominal at $1 per pound.

**Spelter.**—The market has a weaker tendency on account of the light demand which is resulting in a decline in production. The price of spelter in London remains officially fixed at £54 for prompts and £50 for futures, which are equal to 11.45c and 10.60c per pound. The local price is unchanged at 11c per pound.

**Lead.**—The market locally is firmer, and the price of lead has advanced ½c per pound due to a scarcity in the East caused by shipments being delayed on account of traffic congestion. The undertone of the market is strong, but with in-

creased production as the season advances an easier position may be anticipated. Lead is now quoted locally at 9½c per pound.

**Antimony.**—There is no change in the antimony market, which is attracting little attention. Present price 17c per pound.

**Aluminum.**—Although the price of aluminum has been fixed at 32c per lb. in the primary market there has been no change made here due principally to the fact that very little metal can be obtained except for government work. The market here is firm and the price is still 52c per pound.

**Solders.**—The great scarcity of tin and consquent abnormal high prices has caused a further advance in the prices of solder. The advance is equivalent to 2c per pound, guaranteed being now quoted at 50c and strictly at 47c per pound.

# Washington

**Special to Canadian Machinery**

WASHINGTON, March 9. The war industries of United States are more closely knit together to-day than at any time since the entrance of that country into the war. Reorganization of the War Industries Board by President Wilson has completed the work of mobilization of the entire industrial resources of the nation to the work of winning the war.

Bernard Baruch has been appointed the new chairman of this important board, as was predicted in this letter last week. Under the new plan the board is given wider authority over the industries of the nation, and it is expected that it will be able to wield the same power that might have been placed in the hands of a Director of Munitions. The entire industry of the country is placed under the rule of Mr. Baruch by the executive act of the President. No legislative power has been given to the War Industries Board, but the executive powers of the President have been transferred to the War Industries Board in a large measure and through this control the industries are placed at the disposal of the government.

### Price Fixing

One of the most important steps taken by the United States government, and affecting the industries of both United States and Canada, is the step taken this week to secure absolute control over the steel industry of United States. Steps have been taken to fix the prices on all commodities which are included in the manufacture of steel. By so doing it is expected that the government will be able to control the entire steel output of United States and to absolutely fix the price on that important product.

The steel situation in United States has not been greatly improved, according to the reports received by officials here. There is still danger of a serious shortage. However, the new War Industries Board has plans under way which will limit the steel output of the country to war purposes, so that it is expected that if there is an acual steel shortage that it will not have any effect upon the war work of the nation, but will be confined to the non-essential industries of United States.

### The Price of Labor

One of the factors in the steel industry in the country which is giving officials no little worry is that of wages. There have been enormous increases in wages which are steadily driving the prices upwards. Reports to the Labor Department show that during the past year increases in wages in the steel industry have ranged from 52 per cent. to 95 per cent. This is one of the reasons for the attempt to fix the prices on all commodities entering into the manufacture of steel, as the officials believe that by holding down the prices of these commodities they can wipe out some of the increased labor costs and keep the price of steel on a level.

### Canada is Favored

The War Trade Board has placed an effective embargo on all exports of tin plate from United States. Canada is exempted from this embargo, however. Although other countries are partially exempted, Canadian manufacturers are the only ones placed in the same class with those of United States, and are unrestricted in their purchases of tin plate in United States.

The United States government has taken over the platinum industry of United States. An order has been issued commandeering all supplies of raw platinum. This order, however, does not affect those manufacturers who are using platinum in the manufacture of anything that may be considered a war necessity.

The price of aluminum has been fixed by agreement with the producers of this product at 32 cents a pound.

### Tenders Are Called

The Navy Department has announced that it will make call shortly for a number of die sinking machines, and for a miscellaneous assortment of hardware. Manufacturers desiring to offer bids on these products should write to the Bureau of Supplies, Navy Department, Washington, D.C., asking for schedules 1721, 1719, 1707 and 1711, 1712. The hardware specifications call for a large number of valves of various descriptions.

### More Labor Trouble

The shipping situation in the United States is again threatened by labor trouble. The Hog Island yard, which up to this time has been free from labor trouble, is now struggling with a strike of some three hundred men because the government officials in charge of the work there have seen fit to cut down the overtime pay for Sundays and holidays from double time to time and a half. The ship carpenter controversy on the Atlantic coast is still going on, although a greater part of the workers have returned to their work and have subjected their demands to arbitration.

### Ship Construction

The Navy Department has announced that tests are now under way of a non-sinkable ship. Work has been going on for some time on the construction of this vessel, which is built on the idea of a double hull. The ship is now at sea, and will undergo numerous tests before a final decision has been reached.

The first of the submarine destroyers being built at the Ford automobile plant in Detroit will be ready for a trial trip in the early summer, according to official announcement from the Navy Department.

Coal and transportation conditions in United States have again reached a state which is almost normal, according to announcements from the Fuel Administration and the office of the Director General of Transportation.

# New York

**Special to Canadian Machinery**

NEW YORK, March 9.—Some large contracts for machinery are understood to have been tentatively placed by the government at Washington in the last few days, and additional contracts are pending. The prospect is that manufacturers of machine tools and of other shop equipment will find employment for full capacity throughout the current year and well into 1919 unless there is a sudden halt in the war. Ordnance makers as well as manufacturers of shells that are preparing to build new plants, as well as to extend works now in operation, must come into the market for all kinds of machine tools and coveying machinery as soon as government contracts have been placed.

### Big Development Here

The Quartermaster's Department of the Army is understood to have closed contracts for equipment of machine shops in this country and in France. Buying of this character for 1918 and for 1919 requirements will be three times the orders placed for 1917 delivery, according to reports from Washington. The local office of the United States Signal Corps has put out an inquiry for 30 small lathes, 10 sensitive drills and other tools for the equipment of shops that will manufacture spark plugs for aviation motors. The New England Westinghouse Co., of Springfield, Mass., has been given a large contract for Browning machine guns which, according to reports current in the trade, will aggregate $12,000,000. Substantial supplementary orders for the same type of guns have also been given to the Remington Arms, U M C Co., the Winchester Repeating Arms Co. and the Marlin-Rockwell Corp., which concerns have been making Browning guns. The Remington Arms Co. has already placed orders for additional shop equipment calling for the expenditure of $100,000 and the other companies are

expected to make similar purchases in the near future.

### More Big Orders

The Dominion Shipbuilding Co. has given a contract for 4,000 tons of structural steel to the Central States Bridge Co., and another contract for 1,000 tons of steel to the Nashville Bridge Co., for the construction of powder plants at Charleston, West Virginia. The same interests are also understood to have placed orders for machinery for these shops. Additional powder plants will be built for government, calling for about 18,000 tons of shapes, specifications for which are now in course of preparation. The Dupont Engineering Co., Wilmington, Del., has bought $75,000 worth of tools for the works at this point. The Dupont Co. will also build and equip shell-making and shell-loading plants at Williamsburg, Virginia, if present plans are carried out. The J. G. White Engineering Co., New York, has issued a list of tools required by the Government for equipping plants in France to manufacture airplane motors and the Pennsylvania R. R. has continued to buy jib cranes for motor hoists to be installed in railroad shops in France. Total purchases will be 336 cranes.

Official announcement has been made at Washington of the ordnance base now being constructed in France at a cost of $25,000,000, but most of the details of this enterprise were reported several months ago. The machine tool equipment has cost about $5,000,000.

It is estimated that the Savage Arms Corp. Utica, N.Y., has contracted for several hundred tools valued at $1,000,000. One order called for 150 tools and another for 100 tools all of which will be used in the manufacture of Lewis machine guns for aircraft.

The Ford Motor Co. has placed a contract with the American Bridge Co. for 4,000 tons of structural steel required in the building of a boat shop 1,700 feet long. The building is to be completed about May 10th. The submarine destroyers will be built in this shop. The Worthington Pump & Machinery Corp., which is to make the pumps for these boats, has purchased tools for its Harrison, New Jersey, shops. The Terry Steam Turbine Co. will make 400 turbines to operate the pumps.

## Pittsburg

Special to Canadian Machinery

PITTSBURGH, Pa., March 9.—As for two or three months past, the crux of the situation is how fast can finished steel be shipped from mills, mill operations depending upon what the mills can ship, while the production of pig iron, although greatly restricted, nevertheless furnishes an ample supply for the steel that can be shipped.

Shipments, on the whole, have increased in the past week, but only slightly. A fair estimate for the industry as a whole is that in the past week the shipments have been equal to [illegible] of capacity, against an average of between 60 and 65 per cent. in February and 55 to 60 per cent. in January. Conditions are quite irregular and inconsistent, however. For instance, a particularly heavy snowfall the first week in January so tied up the Chicago district mills that they shipped hardly anything in the month. Again, while early in February traffic conditions were equally bad in the Pittsburgh and Youngstown district, about the middle of the month a great improvement occurred in the Youngstown district, whereas in the past two or three weeks it has been shipping at a much better rate than the immediate Pittsburgh district. Furthermore, as preference is given to war material, the shipments of war steel, directly and indirectly required by the Government, are very much heavier than the shipments of ordinary commercial steel. Then there are differences among the various branches of the trade. The pipe mills are shipping at better than 75 per cent. of capacity. The independent sheet mills are averaging close to 80 per cent., while the leading interest's sheet mills have hardly averaged over 40 per cent., and so it goes.

### Price Revision or Extension

It is the more common opinion that the War Industries Board will extend the present set prices after March 31, though perhaps not to the end of the year, as the producers desire. While a good bit gets into the public prints about the present set prices being unjust in one respect or another to certain producers, there is little likelihood that any prices will be advanced. Some of the arguments, moreover, will not hold a great deal of water. It is true, doubtless, that the present price for plates, 3.25c, does not afford much margin to the plate mill that must operate on slabs purchased at $50, but the argument that the price should be advanced to 3.75c "to stimulate production" meets with the pertinent observation that possibly the production of plates does not need to be stimulated, that quite possibly a supply of plates equal to 75 or 80 per cent. of the present capacity will provide all the plates the shipyards and car shops can turn into ships and cars respectively, and still leave a respectable overflow for commercial demand, which demand is at present conspicuous by its absence. A ten to twelve-cent plate market last summer had much to do with throttling such demand.

What is distinctly possible is that if the present set prices are continued there will develop shortly in some lines an open competitive market. Producers themselves are quite alive to that possibility, though naturally they do not discuss it openly.

Attention should be directed to the fact that the War Industries Board has, in essence, a great deal more power than it had last September, when it brought about the voluntary agreement by producers that prices should be set to apply to the Government, its Allies, and the domestic buyers generally. The Government had clear legal authority to fix prices only upon the first class of material named, and that was only a relatively small proportion of the total steel being shipped. Now Government steel is by far the preponderating tonnage, and if the Government were to release the producers from the agreement and fall back upon its power to fix prices upon its own purchases, say, at cost plus a certain percentage, the producers might find themselves in a decidedly uncomfortable position. There is no thought of any such thing. The control of the War Industries Board is simply regarded as complete, and no one has a desire to raise any question.

### Demand for Sheets and Pipe

While the finished steel market as a whole is very quiet as regards ordinary commercial demand, there are some high spots. The demand for tubular goods used in the oil industry continues very insistent, with deliveries difficult to obtain, and there is quite a fair demand for standard steel pipe from distributors, who, while they may not expect as heavy a distribution this spring as usual, have been unable to accumulate stocks during the winter as they usually do.

The commercial demand for sheets is also good and early deliveries are very difficult to arrange, the mills apparently being quite well filled for the next two or three months at the rate at which they are now able to operate. Prices in the domestic market are firm at the set maximum levels, 4.25c for blue annealed, 5.00c for black, and 6.25c for galvanized, but there are cases of mills paying a small commission to large distributing interests.

### Coke and Pig Iron

Since the improvement early in February the shipments of Connellsville have not increased to speak of, and are running at only about 300,000 tons a week, whereas it is safe to estimate the blast furnaces depending upon the Connellsville region for their coke require about 375,000 tons a week. There is also some shortage of by-product coke owing to slight deficiencies in supplies of by-product coal, while beehive districts other than Connellsville are not making their full quotas of coke. Assuming a slight increase in pig iron production over the average in February, the country is now making pig iron at the rate of about 33,000,000 tons a year when the capacity is fully 43,000,000 tons. The 10,000,000 tons deficiency is coke, and apparently nothing else. Perhaps with a full supply of coke other difficulties might be uncovered, but they are not apparent now.

### Transportation and Rolling Stock

The only visible influence curtailing the production of pig iron and steel is the lack of sufficient transportation for the coke from coke ovens to blast furnaces, or coal from mine to by-product coke ovens, for intermediate products and for finished rolled steel from mills. Shipments of finished steel, as indicated already, may be estimated at about 70 per cent. of capacity, while the capacity is fully 35,000,000 gross tons a year, or about 3,000,000 tons a month. It does not follow that if the industry could ship at 100 per cent. there would be a continued demand for the increased amount of material.

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago. | 37 50 |
| Standard low phos., Philadelphia. | |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 33 00 |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | | |
| Victoria | | 50 00 |

## FINISHED IRON AND STEEL

| Per lb. to Large Buyers. | Cents |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 5 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 5 75 |
| Chequered floor plate, 3-16 in. | 12 20 |
| Chequered floor plate, ¼ in. | 12 00 |
| Staybolt iron | 8 50 |
| Bessemer rails, heavy, at mill | |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | *3 50 |
| F.O.B., Toronto Warehouse | |
| Steel bars | 5 50 |
| Small shapes | 5 75 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

## FREIGHT RATES

Pittsburgh to Following Points

| | Per 100 lbs. C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 38.1 | 50.5 |
| Halifax | 39.1 | 51.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

## METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $30 00 | $28 00 |
| Electro copper | 30 00 | 28 50 |
| Castings, copper | 29 00 | 28 00 |
| Tin | 98 00 | 100 00 |
| Spelter | 11 00 | 11 00 |
| Lead | 10 50 | 9 50 |
| Antimony | 18 00 | 17 00 |
| Aluminum | 55 00 | 52 00 |

Prices per 100 lbs.

## PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¼ to ½ | $10 00 | $10 00 |
| Heads | 10 30 | 10 25 |
| Tank plates, 3-16 in. | 10 10 | 10 10 |

## WROUGHT PIPE

Effective Feb. 5, 1918.

| | Black Per 100 feet | Galvanized |
|---|---|---|
| **Standard Buttweld** | | |
| ⅛ in. | $ 6 00 | $ 8 00 |
| ¼ in. | 5 16 | 7 29 |
| ⅜ in. | 5 16 | 7 29 |
| ½ in. | 6 55 | 8 12 |
| ¾ in. | 8 28 | 10 41 |
| 1 in. | 12 24 | 15 39 |
| 1¼ in. | 16 56 | 20 82 |
| 1½ in. | 19 80 | 24 89 |
| 2 in. | 26 64 | 33 49 |
| 2½ in. | 42 72 | 53 53 |
| 3 in. | 55 85 | 70 00 |
| 3½ in. | 70 84 | 87 86 |
| 4 in. | 83 93 | 104 10 |
| **Standard Lapweld** | | |
| 2 in. | $ 29 60 | $ 36 08 |
| 2½ in. | 44 46 | 54 70 |
| 3 in. | 58 14 | 71 53 |
| 3½ in. | 72 68 | 90 62 |
| 4 in. | 86 11 | 107 37 |
| 4½ in. | 97 79 | 122 56 |
| 5 in. | 114 00 | 142 82 |
| 6 in. | 147 80 | 185 28 |
| 7 in. | 192 80 | 241 57 |
| 8 L in. | 202 50 | 253 75 |
| 8 in. | 233 30 | 292 32 |
| 9 in. | 279 50 | 350 18 |
| 10 L in. | 259 20 | 324 80 |
| 10 in. | 333 70 | 418 18 |

Prices—Ontario, Quebec and Maritime Provinces.

### WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

## OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 22 50 |
| Copper, heavy | 22 50 | 22 50 |
| Copper wire | 22 50 | 22 50 |
| No. 1 machine composition | 21 00 | 21 50 |
| New brass cuttings | 16 00 | 14 00 |
| Red brass turnings | 17 00 | 17 00 |
| Yellow brass turnings | 12 50 | 12 50 |
| Light brass | 10 00 | 9 50 |
| Medium brass | 14 00 | 12 00 |
| Heavy brass | 15 00 | 14 00 |
| Heavy melting steel | 21 00 | 21 00 |
| Steel turnings | 12 00 | 12 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 23 00 | 18 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 23 00 |
| No. 1 machine cast iron | 27 00 | 25 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 17 00 | 13 00 |
| Car wheels, iron | 26 00 | 25 00 |
| Steel axles | 38 00 | 35 00 |
| Mach. shop turn'gs | 9 00 | 8 50 |
| Cast borings | 12 00 | 12 00 |
| Stove plate | 19 00 | 19 00 |
| Scrap zinc | 6 50 | 6 50 |
| Heavy lead | 7 50 | 7 00 |
| Tea lead | 5 00 | 5 75 |
| Aluminum | 25 00 | 20 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, ⅜" and less | 10 |
| Carriage bolts, 7-16 and up | net |
| Coach and lag screws | 25 |
| Stove bolts | 55 |
| Plate washers | List plus 20 |
| Elevator bolts | 5 |
| Machine bolts, 7-16 and over | net |
| Machine bolts, ⅜ and less | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | 10 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | add 25 |
| Nuts, square blank | add $1 50 |
| Nuts, square, tapped | add 1 75 |
| Nuts, hex., blank | add 1 75 |
| Nuts, hex., tapped | add 2 00 |
| Copper rivets and burrs, list plus | 30 |
| Burrs only, list plus | 50 |
| Iron rivets and burrs | 15 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 37½ |
| Wood screws, O. & R., brass | 32½ |
| Wood screws, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

## MILLED PRODUCTS

| | |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil. Head Cap Screws | net |
| Flat But. Hd. Cap Screws | plus net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. & Semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2 in. | plus 10 |
| Studs | net |
| Taper pins | 40 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | list plus 20 |
| Collar screws | list plus 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | 65 |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add 7 00 |

## BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $47 50 |
| Open-hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.

F.O.B. Pittsburgh.

## NAILS AND SPIKES

| | | |
|---|---|---|
| Wire nails | $5 25 | $5 20 |
| Cut nails | 5 70 | 5 65 |
| Miscellaneous wire nails | | 60% |
| Spikes, ⅜ in. and larger | | $7 50 |
| Spikes, ¼ and 5-16 in. | | 8 00 |

## ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 41 |
| Plumbers' oakum, per lb. | 0 09 |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila rope | 0 33 |
| New Zealand hemp | 0 33 |
| Transmission rope, Manila | 0 45 |
| Cotton rope, ¼-in. and up | 0 47 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | net |

### MISCELLANEOUS

| | |
|---|---|
| Solder, shelled | 0 [illegible] |
| Solder, guaranteed | 0 50 |
| Babbitt metals | 18 to 70 |
| Soldering coppers, lb. | 0 53 |
| Lead wool, per lb. | 0 16 |
| Putty, 100 lb. drums | 4 75 |
| White lead, pure, cwt. | 16 05 |
| Red dry lead, 500-lb. kegs, per cwt. | 15 50 |
| Glue, English | 0 35 |
| Tarred slater's paper, roll | 0 95 |
| Gasoline, per gal., bulk | 0 31½ |
| Benzine, per gal., bulk | 0 30½ |
| Pure turpentine, single bbls., gal. | 0 73 |
| Linseed oil, raw, single bbls. | 1 95 |
| Linseed oil, boiled, single bbls. | 1 98 |
| Plaster of Paris, per bbl. | 2 50 |
| Sandpaper, B. & A. | list plus 20 |
| Emery cloth | list plus 20 |
| Sal Soda | 0 03½ |
| Sulphur, rolls | 0 05 |
| Sulphur, commercial | 0 04½ |
| Rosin "D," per lb. | 0 03 |
| Rosin "G," per lb. | 0 03½ |
| Borax crystal and granular | 0 12 |
| Wood alcohol, per gallon | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

### CARBON DRILLS AND REAMERS

| | Per Cent. |
|---|---|
| S.S. drills, wire sizes up to 52 | 30 |
| S.S. drills, wire sizes, No. 53 to 80 | 30 |
| Standard drills to 1½ in. | 30 |
| Standard drills, over 1½ in. | 30 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 20 |
| Bit stock | 25 |
| Ratchet drills | 15 |
| S.S. drills for wood | 30 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 40 |
| Sleeves | 40 |
| Taper pin reamers | net |
| Drills and countersinks | list plus 30 |
| Bridge reamers | 52½ |
| Centre reamers | 10 |
| Chucking reamers | net |
| Hand reamers | 10 |

### COLD ROLLED SHAFTING

At mill ..... list plus 40%
At warehouse ..... list plus 50%

**Discounts off new list. Warehouse price at Montreal and Toronto**

### IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 8 00 | $ 8 25 |
| Sheets, black, No. 10 | 10 00 | 10 00 |
| Canada plates, dull, 52 sheets | 9 00 | 9 00 |
| Can. plates, all bright. | 9 50 | 9 50 |
| Apollo brand, 10¾ oz. galvanized | ..... | ..... |
| Queen's Head, 28 B.W.G. | ..... | ..... |
| Fleur-de-Lis, 28 B.W.G. | ..... | ..... |
| Gorbal's Best, No. 28 | ..... | ..... |
| Colborne Crown, No. 28 | ..... | ..... |
| [illegible] No. 28 U.S. | 9 45 | 9 25 |
| Premier, 10¾ oz. | 9 75 | 9 50 |
| Zinc sheets | 20 00 | 20 00 |

### PROOF COIL CHAIN

¼ in., $12.35; 5-16 in., $11.85; ⅜ in., $11.50; 7-16 in., $10.90; ½ in., $11.20; 9-16 in., $11.20; ⅝ in., $11.10; ¾ in., $11.05; [illegible] in., $10.95; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $15.50; 3-16 in., $11.70; ¼ in., $8.40; 5-16 in., $7.40; ⅜ in., $6.35; 7-16 in., $6.35; ½ in., $6.35; ⅝ in., $6.35; ¾ in., $6.35.

**Prices per 100 lbs.**

### FILES AND RASPS.

| | Per cent |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 40 |
| Black Diamond | 40 |
| J. Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 37½ |
| Disston | 50 |
| Whitman & Barnes | 50 |

### BOILER TUBES.

| Size | Seamless | Lapwelded |
|---|---|---|
| 1 in. | $36 00 | $..... |
| 1¼ in. | 40 00 | ..... |
| 1½ in. | 43 00 | 36 00 |
| 1¾ in. | 43 00 | 36 00 |
| 2 in. | 50 00 | 36 00 |
| 2¼ in. | 53 00 | 38 00 |
| 2½ in. | 55 00 | 42 00 |
| 3 in. | 64 00 | 50 00 |
| 3¼ in. | ..... | 58 00 |
| 3½ in. | 77 00 | 60 00 |
| 4 in. | 90 00 | 75 00 |

Prices per 100 ft., Montreal and Toronto.

### OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | |
| Royalite, per gal., bulk | 17 |
| Palacine | 20 |
| Machine oil, per gal. | 26½ |
| Black oil, per gal. | 15 |
| Cylinder oil, Capital | 45½ |
| Cylinder oil, Acme | 36½ |
| Standard cutting compound, per lb. | 0 06 |
| Lard oil, per gal. | $2 50 |
| Union thread cutting oil antiseptic | 88 |
| Acme cutting oil, antiseptic | 37½ |
| Imperial quenching oil | 39½ |
| Petroleum fuel oil | 13½ |

### BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30-5% |
| Standard | 40% |
| Cut leather lacing, No. 1 | 1 95 |
| Leather in sides | 1 75 |

### TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 06 |
| Emery glue | 15 to 20 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 35 |

**Prices Per Lb.**

### BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 38 |
| Brass sheets, 24 gauge and heavier, base | 0 43 |
| Brass tubing, seamless | 0 46 |
| Copper tubing, seamless | 0 48 |

### WASTE.

| White. | Cts. per lb. | | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 18½ |
| Peerless | 21 | X Empire | 17¼ |
| Grand | 19¾ | Ideal | 17¼ |
| Superior | 19¾ | X press | 16 |
| X L C R | 18½ | | |

**Colored.**

| | | | |
|---|---|---|---|
| Lion | 15 | Popular | 12 |
| Standard | 13½ | Keen | 10½ |
| No. 1 | 13½ | | |

**Wool Packing.**

| | | | |
|---|---|---|---|
| Arrow | 25 | Anvil | 15 |
| Axle | 20 | Anchor | 11 |

**Washed Wipers.**

| | | | |
|---|---|---|---|
| Select White | 11 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING.

Standard ... 10% Best grades .. 15%

### ANODES.

| | |
|---|---|
| Nickel | .50 to .54 |
| Cobalt | 1.75 to 2.00 |
| Copper | .44 to .46 |
| Tin | .49 to .56 |
| Zinc | .23 to .25 |

**Prices Per Lb.**

### COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | 42 50 | 43 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 46 00 | 44 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 48 00 | 48 00 |
| Copper sheet, planished, 16 oz. base | 57 00 | 45 00 |
| Braziers,' in sheets, 6x4 base | 45 00 | 44 00 |

### LEAD SHEETS.

| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $13 25 | $13 25 |
| Sheets, 3½ lbs. sq. ft. | 13 25 | 13 25 |
| Sheets, 4 to 6 lbs. sq. ft. | 12 50 | 12 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS.

| | |
|---|---|
| Acid, boracic | $ .15 |
| Acid, hydrochloric | .05 |
| Acid, hydrofluoric | .14½ |
| Acid, nitric | .10 |
| Acid, sulphuric | .05 |
| Ammonia, aqua | .08 |
| Ammonium carbonate | .15 |
| Ammonium, chloride | .11 |
| Ammonium hydrosulphuret | .40 |
| Ammonium sulphate | .07 |
| Arsenic, white | .12 |
| Copper, carbonate, anhy | .35 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .70 |
| Iron perchloride | .20 |
| Lead acetate | .16 |
| Nickel ammonium sulphate | .12 |
| Nickel carbonate | .35 |
| Nickel sulphate | .15 |
| Potassium carbonate | .75 |
| Potassium sulphide (substitute) | .20 |
| Silver chloride (per oz.) | .65 |
| Silver nitrate (per oz.) | .55 |
| Sodium bisulphite | .10 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .41 |
| Sodium hydrate | .04 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | .14 |
| Tin chloride | .60 |
| Zinc chloride | .60 |
| Zinc sulphate | .09 |

**Prices per lb. unless otherwise stated.**

# INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

## ENGINEERING

**Moose Jaw, Sask.**—The C. P. R. contemplates the erection of a 400-ton capacity mechanical coaling plant here.

**Galt, Ont.**—Work on the new machine shop for the Canada Machinery Corporation Co. is progressing rapidly despite the weather. The 25-ton electric crane, which will run the length of the new building, is now in place. Before long the roof of the building will be on.

**Port Moody, B.C.**—The Aetna Iron and Steel Co. are installing a six-ton electric furnace which will be in operation about the middle of this month. The material used will be scrap iron, and the product will consist of merchant bars, light angles and channels. The company is operating the mill on scrap faggots to make rods for shipbuilding purposes.

**Ottawa, Ont.**—Plans are being made by the Railway Department for a further increase in the rolling stock and equipment of the Government railway system, including the Canadian Northern. In addition to the heavy purchases made last year, it is proposed to buy one hundred and fifty new locomotives, and 7,500 box cars this year, to be utilized in taking care of the anticipated increase in traffic.

**London, Ont.**—The Public Utilities' Commission has directed to the Dominion Natural Gas Co. a request for full particulars concerning the strike of gas in a well near Port Talbot, thirty miles from London. The company is reported to have found gas there 70 miles from any other known field. The strike was made at a depth of 1,506 feet, and the yield is now estimated at from 5,000,000 to 7,000,000 feet a day. London will ask for a supply in order to be able to meet the coal shortage next winter.

**Montreal, Que.**—J. M. Hutcheson, general manager of Montreal Tramways Co., states that the second auxiliary steam plant at Hochelaga, consisting of a steam turbine with a capacity of 12,500 k.w.h., or about 17,000 h.p., will be installed towards the end of April or at the beginning of May. Asked as to how the first auxiliary plant was working out, Mr. Hutcheson replied that it was doing very well, being used in rush hours, such as in the morning and evening, when requirements for electric current are far above normal, besides which it can be used in case of any failure of transmission of hydraulic power.

## ELECTRICAL

**Calgary, Alta.**—The City Commissioners are in the market for a motor generator set.

**Chatham, Ont.**—The Dominion Sugar Co. has asked the Hydro Commission for 2,900 h.p. for the operation of a part of their plant using what is known as the Barium process, by which it is now possible to manufacture sugar from refuse formerly regarded as almost impossible.

**Toronto, Ont.**—The Ontario Legislature has voted over $9,000,000 for Hydro-Electric extensions, of which $4,175,000 is for carrying on work on the great Chippawa development at Niagara Falls, from which the province will ultimately secure a minimum of 250,000 additional horse-power.

## GENERAL

**Winnipeg, Man.**—A deal is being put through whereby the Harris Abattoir Co. will purchase the Gordon, Ironsides & Fares Co.

**Georgetown, Ont.**—The woollen mills owned by H. Corke & Co. were burned to the ground on Monday morning. The company had been working on yarn and was supplying various manufacturers, filling Government orders. The loss, including building and contents, is estimated at about $50,000.

**Tillsonburg, Ont.**—Fire on March 6 almost completely destroyed the main building of the Huntley Manufacturing Co. Its origin is a mystery, and the amount of the loss will probably amount to at least $50,000 on the building, exclusive of machinery, tools and new machines ready for shipment. The main factory of the Huntley Co., which is engaged in the manufacture of elevator machinery, is situated in Silver Creek, N.Y. The Canadian company purchased the plant of the Tillsonburg Electric Car Co. a year ago.

## MUNICIPAL

**Melfort, Sask.**—Town Council contemplates the purchase of a Diesel oil engine.

**Port Dover, Ont.**—The gas franchise by-law was carried here by 210 for and 10 against.

**Fredericton, N.B.**—The city council are considering calling for tenders for pumps for the waterworks.

**Chatham, Ont.**—The city council contemplate undertaking extensive improvement to the waterworks system.

**Verdun, Que.**—Tenders will be called this year for repairs and reinforcements to waterworks and electric plants at a cost of $50,000 for the town council.

**Alliston, Ont.**—The Town Council has decided to purchase a 20 h.p. triplex plunger pump and electric motor at a cost of $2,800. W. J. Cunningham is chairman of the committee which has the matter in hand.

**London, Ont.**—The ice pressure of last month has forced a hole 20 feet wide in the foundations of the waterworks dam at Springbank, which prevents further development of power from this source. Five hundred horse-power was developed there and used for power-load correction and during the present shortage. It will be months before the necessary repairs can be made.

## TENDERS

**Ottawa, Ont.**—Tenders will be received until March 21 for motor street flusher for the Department of Works.

**Montreal, Que.**—Tenders will be received up to Tuesday, March 19, 1918, for steel rails and angle bars, castings, oils, timber and ties, smokeless coal, steam coal. Copies of the specifications and tender forms may be obtained upon application to F. W. Cowie, Chief Engineer.

**Winnipeg, Man.**—Tenders for structural steel ornamental lamp posts for the Provencher Ave. Bridge, addressed to J. B. Cote, secretary of the Joint Committee, St. Boniface, will be opened on March 28. Plans and specifications to be obtained from the Bridge Engineer, 802 Confederation Life Building.

**Ottawa, Ont.**—Tenders will be received until Tuesday, April 2, 1918, for the construction of a Dominion Government Office Building, O'Connor street, Ottawa, Ont. Plans and forms of contract can be seen and specifications and forms of tender obtained at the offices of the Chief Architect, Department of Public Works, Ottawa; the Overseer of Dominion Bldgs., Central Postoffice, Montreal, and the Clerk of Works, Postal Station "F," Toronto, Ont.

**Ottawa, Ont.**—Tender will be received until Monday, March 18, 1918, for the construction of structural steel work, Dominion Government Office Building, Ottawa. Plans and forms of contract can be seen and specifications and forms of tender obtained at the offices of the Chief Architect Department of Public Works, Ottawa, the Overseer of Dominion Buildings, Central Post-Office, Montreal, P.Q., and the Clerk of Works, Postal Station "F," Toronto, Ont.

**Melbourne, Australia.** — Tenders for the following may be addressed to the Director of Navy Contracts, Navy Office, Melbourne: Supply, delivery and erection at Garden Island, of one (1) 200 horse-power prime mover set of either semi-Diesel type or other heavy oil engine direct coupled to 2-65 K.W. 240 volt D.C. electric generating set. All accessories, tank and fittings to be supplied by tenders as per specification. Date of closing, June 7, 1918. Tender forms are open for inspection at the Department of Trade and Commerce, Ottawa. File No. 20117.

**Ottawa, Ont.**—Tenders will be received until March 25, 1918, for the switchboard, panel boards and transformers

required in the reconstruction of the Parliament Buildings. All tenders to be based on the execution, completion, and delivery on the site, together with the furnishing of all material, tools, appliances, labor, etc., for the work as required and described by the plans and specifications for switchboards, panel boards and transformers. Plans and specifications and any other information required can be obtained at the office of the general contractor, P. Lyall and Sons Construction Co., Ottawa.

**Ottawa, Ont.**—Tenders will be received until Tuesday, March 26, 1918, for the construction of fifty-one (51) section houses at various points on the Canadian Government railways (National Transcontinental Railway) between Moncton and Winnipeg. Plans, specifications and blank form of contract may be seen at the following offices: Chief Engineer, Dept. of Railways and Canals, Ottawa, Ont.; Chief Engineer, Can. Govt. Rys., Moncton, N.B.; Resident Engineers at Edmundston, N.B., Levis, P.Q., Quebec, P.Q., Cochrane, Ont., Fort William, Ont., the Terminal Agent, Montreal, P.Q., the General Western Agent, Toronto, Ont., and the General Manager Western Lines, Winnipeg, Man.

**Ottawa, Ont.**—Tenders will be received until March 18, 1918, for rolled steel casements and bronze-covered frames and sash for the Parliament Buildings. All tenders to be based on the execution, erection and completion; together with the furnishing of all materials, tools, appliances, labor, etc., as required and described by the plans and specifications for (a) rolled steel casement; (b) bronze covered frames and sash. Separate tenders to be submitted for "a" and "b." The work included under this contract shall be commenced immediately on the signing of the same, or at such time as may be directed, and be carried out in such a manner as to insure the completion thereof by Sept. 30, 1918.

**Ottawa, Ont.**—Tenders will be received until March 18, 1918, for heating and ventilating equipment required in the reconstruction of the Parliament Buildings. All tenders to be based on the execution, erection, and completion, together with the furnishing of all materials, tools, appliances, scaffolding, apparatus and labor required for the installation of the heating and ventilating equipment as called for in the plans and specifications. All information can be obtained at the office of the general contractors, P. Lyall & Sons Construction Co., Ottawa. A set of plans and specifications may be had by depositing an accepted bank cheque for twenty-five ($25.00) dollars, made payable to the Honorable the Minister of Public Works, which will be re- ing bidder submits

## INCORPORATIONS

The Galt Foundries Co. been incorporated at Toronto with a capital of in iron Galt

**Ont.** The provisional directors are B. Colvin, D. Buchanan and W. E. Demill, all of Galt.

**The Acme Waste Mfg Co.** has been incorporated at Toronto with a capital of $40,000 to carry on the business of rag pullers and waste manufacturers at Toronto. The provisional directors are W. P. Ford, I. M. S. and H. Goldstein all of Toronto.

**The Buckeye Traction Ditcher Co.**, incorporated in Ohio, has been granted permission to manufacture iron, steel, machinery, tractors, implements, etc., in Ontario, with a capital stock of $50,000. John J. Wallace, Chatham, Ont., represents the company

**Leonard Tractor Co. of Canada, Ltd.**, has been incorporated at Ottawa with a capital of $1,000,000 to manufacture tractors, motor trucks, etc. The head office is at Montreal and the incorporators are W. W. Skinner, W. G. Pugsley and G. G. Hyde, al of Montreal.

**The Electric Insulation and Varnish Co.** has been incorporated at Toronto with a capital of $60,000 to manufacture varnished cambrics and other products for insulation purposes in connection with all kinds of electrical machinery and apparatus. The provisional directors are John Whitfield, T. G. Shaw, and J. Montgomery, all of Toronto.

## RAILWAYS

**Ottawa, Ont.**—Work on the Quebec and Saguenay Railway will be resumed very shortly.

**Ottawa, Ont.** The acute scarcity of 80-pound steel rails in Canada to meet railway requirements for replacing worn rails has led to an arrangement between the Federal Government and the Government of New Brunswick for the purchase of over 100 miles of new rails on the St. John Valley Railway, now Provincially owned.

**Ottawa, Ont.**—It is being suggested at the City Hall that if the city is to provide accommodation for foot traffic across the Rideau Canal between Ottawa East and Centre Town in the vicinity of the old Ottawa East Bridge, this accommodation should take the form of a tunnel instead of a foot bridge. It is asserted that with bridge materials at present prices a tunnel would cost less than a bridge.

**Ottawa, Ont.**—Plans are being made by the Railway Department for a further increase in the rolling stock and equipment of the Government railway system, including the Canadian Northern. In addition to the heavy purchases made last year it is proposed to buy 150 new locomotives and 7,500 box cars this year, to be utilized in taking care of the anticipated increase in traffic.

**Ottawa, Ont.**—It is estimated that new rails are required this year for some 2,000 miles of Canadian railways, improvements being long overdue because of the difficulties of the past three years in regard to securing rails, money and labor during war time. The arrangement which has been made in regard to new rails on the Intercolonial emphasizes the difficulties of the railway companies in meeting pressing requirements of keeping roadbeds up to standard.

## MARINE

**Victoria, B.C.**—It is understood that the Dominion Government will give $50,000 towards the construction of the shed required on pier No. 2 at the new outer wharves.

**Montreal, Que.**—It has become known that interests headed by James Playfair, of Midland, were bidding for the purchase of the Northern Navigation Co.'s passenger service on the Great Lakes, reports stating that $2,000,000 had been offered to the Canada Steamship Lines as owners of the Northern Navigation Co.

**Vancouver, B.C.**—The auxiliary schooner Stasia has left Vancouver bound for Kobe and Yokohama, carrying 500,000 feet of lumber and a shipment of steel. She will complete cargo at Victoria. The Stasia was the twelfth and last of the fleet of British Columbia-built schooners and was launched in November under the name of the Beatrice Castle, but was recently sold to French interests. She loaded at the Evans, Coleman & Evans docks.

**Vancouver, B.C.**—J. H. Price, president of the Cameron-Genoa Mills Shipbuilders, operating a four-way shipyard at Point Ellice, has been entrusted with the designing of two types of sailing craft, one of 3,000 tons and another of 3,500 tons register, for Charles Towne, of Buenos Aires, Argentina. These vessels will be similar in design to the five-mast power schooners designed and built for the Canada West Coast Navigation Co., but considerably larger. These ships will be of the windjammer class and consequently will rely solely on sails for driving power.

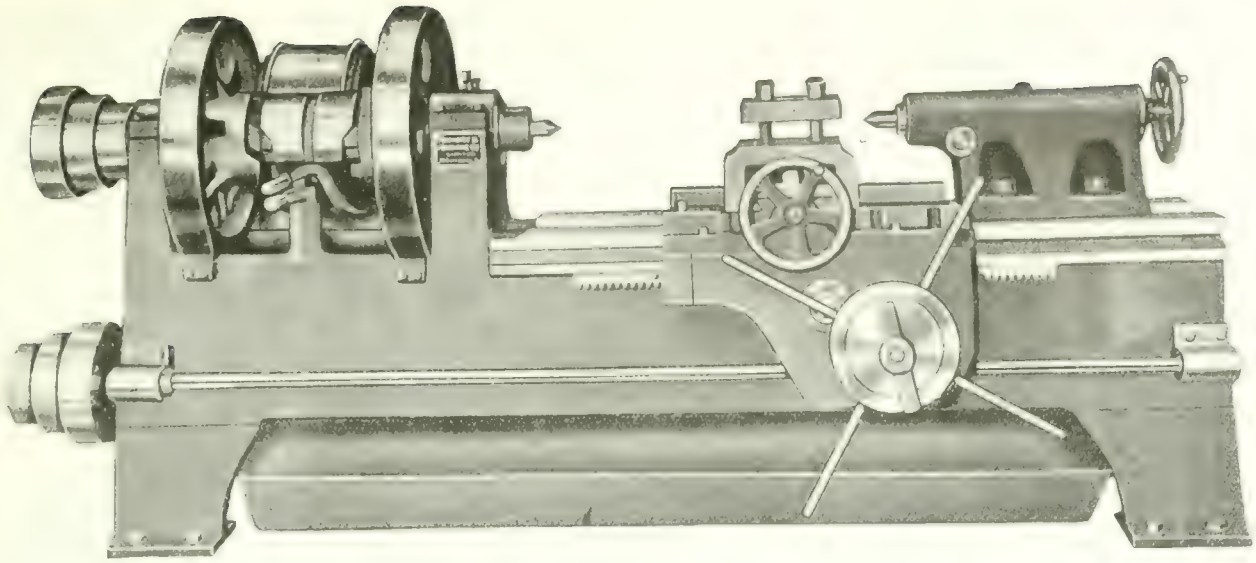
**Victoria, B.C.**—The arrival of British officers to take over the first two wooden steamers of the war emergency fleet again brings to the fore the question of manning the ships with full complements as they are turned over to the owners by the builders. Capt. Norman C. King and Capt. R. M. Milestone, of the Fernie Line, accompanied by four mates and eight engineers, have reached the city from Liverpool, and are now standing by the vessels to which they will be assigned, the War Yukon and the War Nootka, the most advanced of the twenty-seven steamers under construction on this coast for the Imperial authorities.

## PERSONAL

**G. G. Bushby**, of Vancouver, has been elected president of the British Columbia Manufacturers' Association.

**Hon. W. J. Hanna** has been appointed president of the Imperial Oil Co., with headquarters in Toronto. Mr. Hanna succeeds W. C. Teagle.

**Captain Robert Fraser**, who for over twelve years was marine superintendent of the Montreal Transportation o., at Kingston, ont. died at Long Beach, Cal., on Sunday.



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LIMITED
(Formerly Marsh & Henthorn, Limited)
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BELLEVILLE - - ONTARIO

C. J. Hicks [illegible] the Dunlop Mfg. Co. of Toronto. Mr. Hicks came from Midland, Ont., and previous to his work [illegible] had wide experience in manufacturing work.

**William M. Brouse**, a prominent business man of Brockville, Ont., will move to Orillia having been appointed assistant manager of the International Harvester Co., there.

**R. S. Carter**, district representative of The Whitman & Barnes Mfg. Co., with headquarters in Pittsburgh, has been promoted to sales manager and will have direction of twist drill and reamer sales from the Akron O., general office.

**Adam Cook**, the senior member of the firm of Adam Cook's Sons, manufacturers of Albany Grease, died on Feb. 19, at his residence, 148 West 78th street, New York City. Adam Cook was born in Albany, N.Y., in 1867.

**H. E. Fisher**, formerly with The Pittsburgh Model Engine Co., Pittsburgh, Pa., has become associated with The Whitman & Barnes Mfg. Co., Akron, O. He succeeds R. S. Carter as mechanical engineer and will have charge of sales in the Pittsburgh district.

**W. A. Jamieson** has been elected chairman of the Victoria branch of the B.C. Canadian Manufacturers' Association. Mr. Jamieson thus becomes vice-president of the British Columbia organization, the headquarters of which is in Vancouver.

**Paul E. Thomas** of Chicago, prominent for years in railroad circles in the traffic department of the Seaboard Air Lines, has become connected with The Whitman & Barnes Mfg. Co., Akron, O. His official position is that of sales manager in charge of the department of wrenches and spring cotters.

**R. A. Gurnham**, who has been connected with the John McDougall Caledonia Iron Works for the past seven years, the last two as works superintendent, has accepted a position as mechanical engineer with Darling Bros., Montreal. He will be associated with the sales department.

**Loyall A. Osborne**, of New York, vice-president of the Westinghouse Electric & Mfg. Co., and chairman of the executive committee of the National Industrial Conference Board, has been appointed by the Secretary of Labor a member of a committee on industrial peace during the war.

**A. B. Hall**, vice-president of The Whitman & Barnes Mfg Co., will have supervision of the company's sales. He has for the past twenty-one years been connected with the company in various sales and official capacities. His early connections were with the company's Chicago sales office as manager, which position he held until his transfer to the general office at Akron, O.

R. W. Gladstone, manager of the Canada Ingot Iron Co., at Guelph, Ont., has been at the plant of the parent company at Middletown, Ohio, recently. At the U.S. mills there are stocks piled up [illegible]

particularly fortunate in securing its supply of raw material, the thickness used being a shade under that which would be necessary for military purposes. Even now none of the output can be exported until all the orders that are claimed by the War Department have been filled and satisfied.

**Thomas A. Russell**, vice-president of the Willys-Overland Co., and of the Russell Motor Car Co., has been elected president of the Canadian National Exhibition, Toronto. Mr. Russell was born at Exeter, Ont., in 1877, and graduated from Toronto University in 1899. He was secretary of the Canadian Manufacturers' Association in 1900-02. He was one of the pioneers of the automobile trade in Canada, and in 1908 was president of the Ontario Motor League. In 1911 he became general manager of the Canada Cycle and Motor Co., and later vice-president of the Willys-Overland Co.

# TRADE GOSSIP

**February Fire Losses.**—The "Monetary Times'" estimate of Canada's fire loss during February is $2,243,762, compared with the January loss of $2,688,556 and $2,009,953 for February, 1917.

**Civil Engineers to Merge.**—A Committee of the Nova Scotia Society of Engineers has adopted a resolution favoring an amalgamation with the Canadian Society of Civil Engineers. It has been unanimously decided to make application to the Council of the Canadian Society for the formation of a branch in Halifax.

**Greater Production in B.C. Coal Mines.**—An increase of ten per cent. in the output of coal in British Columba was shown in January, according to returns made by the various operating companies to the Department of Mines. The total tonnage (long tons) in January, was 230,755, compared with 197,636 in January, 1917. The production, according to districts, was as follows:

**Price For Aluminum Fixed by President.**—A maximum base price of 32c a pound for aluminum at the various American plants and their subsidiaries has been fixed by President Wilson. The price is subject to revision on June 1, and covers lots of 50 tons and over of ingots of a 98 to 99 per cent. grade. The price was fixed after investigation by the Federal Trade Commission, and an agreement by the War Industries Board with the producers.

**Canadian Steel Plants Expect Large Contracts.**—That all steel plants in Canada will probably be operating at full capacity throughout the year under heavy demand, and that large new munitions contracts are expected from the United States and Great Britain, are opinions expressed by Colonel Thomas Cantley, chairman of the board of directors, Nova Scotia Steel & Coal Co.

**Tin Plate Available for Canada.**—The War Trade Board of Canada has been successful, it is understood, in making an arrangement with the War Trade Board of the United States whereby the fruit, vegetable and fish canners of Canada will be enabled to obtain supplies of tin plate from the United States at a price which will approximate to the price of $7.75 per base box of 300 pounds now paid by American canners.

**Large U.S. Contracts Placed in Canada.**—Orders for munitions, marine engines and other supplies for war purposes to an estimated value of fifty million dollars have been placed by the United States in Canada during the past five months. Of the total orders to the amount of thirty-five millions have been placed by the Imperial Munitions Board. The latter mentioned orders include contracts for seven million shells, two million cartridge cases and ten million forgings.

**Increase Freight Rates From U. S. to Canada.**—Following the recent 15 per cent. increase of class and commodity rates in Canada, the Interstate Commerce Commission on Sunday formally authorized a proportional increase in rates from points in the United States to Canada on the leading railroads. The lines affected directly are the Grand Trunk, Minneapolis, St. Paul & Sault Ste. Marie, Great Northern, Canadian Northern, Canadian Pacific, and Duluth, Winnipeg & Pacific.

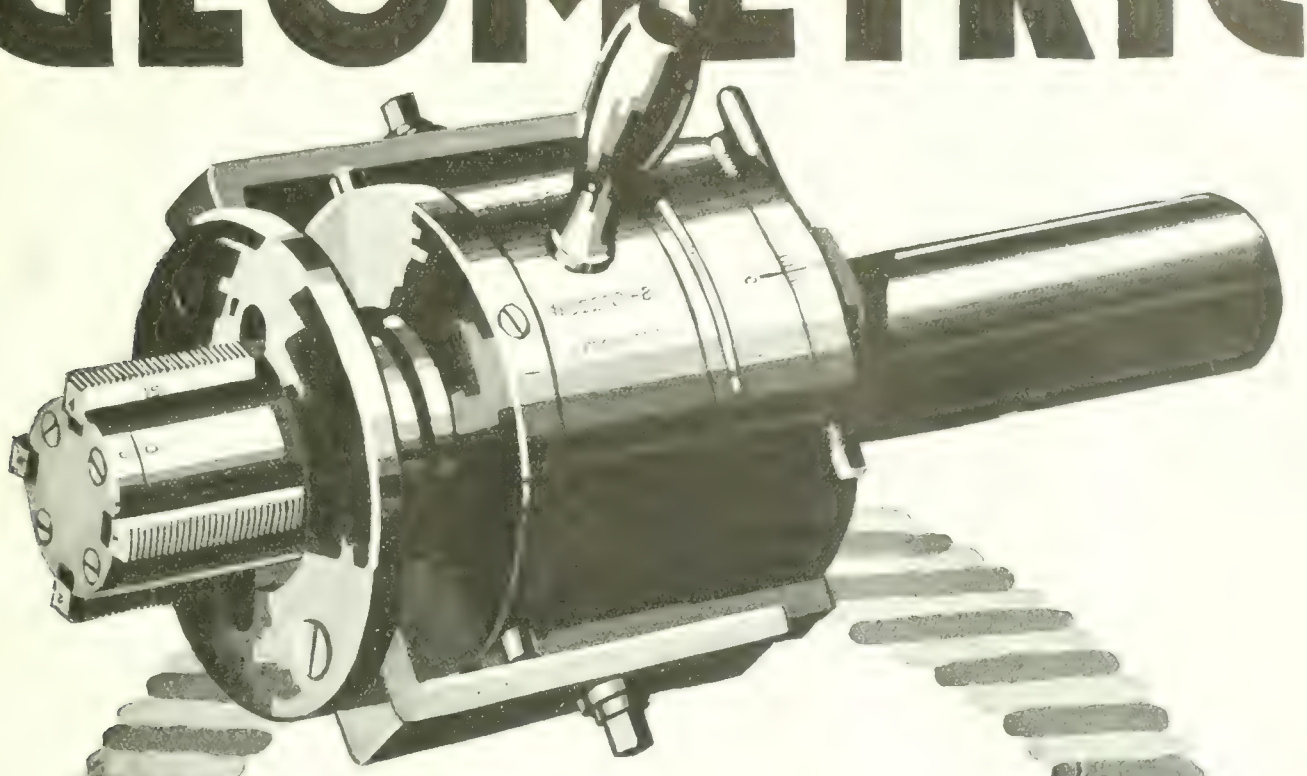
**Scrap Iron Export Prohibited.**—Export of scrap iron has been prohibited entirely by the Dominion Government with a view to conserving in Canada the limited supplies of iron and steel raw material easily convertible for manufacturing purposes. The United States prohibited export of scrap iron some time ago, and in view of the prevailing scarcity of supplies for the iron and steel trades in Canada it was found necessary to stop in Canada issuing further licenses permitting export of scrap iron to the States.

Practically all raw materials necessary to Canadian manufacture in essential industries re now on the prohibited list of exports, except on procuring of special license therefor from the War Trade Board.

**Steel Companies' Loss Through Fuel Shortage.**—It is estimated that the steel companies in the United States have lost between $100,000,000 and $150,000,000 because of the compulsory cutting down of production in January, due to lack of fuel and to freight congestion. Additional losses have been sustained through the production of off-quality of steel arising from the use of high sulphur coal and poor coke. Because of these developments the productive costs of steel have advanced enormously and some of the smaller companies are actively agitating the question of more remunerative prices from the Government.

**Aluminum Price Fixed by War Industries Board.**—A price of 32 cents per pound has been fixed on aluminum by the War Industries Board acting with President Wilson. The figure applies to all lots of 50 tons and over of ingot of a grade of 98 to 99 per cent., the existing trade differentials for other grades being continued. The new price holds for all business done up to June 1 next, when provision is made for revision if neces-

# GEOMETRIC



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**Shell Forging Production**

WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

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It means more shells, per machine per day.

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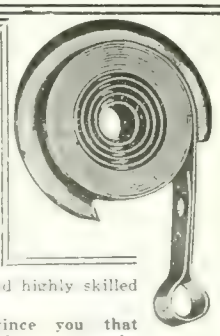

are unusual in service and wear.

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sary. In announcing the price several provisions were made for dealers, one being that the same price must be maintained to all, whether Government Allies or public.

**To Consider Plans for Export Traffic.**—To consider the outlook for export traffic and to lay plans for the handling of the same to Atlantic seaports, representatives of railway and inland navigation companies met in Ottawa early this week. The conference has been called by the Prime Minister at the suggestion of Hon. C. C. Ballantyne, Minister of Marine. Information will be obtained from the railway and steamship men as to the facilities for moving to Montreal, Quebec, Halifax and St. John, N.B., freight intended for shipment overseas. An effort will be made to bring about close co-operation between the transportation companies in the use of those facilities.

**Want Prices of Steel Advanced.**—The American Iron and Steel Institute has been getting ready for March 31, when the present schedule of prices of iron and steel expire. It is understood that the trade will oppose a lower schedule and that many small manufacturers, pleading the higher cost of materials and labor, will seek higher prices. Judge Gary explained that the meeting was held "for the purpose of examining the cost sheets of manufacturers and for the discussion of the relatives or differential prices heretofore in force, in order intelligently to present to the War Industries Board the facts necessary to a determination of future prices."

**Ice Conditions on the Lakes.**—The first ice report showing conditions on the Great Lakes, as compiled by the Weather Bureau, Detroit, Mich., and the regular display stations of the Meteorological Service of Canada, indicates that the ice field over Western Lake Superior extends, solid, East from Duluth for more than thirty miles, with some open water East of Grand Marais. From Keweenaw Point East to Whitefish Bay, fields are extensive and heavily windrowed over the East portion. The ice averages from 22 to 26 inches. In comparison with the ten-year average there is about eight inches more ice at Duluth, seven inches at Sault Ste. Marie, twelve inches at Mackinaw, and seven inches at Escanaba.

**To Fix Prices on Raw Materials for Steel.**—A despatch from Washington states that the steel manufacturers have asked the Government to fix prices on all products entering into the manufacture of steel, in order that the fixed price for steel may be stabilized.

The steel manufacturers urged that it was inconsistent to set a price for the finished products without at the same time controlling prices of products entering into its manufacture. Raw materials of which steel is made already have come under Government control, but accessories have not. Chrome, refractory brick, crucibles and all materials entering into the construction of blast furnaces will be affected.

**Engineers Will Discuss Fuel Problem.**—Because of the great public interest in fuel and power, the Canadian Society of

Civil Engineers has called a public session for March 26 and 27 at the University of Toronto, Physics Building, to discuss coal, wood, peat, gas and electricity, as related to coal and kindred problems. Arthur Hewitt will speak on "Gas," B. F. Haanel on "Peat and Natural Resources," Prof. Zavitz on "Wood," and Sir Geo. Bury on "Transportation," John Murphy on "Railway Electrification," P. H. Mitchell on "Electric Heat." Premier Hearst has been asked to preside, and invitations have been sent to the Provincial Government, the City Council, the Board of Trade, and the Canadian Manufacturers' Association

**Will Confer on Steel Prices.**—The American Iron and Steel Institute's special Committee on Steel and Steel Products, headed by E. H. Gary, is scheduled to confer with the War Industries Board at Washington on Wednesday of next week. The meeting promises to be memorable, as related to the question of fixed prices for steel and measures to be evolved for speeding up production. The committee will be empowered to speak for all the steel manufacturers in the country, it is understood. As a means for stimulating production, it is expected that the committee will present data in behalf of many steel makers intended to show that prices for certain lines, particularly plates and other material used in shipbuilding, should be increased.

**Government Place Large Order for Rails.**—An order for 100,000 tons of steel rails, or enough to lay tracks on some 800 miles of railroad, has been placed by Hon. J. L. Reid, Minister of Railways, on behalf of the Government, with the Dominion Iron and Steel Co. The rails are to be manufactured at Sydney, C.B., and all are to be delivered by the end of July next. Rolling will begin on April 1 and it is hoped that during April 10,000 tons can be ready for use in making replacements on Canadian railways. In May, June and July it is expected that the rail mill will be working up to its full capacity, and that deliveries will reach 30,000 tons a month. The rails will be heavy ones, probably 85 pounds to the yard, and will be suitable for renewals on railway main lines.

**Copper Refineries May Have to Close.**—A crisis appears to have been reached in the copper industry, and the opinion is general that the United States Government will have to raise the price of the metal, which has been pegged at 23½c for the past year. The copper refining companies have delivered an ultimatum to the copper producing companies stating that unless the latter pay an increased charge for the handling of their produce the refineries will have to shut down. Executive committees of the various refining companies have held sessions recently and the situation is so critical that it was deemed best to acquaint the producing companies with the real facts, accompanied with a demand that the refining charge be increased. It is expected that the copper mining companies will agree to the additional expense.

**Many Factors Affect Output of Steel**


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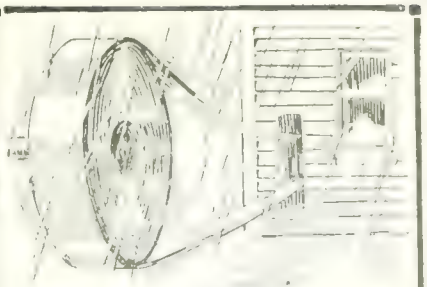

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# Business Problems During the War and After

JUDGE ELBERT H GARY, clerk in a general store, student of law, and head of the United States Steel Corporation, warns business men.

"It is probable that the Russian Revolution and its consequences were planned in Germany, and have been financed and directed by German money and brains. Germany is now endeavoring to 'Russianize' several other countries."

**LABOR IS IMPORTANT**

Above is one of Judge Gary's warnings. Another refers to labor-power for production of food and munitions of war. Another calls business men to organize for efficiency. The whole article is head and shoulders above average 'war-business' articles because Judge Gary is head and shoulders above even his peers in big business.

**IN THE FINANCIAL POST**

You can get the business value out of this powerful article to-day, for it appears in THE FINANCIAL POST for this week. Some one you know subscribes for THE FINANCIAL POST. Think of the most efficient friend you have. 'Phone him and ask him for a loan of his copy.

**OTHER CONTENTS TO NOTE**

Besides Judge Gary's article in this week's FINANCIAL POST, look for these headings. There's worth-while business news for you in every one of these items:

Outlook for Trade in Russia after War.

Sir Robert Borden and Luxury Imports.

Ontario Guarantees Loans to Farmers.

The Future of the Grand Trunk and C.P.R.

The "Muddling Along" Policy with the War.

The Making of a Mail Order King

Canadian Car Co. Had Big Profits.

Larger Profits for Dominion Canners.

These articles and many others on current business affairs appear in THE FINANCIAL POST of date March 9th. To read THE FINANCIAL POST this week and every week is to place yourself head and shoulders higher in business information than the rank and file whose news comes to them haphazard. THE FINANCIAL POST has a staff of expert editors with representatives in every important centre. The Editors of the strong group of THE MACLEAN BUSINESS NEWSPAPERS all add their intensified practical knowledge of the different business fields each week to the news columns of THE FINANCIAL POST.

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C M 3C


Repairs to iron and steel-making units, shortage of iron ore, lean ore, coal shortage, high water and railroad conditions are the chief factors affecting steel-making conditions in United States, and still holding output below normal. Reports on operations for the week ended March 2, however, show general improvement as compared with conditions prevailing a week earlier. Further improvement is expected during the coming weeks. Last week the Youngstown district coke ovens produced 92 per cent. of capacity, operating on the same basis as the previous week. Blast furnace operations were on an 88 per cent. basis, compared with 80 per cent. the week before, while open hearth operations were 86 per cent. compared with 81 per cent., and Bessemer operations 75 per cent., a slight reduction from the previous week owing to extensive repairs at one plant.

**Steel and Iron Manufacturers Organize.**—The metal interests held a separate meeting in the Windsor Hotel, Montreal, on Thursday, and decided to to organize a steel and iron section of the Canadian Mining Institute. An organizing committee was named which will start work at once. The members are as follows: Robert Hobson, Hamilton, Ont.; Col. Thos. Cantley, Mark Workman, W. C. Franz, Dr. Alfred Stansfield, W. J. Jannsen, H. M. Jacquays, J. A. Irwin, C. F. Bristol, Esmond Peck, G. H. Duggan and P. L. Miller, Montreal; J. J. Hartley, Kingston; F. H. MacDougall, Sydney, N.S.; F. H. Crockard, New Glasgow, N.S.; Geo. W. Watts and Wm. Inglis, Toronto; J. G. Morrow, F. A. Sherman and W. M. Curry, Hamilton, Ont.; Col. David Carnegie, Ottawa; Capt. David Kyle, Sault Ste. Marie; M. Deakin, Winnipeg; Fleet Robertson, Vancouver; Geo. McKenzie.

**White Sewing Machine Co. Development.**—"Our aim now is to increase the output of machines to one hundred per day," said Mr. Hedley, manager of the White Sewing Machine Co. of Canada to CANADIAN MACHINERY. "That is the reason for the extension which we now plan to make to our Guelph factory. It will be in the form of a third story on a building 250 x 40 feet. It will be used mostly for the woodworking departments. We will not be in the market for any new equipment on account of the extension." When the White Co. took over the business from the Raymond Co. twenty-five machines per day was the usual accomplishment of the factory. Since then the system of working has gradually been changed to conform largely with that used by the White Co. of Cleveland, and the result has been an increase in output, until at the present time sixty finished machines per day are being turned out. Mr. Hedley intimated that his company was preparing to enter the export field on a greater scale than ever. An organization is being built up to attend to the business abroad, this work being carried on in Australia especially just now, and considerable success is being met. Orders from France are also coming in under the heading of new business for this Canadian concern.

# Mechanical Engineering Books

**If you are desirous of improving yourself in your trade and so putting yourself in the position of making more money, these Mechanical Engineering Books will be found helpful.**

**MACHINE-SHOP WORK.** By **Frederick W. Turner,** Instructor in Machine-Shop Work, Mechanics Arts High School, Boston. 208 pp., 241 illus. Cloth binding. The use of various hand tools is explained, followed by a comprehensive discussion of the lathe and lathe tools, with the methods of screw cutting, taper and eccentric turning, etc. The way to figure compound gears for screw cutting; drilling; boring; planers; shapers; slotters; milling machines and cutters; how to cut spirals, gears, cams, etc.; grinding; the operation of automatic machines. Price **$1.50**

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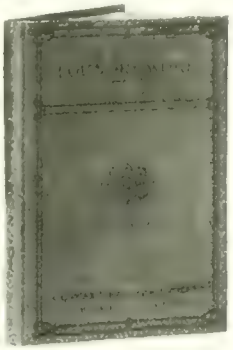

**FOUNDRY WORK.** Revised by Burton L. Gray, instructor in Foundry Practice, Worcester Polytechnic Institute. 224 pp., 191 illus. Cloth binding. A practical handbook on standard foundry practice, including hand and machine molding, cast iron, malleable iron, steel and brass casting, foundry management, etc. Includes use of various types of molding machines. Price, **$1.00**

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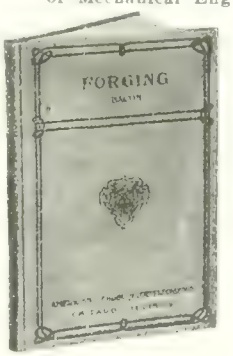
**TOOL MAKING.** By **Edward R. Markham,** Consulting Mechanical Engineer, formerly Superintendent of the Waltham Watch Tool Co., American Society of Mechanical Engineers, Author of "The American Steel Worker." 224 pp., 325 illus. Cloth binding. Takes up the methods of treating tool steels—annealing, tempering, spring tempering, hardening, case-hardening, etc.; how to make drills and reamers of all kinds; the making of arbors and mandrels, taps, hobs, reamer and tap-holders, jigs, gauges, dies and die-holders of all kinds; counterbores, facing tools, milling cutters, hollow mills, and forming tools. Gives all necessary information for tool making in all its branches. Price ...**$1.50**




**FORGING.** By **John Lord Bacon,** Eng. and Supt. of Construction, with R. P. Shields & Son, San Diego, Cal., American Society Mechanical Engineers. Author of "Forge Practice." 128 pp., 180 illus. Cloth binding. A working handbook of practical instruction in hammering, working, forming, and tempering of wrought iron, machine steel, and tool steel, including the important modern development of electric welding. Price .....**$1.00**

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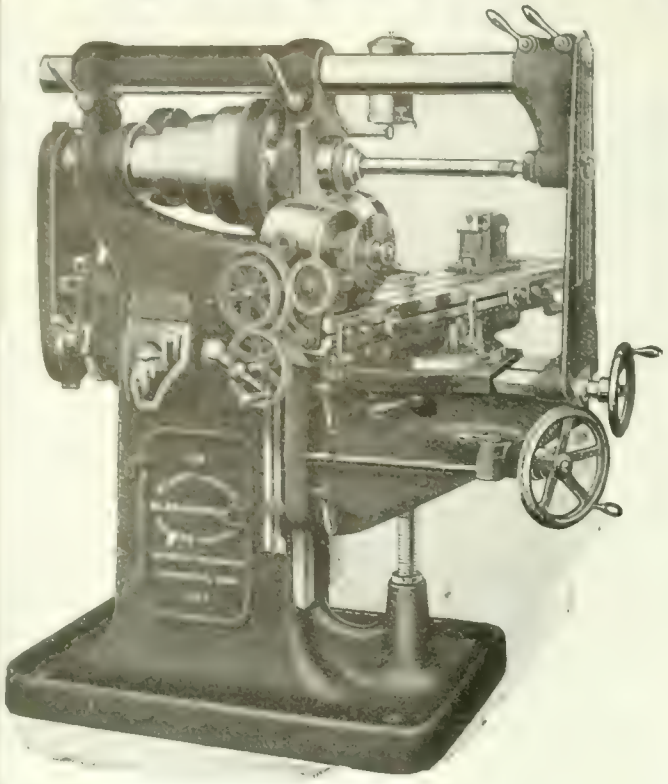

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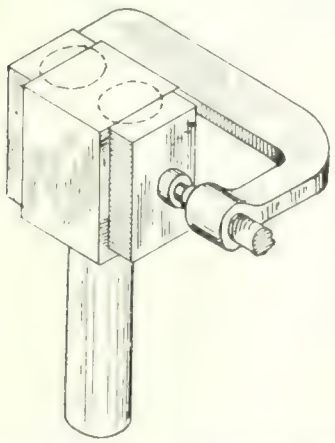
# Press Work Operations in Hospital Equipment Production

By D. A. Hampson

*Operations possessing marked features of economy, adaptability and lack of intricacy in the finished product are characteristic of the work described. The factors of labor cost, quantity production, necessary degree of accuracy, and cost of dies are related to each other in a manner which must receive careful consideration if successful results are to be obtained.*

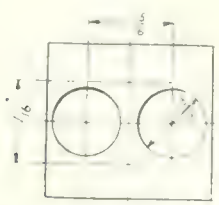
A GREAT many stays or ties are used on beds that are made from flat iron bars ⅛ in. to ¼ in. thick and ¾ in. to 1¼ in. wide. To make a more finished, mechanical job of these the ends are rounded in a punch press, using the punch and die shown. This outfit cuts the piece from the bar and rounds two corners at the same time. Formerly it was the practice to punch the holes in the centre of the round at the same operation, but this practice has been discontinued, because it was found to be more expensive to change for various sizes of holes and the tool upkeep was greater than when the holes were punched in a smaller press that was kept just for round hole work.

No special feature is noticeable about the die. It is held in the bolster by two set screws, which are ample and furnish a ready means of changing for other



SHOWING METHOD OF DRILLING HOLES THAT OVER-RUN THE BLANK

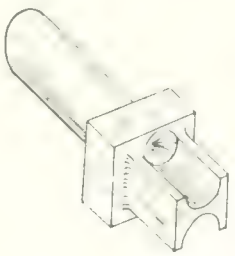
sizes. The punch is worked out of a solid piece of tool steel. First, the shank is turned and the cutting end faced off for the lay-out. On the smaller punches the



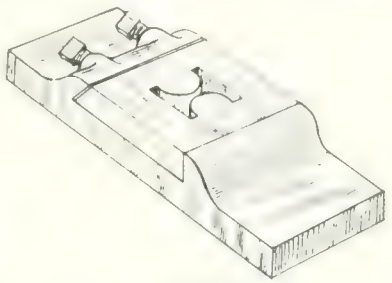
END OF PUNCH AFTER DRILLING NOTE THAT [illegible] IN CURVE IS USED FOR ⅝ IN. STOCK.

bar of steel is large enough to include the holes which are drilled and which form the round sides of the punch. On the larger punches pieces of steel are clamped to the sides, where the drill would otherwise break out and run off, and by so doing parallel holes are produced. This set-up is shown in the drawing. The space between the two circles is made greater for the larger sizes of bar iron. After drilling, the punches are milled to size. The sides are left parallel, and this permits the punch to be ground all the way down without any change in the work produced.

THE END TO BE FORMED



THE PUNCH.

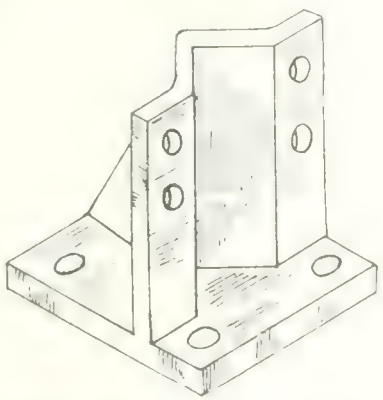


THE DIE

### A Special Angle Plate

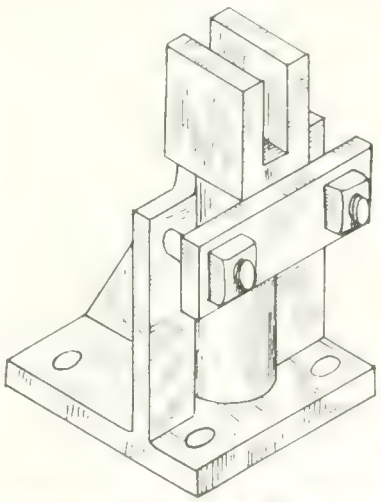
The drilling of the end holes is greatly facilitated by use of the V-angle plate shown. In fact, this fixture has become almost indispensable about the shop, not only on punch and die work, but for a great variety of other work where a round piece has to be held in an upright position for machining operations. A punch with a deep slot is shown; this would have been difficult to hold for such a cut without a similar fixture. Punches which have to be machined in the lathe and have a projection of considerable length are more rigidly held by this angle plate than by a chuck because the support is nearer the cut—often it is used in connection with the chuck.

Rods of ⅜-in. and ½-in. iron are used extensively in building beds, cots, stands, etc., and quite a few of these are required with the ends square tapered as



ANGLE PLATE FOR DRILLING ENDS OF PUNCH

shown. This work is done on the press. The die for the job is detailed. It has two stations, one for punching the first two sides and the other for punching the final two sides. A rod can then be finished at the one handling; as a matter of fact, with a little practice the press hand completes a rod at one stroke of the punch by taking a piece in each hand,



SHOWING ANGLE PLATE IN USE ON MILLING MACHINE.

working them progressively from the pile on his left to that on his right.

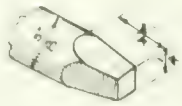
The punch is made from soft steel, with two inserts. The insert for the first cut is merely a pusher it never reaches the face of the die. The second insert is shaped to match with the tapered end left by the first operation.

Reference to the die will show that the opening for a ⅜-in. rod is made 7/16 in.; this is done to prevent any time lost in prying out a stuck rod. The face of the die is lowered for the second cut, and is so shaped that the tapered end has a full bearing when the rod is horizontal; a spring assists in maintaining this position before the ram descends. Suitable guides are provided and a stop does for both stations. This outfit produces a cheap square-tapered end without bend-

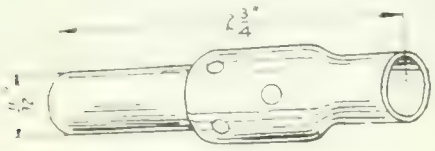
ing the rod. The work was such that the rods are pushed up until pulled, following that they are upset up and the taper ends formed by milling and chipping.

A factory's specialty made in the shop has as one of its parts the piece of thin brass tubing with an enlarged centre as shown. Several holes are required through the expanded part; these holes are not accurate as to size or position—they are in the nature of breather holes—and a method of punching has been adopted that is cheaper than drilling. A small bench punch is used. Because of the narrowed ends the die is necessarily reduced to permit the tube to be slipped over and this reduction does not add anything to the strength of the die. Worse, the hole for the punchings comes just where the section should be strongest, but isn't. To stiffen this part the punch is hardened and drawn to a blue. This temper holds up on the brass work very nicely, and when the edge gets dull the piece is thrown away. The keen edge and bevelled shape of the punch help to lessen the strain on the die.

PUNCH SHOWN INVERTED.



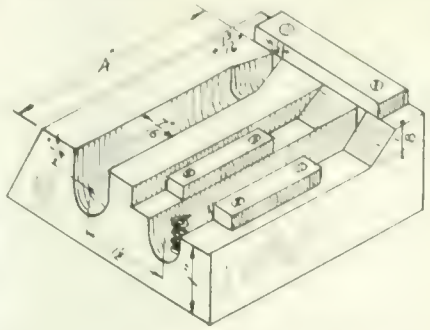
THE WORK.



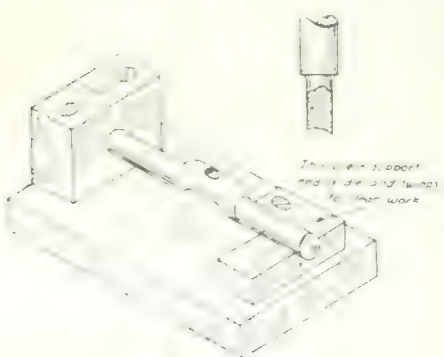
THE WORK.

### Punching Cast Iron

On a folding operating table there were several places where a nice fit was required in castings for the sliding of a ½-in. C.D.S. rod. Cored holes were too rough, filing was too slow and uncertain, and drilled holes were too expensive for the quantity of pieces in the lot. So a construction was adopted that permitted the punching of the holes; not punched from the solid, but punched to exact size from the cast hole. The casting was depressed on both sides, leaving the minimum amount of length of hole to finish that was permissible. Plenty of draft on each side not only made the foundry work easier, but made the punching operation a simpler one.

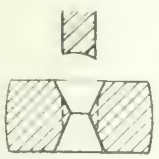


DIE FOR SQUARE RODS.



DIE AND HOLDER.

No die was needed. The castings were laid on the bolster on either flat side, located within an eighth of an inch by a V-shaped guide. When the punch descended the tapered hole centred the casting automatically. The shape of the punch end was as concave as the strength of the steel would stand; this had a tendency to gather the metal toward the centre of the hole and offset almost entirely any splitting of the castings. The resulting hole was clean cut, round and very quickly produced. The bevel on the under side had the same effect that filing off the edge of a casting on the planer does, i.e., to prevent chipping out as the tool passes over. An aid to the complete success of the process was the thorough pickling and tumbling that the castings received before coming into the shop.



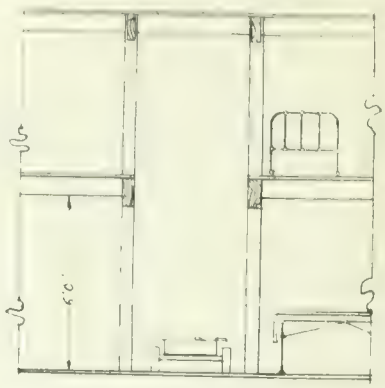
METHOD OF PUNCHING CAST IRON.

PUNCHING GLASS.

Two other points of interest in the factory are worthy of mention, though neither has to do with press work.

### Punching Glass

A non-refillable bottle for disinfectants was a patented article among the products of the plant. A section through the bottom of the bottle is shown. Without knowing the ins and outs of the glass bottle business, let it be said that the glass men could not or would not put the hole on the bottom—said there must be a continuous wall of glass there of some thickness. The plan we hit upon was to mould a depression on the under side, leaving the inside flat and of relatively thick wall except in the centre where the depression arose. This was agreeable to the glass blowers. When the bottles were received we put a boy to work knocking the thin part out. With the bottle resting on a cushioned fixture, he used a steel rod and a hammer and knocked out the centre portion. This was done from the "inside out," and was possible this way because of the clear nature of the glass, which enabled him to see the spot so readily. The breakages were few and the results, over having to cut the hole in some other way, were quite acceptable. An emery stick run at a high rate of speed was used to smooth off the edge of the hole left ragged by the punching.



ARRANGEMENT OF STORAGE SPACE.

### Unique Storage System

A storage system, somewhat unique, was in vogue. The drawing will make this clear. Instead of the usual height of ceiling, there was a space of just six feet from floor to beams and the "second floor" was but a little above that. Then instead of an elevator or stairway the second floor opened out into the aisles. From this height a man below could place goods on the second floor, or he could take them as handed down to him. This scheme required none of the usual lugging and handling of most storage rooms. Two men would be sent in any case for second floor goods and, with the six-foot arrangement, the handling time was very little. The value of the main floor storage space was in nowise curtailed, for greater head room would have only been waste space, it being well-nigh impossible to stack such enamelled goods in two tiers without damage to the finish.

## SEARCHING FOR BURIED SHELLS

AS an example of the uses to which abstract science may be put the application of the induction balance to the finding of unexploded shells on the battlefields of Europe is of more than passing interest.

In the early days of the Hughes' induction balance the hope was expressed that the balance would aid in the prospecting for certain magnetic ores and would also aid the surgeon in the probing for iron and steel objects embedded in the flesh.

The Génie Civil of November 10 gives

a description of a portable induction balance used for spotting live shells.

The problem was simply to devise a suitable portable instrument which would function properly, and at the same time would be easily carried.

The instrument consists of a pair of primary and secondary coils, so combined with a telephone and a "hummer" or vibrator that, when the one primary comes near a mass of iron, a sound is heard in the telephone, whilst the telephone will remain silent when the two primary circuits are exactly in the same condition. As the symmetry will rarely be perfect, a regulator is added to the instrument by means of which balance is established each time before use. The two pairs of coils are wound on two wooden discs, C and C', 60 cm. in diameter; the I and I' are the two primaries which, in the application of the instrument, are lying flat on the ground, and S and S' are the two secondaries; the distance between the centres of the two discs is 1.5 m., about 5 ft. The jointed arms with which the coils are connected in the way the diagram shows are made of wood; at the apex is the wooden handle, of which the observer takes hold; the main weight of the instrument is, however, taken up by a strap which is carried over the shoulder. The regulating device mentioned is mounted at the apex. It consists of two small concentric coils; the outer one is inserted in the primary circuit; the inner coil, in the

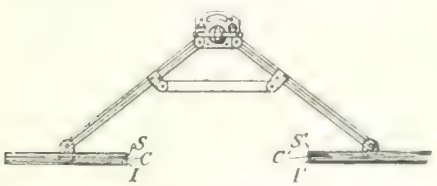



DIAGRAM OF INDUCTION BALANCE USED FOR SHELL FINDING.

secondary circuit, can be turned, and the angle between the two coils can thus be varied between 0 deg. and 90 deg. The vibrator and the induction coil and battery of three cells which actuate the vibrator are placed in a box which is carried by the observer's assistant; a flexible conductor joints the two parts of the instrument. The weight of the instrument is not mentioned. In conducting his search the observer, followed by his assistant, walks over the ground, keeping the flat coils as near the ground as is advisable and listens in the telephone, having previously tuned the regulator to silence. It is stated that a shell of about 10 kg. weight is easily discovered by this test if buried to a depth of 40 cm. or 50 cm.; a hand bomb would betray itself if buried to a depth of 30 cm. The maximum depth stated is only 20 in., which is not much. Fortunately the plow and spade of the farmer rarely approach this depth, and as live shells are dangerous objects this device should prove very useful.

It is said that experiments are proceeding for enlarging the range of the instrument, and improvements may be expected. It must be borne in mind, however, that the balance is a differential instrument, and that with greater depths and greater masses of iron, the differential effect on the two coils would be diminished; the coils and their distance apart would thus have to be enlarged, and the portability of the instrument would suffer. On the other hand, live shells are dangerous objects, especially to the farmer. Fortunately, his plough and spade do not, as a rule, go deep down into the earth.

## AMERICAN BATTLE PLANES EN ROUTE TO FRENCH FRONT

THE following statement is authorized by the Secretary of War in order to give as complete a picture as is permissible under military requirements of the problems and the progress in equipping the air service with fighting planes.

The first American-built battle planes are to-day en route to the front in France. This first shipment, though in itself not large, marks the final overcoming of many difficulties met in building up this new and intricate industry.

### Equipped With Liberty Motor

These planes are equipped with the first Liberty motor from machine production. One of them in a recent test surpassed all records for speed and climbing for planes of that type. Engine production, which began a month ago, is now on a quantity basis and the peak of production will be reached in a few weeks. Only the 12-cylinder type is being made, as developments abroad have made it wise to concentrate on the high-powered engine instead of the 8-cylinder.

These statements should not be exaggerated, but should be considered in the light of the following facts: After three years of warfare the total number of planes able to take the air at any one time on either side of the western front has not been over 2,500. This, combined with the fact that 46 men are required on the ground for every plane in the air, gives a truer perspective of the European aviation situation than commonly possessed.

### Replacement Planes

For every plane in the air there must be two replacement planes on the ground, and one training plane for every pilot who eventually reaches the front, with a spare engine for each plane. Moreover, while the American programme has been delayed by difficulties which were impossible to foresee when the tentative programme was adopted in all our lack of knowledge last spring, it may be said that American planes are not due in France under the original schedule until July.

At the outbreak of war the first step, both in sequence and importance, was to build up an industry to rush out the training planes needed for the prospective aviators who were immediately on hand. This fresh and most promising personnel afforded indeed America's largest immediate source of aid to her associate nations in the war, which, while well able to turn out the latest type of airplanes, were seriously drained of men capable of manning them. The ultimate goal, however, was the construction of a large fleet of battle planes.

Two serious problems, interwoven and reacting, were immediately met, the almost total lack both of airplane industry and of airplane engineering knowledge. The industry was rudimentary, with only one company on an appreciable production basis and another dozen small experimental companies. The metal work was mostly done by hand, each machine built as a separate unit and little attempt made to manufacture from dies, jigs, or gauges. The estimates of the total value of the industry vary from $2,000,000 to $10,000,000 and of employees from 5,000 to 10,000. The Government was practically the only purchaser, having ordered 366 planes the year before the war, of which only 66 were actually delivered.

### Difficulties in Europe

The engineering problems were even more complex. Europe, at war, with the best engineers of each country pitted against each other in a struggle which knew no close, had worked out the most ingenious developments in the light of actual fighting experience. Information reaching here was generally fragmentary and always late. As a result, when war came, the United States had practically no airplane engineering staff and no modern fighting planes.

Construction of planes presented a much more complex problem than that of engines, which had been developed and produced here for other purposes on a colossal scale. The extreme refinement of their manufacture, requiring 23,000 screws in a single fighter, or 700 pieces of wood in a single wing, necessitated the most expert workmanship and balance to secure the essential combination of lightness with strength, and seemed to militate against quantity production.

### Securing Information

The first step was to secure information from Europe. A commission was early sent across and rushed back the last-minute details, upon the strength of which a large number of fighting planes of a certain type were ordered. The raw materials were very largely in hand and the drawings within several days of completion when another cable said that this type had been superseded and should not be built. Nearly a month was thus lost.

Drawings then came for another type. They had just been redrawn for American manufacture and the die makers put to work when a second and different set arrived. The work done had to be cast aside and the process begun over again. Just as it was nearing completion still a third set of drawings arrived, and a third start was necessary. The unavoidable loss of time was preferred to turning out a design known at the outset to be out of date.

The effect of separation from the battlefields by 3,000 miles is further shown in that anywhere from 17 days to 11 weeks have been required to secure various important samples from abroad. Another three weeks of day and night work is necessary to reduce these samples

to drawings for American manufacture. It is significant of the rapid development of the art of aviation that not a single type of the original schedule has survived into the present programme.

During the past month, however, a responsive channel of communication with the Allies has been opened, the latest types adapted to American manufacture, the industry increased at least twenty-fold, the training plane problem solved, and the production of battle planes begun. It is still very necessary, however, to view America's effort in aviation against the true perspective, both in this country and in Europe.

### Need for Skilled Men

The great problem now remaining is to secure the thousands of skilled mechanics, enginemen, motor repair men, wood and metal workers, etc., needed to keep the planes always in perfect condition. This great engineering and mechanical force at the airdromes, the flying fields, and the repair depots, both here and behind the lines in France, is a vital industrial link in the chain to air supremacy. Without them the planes turned out would soon be useless and the flyers helpless.

At best the life of a plane is but two months, and the engine must be overhauled after 75 hours, while a pilot on a plane allowed to leave the hangars in imperfect condition is as helpless as a bird with a broken wing. Now that American battle planes are going overseas, a great increase in the volunteering of skilled mechanics is both essential and expected.

## MORE EFFICIENT MECHANICS

NO mechanic will ever attain to a high state of proficiency if he neglects to acquire and retain those rudiments of arithmetic that are necessary essentials to a more thorough understanding of the elementary fundamentals of mechanical engineering. Too many workmen of to-day are apparently content with the limited knowledge required to do the actual operations of cutting metal to bring the piece of material to the specified shape and dimensions. Without the application of mathemetics the study of engineering would be virtually impossible, and without fair knowledge of the first principles of arithmetic, even the simplest mechanical operations would be very difficult to perform. Many men fail to realize the advisability of acquiring the technical or theoretical details of mechanics for the better accomplishment of shop problems. The fact that a boy has only been able to obtain a limited public school education should not deter him from aspiring to a more thorough knowledge pertaining to the theoretical science upon which his practical work is

It is probably true that modern methods of manufacture very often eliminate the necessity on the part of the workman to use the learning of their younger days in the production of the work upon which they are engaged. This [illegible] accepted and likewise recognized by every workman as one that will gradually place the machine tool operator in a position relatively the same as any other part of the machine that he is called upon to serve. The actual thinging and planning of his duties is becoming a problem in the solution of which the workman has little to do, owing to the efficiency methods (so called) that are constantly being adopted in mechanical industries. These systems, however, unless operated on a comprehensive, co-operative basis, must eventually crush the individual initiative in factory employees, so that their tasks become more a question of observation and application than the concentration of reasoning powers for successful achievement. It is therefore obvious that, if a workman aspires to higher positions, where his brain will relieve the hands and the labors of former days, he must acquire the knowledge that will enable him to apply these potential but often dormant faculties.

Many young men, and also those who are not young, refrain from the study of technical journals or handbooks because of the general use of formulae in such text books, believing that a comprehensive knowledge of algebra is required before these formulae can be solved. A brief study of a formula will demonstrate to the average mechanic that the only requirement is a well grounded learning in the elementary principles of arithmetic and patient application of these fundamental rules in order to solve the problem. Of course, there are many formulae that require a wider knowledge of mathematics than that possessed by ordinary mechanics, but the persistent study and practice of working out the more simpler problems will gradually develop the reasoning powers to such an extent that eventually the difficult questions will not appear so formidable as first supposed.

To achieve, one must continue to strive, as the prize is invariably given to the winner, and in these days of rapid progress and development no man can hope to succeed and at the same time be content to sit still and let the boat drift with the tide. Seldom does the current flow in the right direction, and, in order to reach a haven where the going requires less effort, it is necessary to get out the oars and pull against the stream, and the harder you pull the sooner you will be in a position to watch the others as they drift indifferently or struggle to free themselves from undesirable, but oftentimes unavoidable environment. Too many men to-day are wasting their time and energies in commenting on the other fellow's job, a factor that cannot but detract from the ability to do justice to their own. Those men who are continually envying the other fellow and his "soft job" will rarely ever find themselves in a similar position, as with few exceptions, these so-called soft jobs are the result of previous concentration to less responsible, but none the less important, details. Therefore it is imperative, and also quite obvious, that the ambitious young mechanic who hopes for greater remuneration or more responsible position must use every means to fit himself for the wider duties that call for a thorough knowledge of the work upon which he is temporarily engaged, together with the deeper technical understanding that is essential for the successful filling of the job higher up.

## RESEARCH WORK IN GLASS

WITH the aid which the British Government is extending to research work, and the formation of a Department of Technichal Optics, Great Britain is undoubtedly about to play an important part in the future production of scientific optical glasses. Perhaps in no other industry has the change and development due to the war been so unexpected. Scientific thinking is now the order of the day, and this is being directly exercised in the surveys of roads of commerce. A great improvement is taking place in respect to the output of optical instruments and spectacle ware. German firms, subsidized by their government, and French firms did most of the business in opthalmic glasses and lenses before the war.

When hostilities broke out the shortage of optical glasses became a pressing matter for England, and it was necessary for the Government to subsidize at least one large firm to supply the army with field glasses. Other firms have been encouraged to meet the demand, with the result that the hand work of the past has been superseded by machinery, which, after the war, will be available for a large export trade. Steps have now been taken to establish systematic education and research for the industries of optical glasses and instrument mak-

A fund of £1,000,000 has been placed at the disposal of the committee of the Privy Council for scientific and industrial research, from which grants will be made to trade research associations for the next five years at least. To the Department of Technical Optics, recently established at the Imperial College of Science and Technology, London, £1,000 a year for five years has been allocated, together with a grant of £750 for special apparatus. The college provides laboratory accommodation with an equipment grant of £2,000. The London County Council has contributed £1,000 a year for maintenance, with a special capital sum of £2,500 for alterations and equipment, whilst optical instrument makers in London have provided apparatus worth about £1,000.

Professor Cheshire of the Patent Office and the Ministry of Munitions, is director of the new Institute of Technical Optics. The Society of Glass Technologists has also been established, and Professor Herbert Jackson, F.R.S., has been investigating the position of certain optical glasses for the Government department with the assistance of the glass research committee of the Institute of Chemistry. He has succeeded in defining the composition of the batch mixtures necessary for the production of glasses hitherto manufactured exclusively in Jena, and amongst other things he has discovered three completely new glasses with properties hitherto unobtainable.

# Some Considerations Regarding Modern Plant Organization-II

By M. H. Potter

*The factors which enter into the successful manufacturing process of to-day are dependent to an ever increasing degree. Location of plant, factory organization, staff organization and plant equipment are features which require to be considered both singly and as a whole in relation to the particular product to be manufactured. [illegible] idea of such considerations is necessary to [illegible] manufacturer.*

THE duties of an up-to-date purchasing agent are quite difficult and should not be looked upon lightly, for, in addition to his being an administrative officer, he remains the man of details. Details are paramount for the department's success for one to keep a hand on the pulse of the entire organization; and those who entertain hopes of becoming identified at some future time with this particular field may be assured that hard work and conscientious endeavor are vitally necessary. The work, however, is interesting and pleasant, and leads to higher posts and responsibilities.

The business training of a purchasing agent is of the best, his duties are diversified, his field of action country-wide, and his acquaintance among business men broad and comprehensive.

It has been said that the purchasing agent, although a responsible head of a department, performs his duties to greater disadvantage than do the heads of other departments and with less official recognition. This may have been true at one time, but to-day it is different, as the purchasing agent, if a good one, usually is recognized by his superiors and his meritorious work is placed upon a high plane of achievement. He should be one of the highly paid officials, not because it is necessary to place a premium upon his honesty, but because his work is important, his position lofty in the true sense of the word, and his vocation one that requires long years of training and careful study. Through his department large sums of money are spent annually, and the spending of this money for materials and supplies is no easy task, provided judicious expenditure obtains. In this department large sums of money may be saved or wasted.

### Knowledge Must be Extensive

The knowledge of a purchasing agent must be extensive. Where it is his duty to secure many and varied substances or articles, he must be familiar with the nature, cost and process of manufacture of the articles in question in order to discuss intelligently the propositions of the different salesmen he may meet.

When the buyer is thoroughly informed regarding the costs incidental to the production of an article and the conditions prevailing in the locality where it is manufactured, he is able to decide with a remarkable degree of accuracy just how much profit the manufacturer is making by the sale. If this profit is somewhat liberal he has some reason for expecting a better price, and may insist more forcibly upon the same being granted. Manufacturers who fail to keep accurate account of the cost of their productions are in no position to furnish their salesmen with information on this point. A salesman handicapped by this lack of information, in order to meet the quotation of a competitor, may sell goods at lower figures than is advisable. In such a case the buyer profits, but where the concern producing the goods and the salesman selling them know exactly the cost of producing, the salesman will turn down an order rather than book it at a loss.

The buyer must be on constant watch for adulteration in the articles he obtains. Although samples of an article may be submitted for his inspection which are perfect in every respect, it frequently happens that several may be found in the shipment which do not fill the requirements. In such a case, the inferior articles must be brought to the notice of those from whom they were obtained and an adjustment effected.

Another unsatisfactory condition, which, if allowed to continue indefinitely, would work a loss for his firm, results from a tendency on the part of heads of departments to rush to the purchasing agent with a requisition for this or that which they may have already in stock, but which, through lack of diligence or care they fail to discover until fresh stock is ordered. To counteract hasty buying the buyer must possess an intimate knowledge of the needs of each department as the heads of the departments themselves. In order to act fairly to each department, without bringing undue expense upon the firm, he must in fact possess an extremely detailed fund of knowledge of everything connected with the business.

### Duties Enumerated

Briefly enumerated, the duties of a purchasing agent and his department consist of securing catalogs, names of manufacturers, dealers, and other information regarding sources of supplies, obtaining samples, and, where necessary, having the same subjected to test. In conjunction with the superintendent or general manager, he prepares schedules of materials required, secures bids and distributes orders. Records of all orders must be kept, and a systematic method followed for tracers. All orders that are not filled within a reasonable period must be followed up.

When the goods are received he must acquaint himself with the accuracy of the amount, of their quality, see that they are properly stored in the stores department, which he also controls, and require from the stock clerk and his assistants an accurate report of all goods received or sent out.

To perform these duties satisfactorily records must be kept of all sources from which supplies are obtained and the quotations given on each article or class of material.

### Trade Catalogues

A systematic collection of trade catalogues filed according to some prescribed method and furnished with an index is essential, as well as a record of all previous purchases showing the nature and amount of the goods, where they are obtained and the prices paid for the same. To keep accurate and systematic records of all necessary information involves the adoption of a suitable system of recording and filing. In many cases the designing of the system is entrusted to public accountants, who make a thorough study of the business and devise methods applicable to the case in hand.

With a crude or inferior system, even extraordinary ability would be of little avail on the part of the persons involved, but the combination of a suitable system and good common sense is almost certain to result satisfactorily.

It is usually an easy matter to secure the names and catalogues of dealers. A new concern is usually made the recipient of a great deal of such literature as soon as concerns in the same or similar lines are aware of its existence. A matter of fully as great importance is to have information so arranged that it may be instantly available.

### Card Index System

In a business handling many lines a record system of value is based upon the card index. The first subdivision of the card is based upon the classification of the goods, and under each class are placed the names of the firms dealing or manufacturing in that particular line. The filing of cards may be effected either in alphabetical or numerical order.

Where the number of catalogues to be considered is not very great, they may be kept in bookcases or other receptacles arranged under the names of the firms. In many cases the use of an index may be unnecessary as the distinctive appearance of the different catalogues is sufficient to render their recognition easy.

In extensive systems a numerical arrangement is more satisfactory; a sticker may be attached to each catalogue on which is written a number and date of issue. A certain group or series of numbers may be used for each line,

as, for example, [illegible] to 200 special steel [illegible] and so on. If the number of catalogues on any particular line [illegible] number assigned to the line, they can be numbered as 1a or 1b, etc., without disturbing the index as a whole.

Bound catalogues and others having sufficient stability to stand on end may be placed conveniently in sectional bookcases where they are in plain view and can be located without reference to an index. Phamphlets are better placed in vertical files.

### Catalogue Index

The index to the catalogue list is of vital importance. One method of preparing such an index is as follows: A card of suitable size bears at the top the name of a certain class of merchandise. On the body of the card are written the names of the concerns handling such a line. Opposite the name of the firm are numbers which indicate the location of the catalogue. Where only one or two pages in the catalogue are of interest, the page number should be placed on the card, thus effecting a considerable saving in time. The cards when filled are filed alphabetically under subjects, and may be kept in an ordinary card tray or drawer in a desk.

In some cases the above method is reversed. The cards give the names of the firms at the top, while the names of the articles sold follow in alphabetical order. Inasmuch as a number of concerns may furnish quotations for a certain quantity of goods, or one firm may quote on a number of different lines, some systematic record must be kept of all such quotations. In addition, the date of the quotation should be specified, as well as the quantity on which the quotation was based, the initials of the salesman by whom the quotation was given, the list price, discount, and net price, whether the goods were f.o.b., or to be delivered and the terms of payment. When an order is given, it should be recorded on the card on which it belongs, but all quotations should be personal and filed in a fashion governed by the nature of the business.

The catalogue file should contain catalogues of almost every manufacturing institution in such condition that easy reference may be made thereto, not only as to the manufacturers' names but as to the particular materials and supplies handled. Therefore, in connection with many such files may be found a cross-reference system, in which the catalogues are referred to by names and cross-references made as to materials and supplies handled by each manufacturer.

An inquiry list should be kept, in which should be found the names and addresses of manufacturers, alphabetically arranged and numerically compiled so that when a requisition is received from the stores, mechanical or any other department, it is only necessary for the purchasing agent to mark opposite the various items thereon the numbers on the list under which the various items are classified. Inquiries are then sent into the market, prices obtained and tabulated, and orders placed with the lowest bidders, consideration being given to quality of materials and shipping dates.

### Records of Purchases

For keeping the records of all purchases, cards should be prepared showing from whom the purchase was made, the number and date of the order, the quantity bought, and all information relating to discounts, prices and terms, which are filed in a similar manner to the quotation cards.

Loose-leaf devices can be used very advantageously for the recording of information in reference to purchases. The name of the firm from whom the goods are bought is written in a column in the center of the page. On the left all the facts concerned with the ordering of goods are set down, while on the right the name of everything relating to their receipt and disposition is noted as fully as possible.

### A Uniform System

In the purchasing department matters should always be arranged, if possible, so that the procedure would be the same regardless of the nature of the goods obtained. While some people are opposed to red tape in the transaction of business, it must not be forgotten that, where extensive interests are involved, some routine work is unavoidable.

For example, when the foreman of a department in a large manufacturing concern finds it necessary to be supplied with certain articles, let us trace the various steps taken before these articles are delivered into his hands. The foreman prepares a requisition on a form provided for the purpose. Such forms have the name of the department printed upon them, and frequently those for a particular department have a distinctive color. Each sheet is also consecutively numbered. The requisition should state the purpose or job for which the goods are required, their exact description and the quantity necessary. It must then be signed by someone in authority, usually the head of the department, or vouched by the superintendent. It passes to the purchasing department if the articles requisitioned for are in the stores and the purchasing agent is convinced that a genuine need exists in the department for such supplies, the same will be delivered.

Perhaps if the articles asked for are not in hand, others may be substituted, but if this is impossible some outside source of supply must be called upon. A copy of the requisition is usually kept by the department. Sometimes three copies are prepared, two of which are sent to the purchasing department. On one of these the purchasing agent notes what is being done in regard to filling the requisition and returns it to the foreman. This, however, cannot be considered essential, as the foreman is chiefly interested in getting his supplies, regardless of the process involved.

### The Requisition

The requisition may be termed the nucleus around which the entire department work is centered. Requisitions are issued by the various departments, setting forth in detail the materials and supplies required and are usually sent direct to the purchasing agent, after being approved by the proper officials. These requisitions should convey complete information, including correct technical description, as well as shipping instructions and dates when materials are required.

The requisitions, when reaching the purchasing department, are put through the system as previously described for the placing of orders. The purchasing agent should be left with free hands for action, accounting only to his superior.

## KEEPING THE SHOP BUSY

By D. A. Middleton

THE average small shop that does jobbing and builds a special machine once in a while, and perhaps manufactures some patented article, too, experiences dull periods just as do other businesses. The class of men in such shops is more of the all-around variety that is slow to train, hard to get, and harder to keep, and it is a decided loss to let such men go because work is slack. If the men know that they will be provided with work enough they are not nearly so apt to be always on the lookout for another job. But the trouble the management has is that the work comes in bunches and then falls off.

A certain shop, Brown's, by name, in the city of R——, employs fifteen to twenty men when times are good, which was about all of the time for them. The men had been with them for years and, as it was known as a steady shop, it had been able to weed out the poor ones and keep the hustlers. There were other shops in the town and there were mills in the surrounding country, but the location was not what could be called in a mechanical region. The other repair shops had their ups and downs and were known to cut prices to get work. Brown believed that good repair work and experimental work could be made to pay as well as the little manufacturing he did and his shop proved that to be so.

It was a saying in the shop that "Brown always knew where he could scare up a few jobs of work when we got slack." Brown himself was a thorough all-around mechanic with a technical education to round it out, also he was something of a salesman in his way and the fact that he had a good foreman left him free to solicit business and plan without a mind befogged with a multitude of shop details. His idea of a vacation, the only one he ever took, was to start out in the Ford or on foot and call on a few friends for the day.

Brown often said he would rather spend an hour in a man's factory than in his parlor, and the feeling was mutual for he was a welcome visitor in every shack where there was a wheel turning for miles around. And while he enjoyed the smell of the engine room, he was getting track of an overhauling job that would have to be done at a future date. Brown knew the condition of the ma-

chinery in most of the plants in the region because on these visits his opinion was sought and his advice freely given. It was not strange that the work the plants themselves could not do came to him. But if it did not he went around to find out if it was not ready, for all these future jobs were noted in his little book.

This book contained a summary of each job, about how much labor was involved and what materials, together with the probable date when it could or would have to be done. Any visitor might have acquired the same information but would not have put it down for business purposes; the men in the plants laid it to Brown's good memory and were pleased when he came around and asked if it were not time to repair that stuffing machine or to make a set of new brasses for the Corliss engine. And the fact that Brown had on hand just the size of shaft needed or the stock for a certain set of bushings pleased still more if the job was hurried, but Brown's little book had seen to it that these parts were in stock if they were not specials.

Sometimes it was an engine room and sometimes it was an office that was treated to a visit. Once the Ford stood a whole day in front of the creamery down at Brookfield where they made the finest cream cheese. Brown came home that night all spattered with cheese but with an idea for a machine to mould and wrap that cheese instead of the hand methods then in force. He worked on the idea at spare times, made drawings and experiments with wood models, and a year later when his shop work was beginning to taper off he got an order for a machine at $5,000 which in the end netted a handsome profit. The machine was semi-automatic, and, after the kinks had been taken out, it did the work of six men in the creamery. It also paved the way for several other jobs of consequence.

Then there were jobs nearby that no one thought of going after. In the dead of winter he actually got around that tightwad Jones who ran the ice cream factory and made him see the advantage of overhauling his freezers and his ammonia system then instead of waiting for them to lay down on him in the summer rush. And the other extreme was the brewery which was good for a repair job any time the shop was slack.

## STRIVING AFTER NATURE?

CONSIDERABLE notoriety has been achieved during recent months by an individual rejoicing in the name of Giradossian, who has influenced certain members of the United States Congress sufficiently to bring before the House a scheme which he wishes to have tested by the Government. The entire proceedings have been so irregular and spectacular that more than ordinary interest has been aroused in engineering circles. Our contemporary "Power" treated the matter editorially in a recent issue, and its comments are very much to the point. Under the caption "Power from the Air," it says:

It is recorded that the Lords of the British Admiralty rejected the propeller when it was proposed by Ericsson, and Dr. Lardner demonstrated that a steam-propelled vessel could never cross the Atlantic. In the absence of a demonstration the injector might well have been regarded as a mechanical absurdity, and a proposition to converse across miles of space, without even a wire connection, would have sounded insane a half-century ago.

The open-minded attitude induced by the contemplation of such instances need not, however, lead one to take seriously a proposition to make ten pounds of sugar out of nine pounds of cane, or to take out of a train of mechanism more energy than is put into it.

Garabed T. K. Giradossian, an Armenian mechanic, claims to have invented a "free energy generator." This, he says, is not a perpetual motion, but makes available a free source of energy, by which vessels may be propelled to any distance without stopping to coal up, airplanes may fly around the world and carry thousands of pounds, torpedoes may be projected at great speed, and the speed of steam engines doubled (although it is not apparent what we should want of the poor old steam engine any more).

We have a great admiration for Garabed T. K. Giradossian, not as an inventor, for our office is the depository of countless schemes for the multiplying of power and evading the law of the conservation of energy, but as a promoter. In "Power" for July 31 was told how he had appeared before the House Committee on Patents, which issued twenty-five pages of printed report about his invention and various subjects more or less touching on and appertaining thereto. The committee has now reported a bill which went through both Houses of Congress with a whoop, providing that the device shall be tested by a board of five scientists to be selected by Mr. Giradossian and approved by the Secretary of the Interior.

Every once in a while somebody discovers that water is a combination of oxygen and hydrogen, and declares that all that a vessel has to do to secure an unlimited supply of fuel is to decompose some of the water upon which it is floating and burn the hydrogen that is produced with the oxygen from which it has been separated. The trouble is that the water is the product of a previous combustion of hydrogen—a union of hydrogen and oxygen—and that it takes just as much energy to separate them as they generate in coming together, just as it takes as much energy to hoist a weight as it will give back in falling.

Is there any reason to hope that Mr. Giradossian's project has any firmer foundation?

It cannot be said that Mr. Giradossian's dream is impossible of realization. The process is going on continually before our eyes. Carbon, in its various forms of coal, wood, charcoal, oil and other fuels, is burned by combination with oxygen, the product of the complete combustion being carbonic-acid gas. To decompose a pound of this gas would require as much energy as would lift a ten-ton weight over one hundred and fifty feet, but here comes in one of the most wonderful, beautiful and mysterious of nature's processes. It is a peculiar property of vegetation that under the influence of sunlight it can overcome the attraction which exists between the atoms of carbon and oxygen, appropriating the carbon to its own use, building it into its structure, and letting the oxygen go free into the atmosphere.

To separate these two elements in our laboratories, we are obliged to resort to the most powerful chemical agents and to conduct the process in vessels composed of the most refractory materials, under all the violent manifestations of light and heat; and we then succeed in liberating the carbon only by shutting up the oxygen in a still stronger prison. But under the quiet influence of the sunbeam in that most delicate of all structures, a vegetable cell, the chains which unite together the two elements fall off, and while the solid carbon is retained to build up the organic structure, the oxy- the atmosphere. To separate a pound of carbon from the oxygen with which it unites in burning would require the expenditure of an amount of energy which would raise the weight of a ton to the height of over a mile, and yet in the economy of nature this process is constantly going on, not with the noisy demonstration of prodigious effort, but quietly, in the delicate structure of a green leaf waving in the sunshine.

Has the Armenian mechanic discovered the secret of the vegetable cell?

## GEAR MAKERS TO MEET

"GEAR Standardization" will be the principal subject of discussion at the second annual convention of the American Gear Manufacturers' Association, to be held at Green Brier Hotel, White Sulphur Springs, W. Va., on April 18, 19 and 20. An address by a representative of the United States Chamber of Commerce, of which the association has just become a member, will also bring matters of timely interest before the association.

The convention will begin with meetings of committees on Thursday morning, April 18. At 1.30 the first session will open with an address by President F. W. Sinram, "The A. G. M. A.—Past, Present and Future." Following the address by the Chamber of Commerce representative C. R. Poole will talk on "Hardening and Heat-treating of Gears," and B. F. Waterman will present the report of the standardization committee.

Friday morning's session will include reports of officers and committees, election of nine members of the executive committee and miscellaneous business. An informal banquet will be held in the evening.

On Saturday morning a paper on "Uniform Cost Accounting" will be presented by J. H. Dunn, and on "Hobs and Hobbing Machines" by a representative of the Barber-Coleman Company.

A programme of sports and amusements has been arranged.

# PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

## DRIP CUPS ON HANGERS

By F. Scriber.

NEARLY every person is familiar with hanger drip cups in some form or another as these range from a common tin can with a wire through it, hung over a bearing to some of quite elaborate design. The purpose of these drip cups is to catch the overflow from the bearings so that it will not be continually dropping on anything below and also to save the oil wastage.

One of the most common drip cup designs is illustrated in Fig 1. which shows a cup that is held to hanger by means of a screw. To remove this cup from the hanger it is necesary to screw the cup A off the stud B and when this has been done a few times the cup is quite apt to become loose on the stud. A loose cup attached to a hanger, over a man's head is quite a source of danger as it may fall down any time and the writer has known this type of drip cup to jar loose and strike an operator standing below at his machine on more than one occasion.

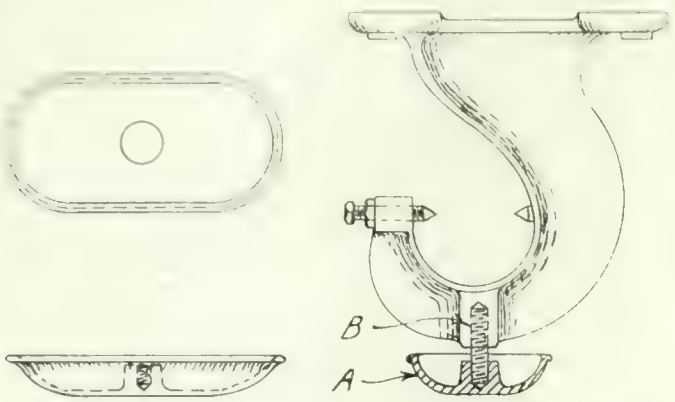



FIG. 1. TYPE OF DRIP CUP THAT IS APT TO WORK LOOSE.

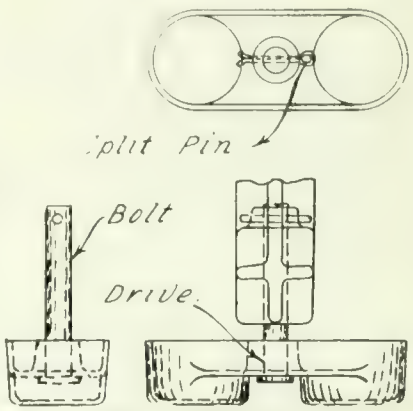
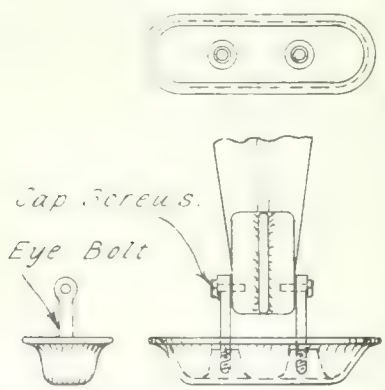



FIG. 2. DRIP CUP HELD IN PLACE BY BOLT AND SPLIT PIN.

Another drip cup that is objectionable feature in that two hands are necessary for removing the drip cup from the hanger to empty out the oil. This to a man on the top of a ladder is rather troublesome although if a pump is used for removing the oil this drip cup does very well. Nevertheless, as it is impossible for a designer to know beforehand whether a pump will be used or not it is a good plan to have the convenience of the man who is responsible for keeping drip cups clean in mind when designing a countershaft.

Fig. 3 illustrates a type of drip cup where both of the objections mentioned above are eliminated. This cup is held to the hanger by two eye bolts and these bolts are screwed in place before putting the drip cup in place. Through the eye bolt cap screws are placed and the drip cup is free to swing on these bolts although the bolts are a tight fit in the hanger. To remove the oil from the drip cups they are swung to one side and, with a pail placed underneath, are readily emptied.

Such things as drip cups may seem to be mere trifles in machine design but to one who has to stand on the top of a shaky ladder to clean them or work beneath them they are vital subjects in the day's work.




3. DRIP CUP HELD TO HANGER BY MEANS OF TWO EYEBOLTS.

A drip cup that is held to the hanger by means of a split pin is illustrated in Fig 2. This type of drip cup is not likely to jar loose or fall down provided the pin is properly inserted, but it has one ob-

## GRIPPING AND DRIVING METHODS FOR LATHE WORK—IV.

By F. Scriber.

### The Elimination of Vibration

MENTION was made at the start of this article about it being necessary to balance a spindle nose fixture to eliminate vibration where the work operated on

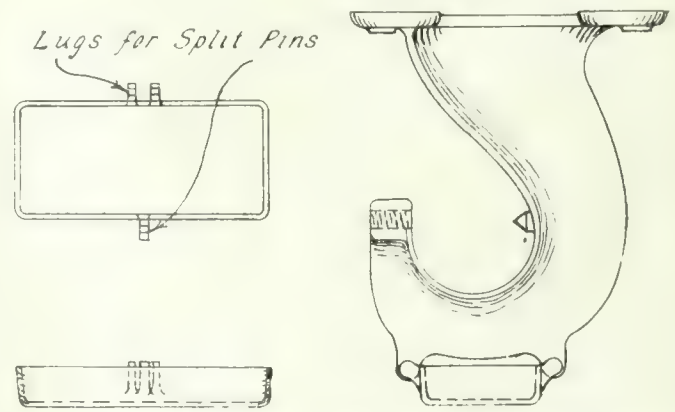
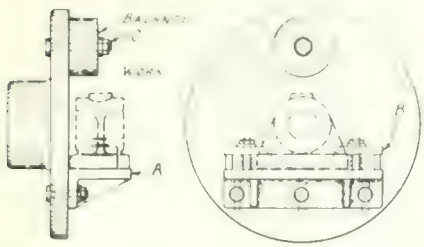



FIG. 4. DRIP CUP HELD TO HANGER BY TWO SPLIT PINS.

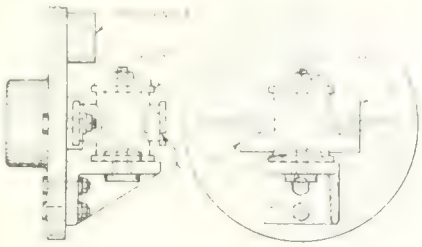
Another drip cup that is easily emptied and cleaned is shown in Fig 4. This is held to the hanger by two split pins, suitable lugs being cast on both the hanger and drip cup to receive the pins. The manner of holding this drip cup in place is obvious as the lugs and pin at one side of the hanger form a hinge upon which the drip cup swings. The pin and lugs at the front side hold the drip cup in position and when it becomes necessary to clean out this cup it is simply a matter of pulling out one of the split pins and letting one side of the drip cup swing down.

was all on one side of the face plate. Fig. 24 illustrates two examples of this type, the upper one showing a bearing mounted on an angle iron A. The work is located in the position shown and is

clamped by means of two clamps B. As all the weight on this fixture comes at one side, a counter-balance is placed on the opposite side, and is held there by bolt C. It is sometimes necessary to put



Method of Holding Bearing Bracket



Method of Holding Tee

FIG. 24. TWO EXAMPLES USING ANGLE PLATES ON FACE PLATE

two or more of these balances on to obtain satisfactory results.

The lower view shows a cross-shaped piece which is located on a plug D; this plug is held in the angle iron E and two vee blocks, F and G, are used to hold the end of the work that is nearest the spindle nose, while the bolt, nut and

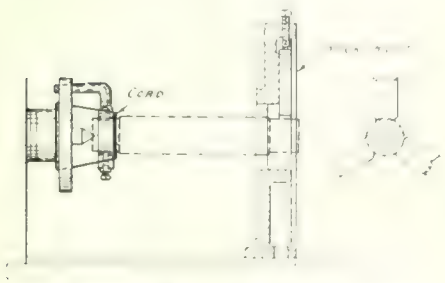


FIG. 26. TIEING WORK ON CENTER WHEN USING BACK REST

washer H bind the work securely to the angle iron. The operations performed on this piece consist of boring the hole X and facing the end. A counter-balance as noted is also used with this fixture.

A face plate where vee blocks are used to good advantage for locating work is shown in Fig. 25. In this instance the two round ends on the work are located in the vee blocks A and the work is clamped in position by means of the straps B, which are two in number. Two screws C are used for backing up the work while the hole is bored and the end faced.

It frequently happens in machining work that a centre hole must be picked up or a hole bored in one end of a bar, and when it is not practical to hold the work in a chuck it is, of course, necessary to use some other means. Fig. 26 illustrates a method often employed, and here the work is held on a centre at one end and in a back rest at the other, while a cord is used for tying the work into the machine. It is a good plan when holding work in this manner to tie the cord with the face plate loose on the spindle, when by tightening the face plate up the cord is drawn taut.

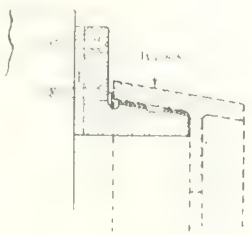


FIG. 28. METHOD OF GRIPPING UNDER RIM ON BEVELLED WORK.

In the example shown it is desired to bore a hole through the bar and the work is first centred; this is followed by turning a spot true at each end of the bar, when by holding the work in the manner shown a hole is bored half-way through; after this a short plug is put in the hole bored, the work is reversed in the machine, and we proceed to bore the hole through the remaining half of the bar.

A group of safety lathe dogs are shown in Fig. 27, the object of these varied designs being either to eliminate the screw head or so protect it that it will not catch a lathe operator when revolving. The first of these in the upper left-hand corner shows a common dog with a headless safety set screw in position; below this is shown the same type of dog with two such screws in position. In the upper left-hand corner a dog with a protecting web is shown; this screw may be tightened by means of a socket wrench or an ordinary wrench. In the lower right-hand corner a dog having a tail bent up to guard the screw is shown.

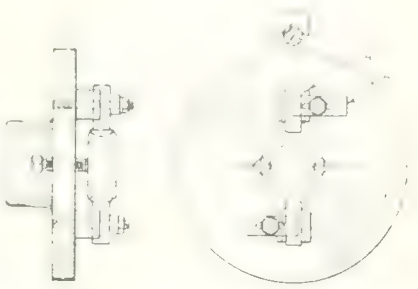


FIG. LOCATING WORK WITH VEE BLOCKS

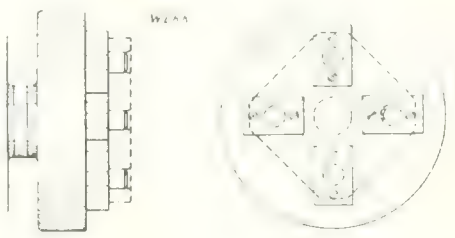
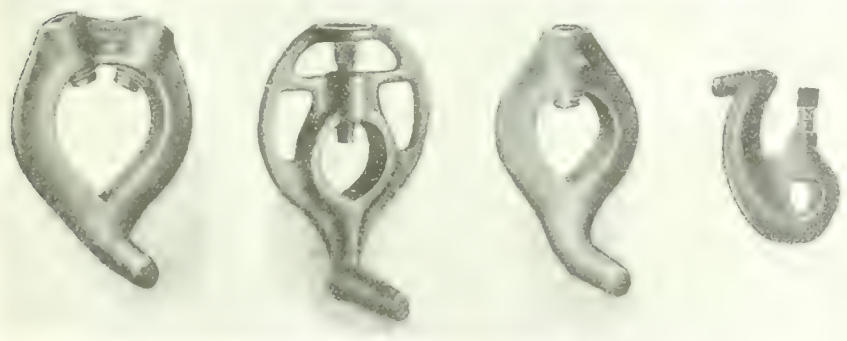


FIG. 29. FOUR-JAWED CHUCK WITH PIN JAWS

In Fig. 28 a long chuck jaw gripping under the rim of the part which has to be turned is illustrated. These jaws are beveled, and where the angle on them is not more than 15 degrees this method of gripping is quite efficient, provided the jaws are scored. Referring to the illustration, Fig. 29, this shows pin jaws gripping in the holes of a square-shaped block. The operations performed on this piece consist of boring the hole and facing the end; the work is slipped over the pins and the chuck is tightened in the usual manner, thus securely holding the work in place by the four holes. A set



Twin Safety Set Screw Dog

Protected Set Screw Dog

Safety Set Screw Dog.

Bent Tail Safety.

FIG. 27. A GROUP OF SAFETY LATHE DOGS

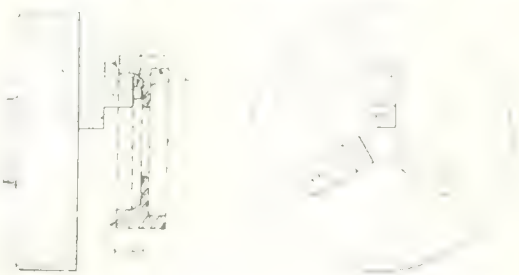


FIG. 30. CHUCK JAWS GRIPPING INSIDE WITH LOCATING PIN.

of chuck jaws which hold the work away from the chuck and grip under the rim are illustrated in Fig. 30. In these jaws pins are used at A to locate the work

from the wall. It is evident from this set-up that the work may be turned, bored and faced; the screw thread can be bored and the web faced at B, while a tool can also face C.

### Chucking and Holding Gears

Many devices for gripping gears are in operation, and a set of chuck jaws which may be used for this purpose are illustrated in Fig. 31. These jaws are made to grip the outside diameter of cast gears, and are simply beveled out to conform to the shape of the gear. That it may not be necessary to grip the jaws tight enough to damage the teeth of the gear a driving pin, as indicated on the illustration, is used to come between one of the teeth and take the drive.

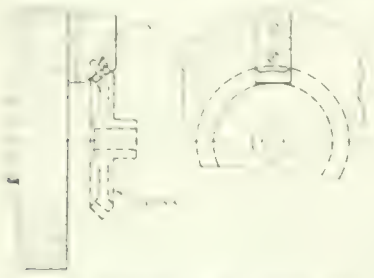


FIG. 31. CHUCK JAWS USED FOR BEVELLED GEARS.

It often happens that in gripping work it is impossible to make all jaws come in contact with the same when these are fixed, as, for instance, two jaws might securely locate the work in place; but if a third jaw is used this will throw the work out of true; in such cases it is common to make one jaw or more if necessary floating. A simple illustration of this type is shown in Fig. 32, where it will be noted that on top of the jaw proper another jaw held in position by a stud A is mounted. This jaw is free to float on the stud slightly, and is also backed up by the solid metal at B. As this jaw is tightened, it is free to float one way or the other until both of the points X conform to the shape of the work in the position where the work sets. It is evident from this that a floating jaw does not distort the work or throw it out of its locating seat; nevertheless, it securely holds the work in place when used in conjunction with other jaws.

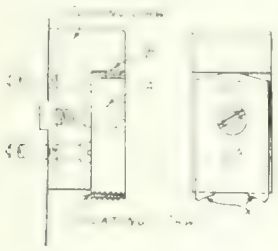


FIG. 32. FLOATING JAW USED FOR CHUCKING IRREGULAR WORK.

Fig. 33 shows a gripping arrangement which is an application of standard chuck jaws used in conjunction with a cast iron ring firmly held to the chuck. This is used for gripping on tubular shaped parts, and the end of the work nearest the chuck is gripped by the jaws, while the free end of the work is gripped by means of the four screws A, thus supporting that end while machining.

In gripping with chuck jaws, particularly when holding finished diameters, it is, of course, necessary to make sure the chuck runs true. The work from soft jaws should be tested quite often, and if this is found to be out of true the jaws should be bored out carefully to the size which they are to grip.

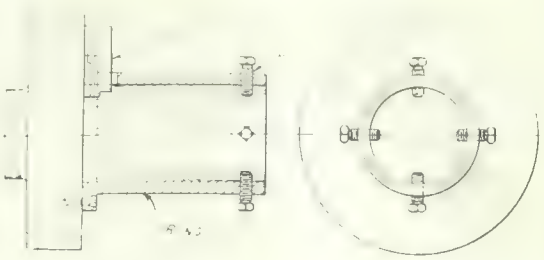


FIG. 33. CHUCK AND JAWS USED WITH TRUING RING.

## THE PIG RINGER IN MACHINE SHOP PRACTICE

By D. A. Hampson

COE was a farmer boy who had come to work in the shop and had been put on a bench job in the manufacturing department. The work was putting collars on spindles of 3-16 in. cold rolled steel; the collars were a single coil cut from a spring made of 1-16 in. wire, which were driven over the end of the spindles and on to the spot where a groove was turned for them; the coil snapped in place in the groove and was closed up a little by hammering to make a more tight appearing job. A smart boy could do 120 per hour, but he had to keep right at it and there was quite a little work about the job.

Coe worked along well, and the second day when the foreman came along he offered a suggestion. "Mr. Brown, I should think a pair of pig ringing pliers would do this work faster than I'm doing it. Of course I don't pretend to know anything about this business but up at Wayland Center we used to put the rings in pig's noses, wires just like this only bigger, with a pair of pliers with a groove in to just fit the wire. These wires are smaller than the rods and I have to drive them on, but if they were bigger and I had a pair of pliers with a groove in to fit the wire I'd put the wire in the pliers and squeeze it around the groove much quicker than I am now. I wouldn't have so many moves to make and so many parts to handle—why you put a ring in a pig's nose with one squeeze of the hand, before he has a chance to squeal, even.

Mr. Brown had never heard of pig ringing before, but he comprehended the idea and thanked the lad for the suggestion. It looked good and it was tried out. Moreover, it proved a time saver. All of which goes to prove that we can learn from the humblest employee in our organization. Very often the simplicity of an operation or our familiarity with it takes an outsider to call our attention to an improvement that can be made. And because that outsider brings with him experience from a field which we would consider far beneath us is no excuse for being too proud to acknowledge the worth of an idea.

## THE BRITISH MUNITIONS INVENTIONS DEPARTMENT

THE Munitions Inventions Department constituted by Lloyd George in August, 1915, has since its inception handled 35,000 cases, and it is interesting to note that the proportion of inventors who are dissatisfied is very small so carefully is the work conducted and so thoroughly is each item investigated for any idea of value to the country.

This department of the Ministry of Munitions deals with and considers inventions put forward by officers, non-commissioned officers and men, and by the general public for use in all military operations and equipment not connected with the navy.

### Personnel

At the head of this department is an honorary advisory council of scientific, military and naval experts of the highest standing. The office staff consists of the comptroller, assistant comptroller, secretary, technical advisers, examiners, military advisers, draughtsmen and clerical staff.

When an invention is received by the department it is submitted to the examiner dealing with the particular class of inventions to which it belongs, and on his reporting it is then submitted to a committee of the advisory council. If an invention is found to have sufficient merit it is developed and tried out under actual service conditions and accepted or declined.

The advice of examiners, who are all technically trained men, the facilities of the drawing office and the workshop actually on the premises, together with those which are afforded by the experimental ground at Esher, and the assistance given by various scientific laboratories are all at the disposal of the inventor, and the department is thus enabled to afford him an amount of technical assistance which would be quite impossible to obtain elsewhere.

### Patents and Rewards

There is attached to the department and housed in the same building a patents and rewards section whose duties consist of:

1. Investigating applications from officers, N.C.O's, and men, and of civilians employed by the government on war work for permission to take out patents.

2. Investigating claims for rewards and royalities where inventions have been adopted for the use of the Crown.

The address of the Munitions' Board of Inventions is Princes Street, London, S.W., and that of the Admiralty Board of Inventions, to which all matters pertaining to naval affairs should be referred is Victory House, Cockspur Street, London, S.W.

# Fundamentals of Apprenticeship: National Interest Grows-IV

Special Correspondence

*Industrial education is to-day the principal educational theme in this country. Employers, business managers, superintendents, thoughtful craftsmen, educators, economists, social workers, men and women in a hundred walks of life, have focussed their attention with growing earnestness upon the problem. Discussions, proposals and theoretical and practical experiments are gradually leavening the great mass of our industrial life.*

### Physical Fitness of Applicant for Apprenticeship.

NO applicant for apprentice employment should be employed who is not in sound condition. Naturally no employer will knowingly employ any boy that has physical deformities or is not in normal health. He should be particularly careful in engaging young people with whom he is to enter into contract relationships that impose upon him specific duties for a considerable time. Every applicant for apprentice employment should be examined for physical or mental condition.

Before engaging an apprentice the employer should satisfy himself upon a number of points among which may be cited the following:

The condition of eyesight.
The acuteness of hearing.
If applicant is tubercular.
Condition of the teeth.
If applicant has adenoids.
Muscular deficiencies.
Nervous condition.
Tendency to hernia.
General state of health.

Physicians will testify to the importance upon the condition of the above will largely depend whether or not the applicant can be classed as physically fit from an industrial standpoint. It is also well to insist at all times upon clean, personal habits upon the part of apprentices and to encourage them in everything that tends towards physical and mental well-being. An occasional class-room talk by a physician upon "The Teeth," "How to Keep in Good Health," "Eating and Sleeping," etc., will repay the expense incident thereto. Talks of this kind, supplemented by class-room examination thereon and examination by the company doctor, is a regular part of apprentice life in some establishments.

### Educational Fitness of Applicant for Apprenticeship.

A boy who applies for apprentice employment presents to the employer a duty which he should not evade. The boy, if employed, will become either a valued acquisition that will develop into a scentific workman (an honor to his craft and a profit to himself and to his employer); or a misfit that will cost the employer money until he is droped; or an "average" workman, with which industry is already over-afflicted. The employer should realize that employing an apprentice is a much more important task than hiring a journeyman—that boy selection entails serious responsibility, the infliction upon industry (and possibly upon his own shop or community) of a lifetime of misapplied and unprofitable energy,—or the infusion into industry of a lifetime of progress that may eventuate into a veritable endowment.

The selection of the apprentice therefore, is second in importance only to his training. Since the apprentice is presumably about sixteen years of age, he will come directly from the school or from a brief period of employment (or unemployment) elsewhere. In the selection of the apprentice, therefore, it is important to take account of the amount and character of his school training.

It was not so long ago when it was said of the boy who lagged in his classes and refused to respond to his educational advantages, "John is no good; he simply will not learn,—he'll have to go to work." And so "John" was sent to some trade for employment, taken in, and he was followed by countless other "Johns" absorbed by industry for the same reason. As a well known commissioner of education has aptly said: "No matter where the fault has been, or whether there has been any fault, the fact is that great numbers of the plain people have withdrawn their children from the schools before completing the elementary course for the too apparent reason that they did not think it worth while to have them remain." It is obvious that most of these children have been received, ultimately, by the employers of the country.

But this attitude upon the part of parents and employers is gradually changing for the following reasons:

(1) The effect of recent child labor legislation, whether intentional or not, and whether the part of wisdom or not, is to exclude from employments offering future progress all boys under sixteen years of age.

(2) Industry has awakened to the fact that workers without mental capacity are like boilers without steam.

(3) The traditional school system is being modified in the interest of those who leave school, either through choice or necessity, before sixteen or seventeen years of age.

As educational fitness will have much to do with the boy's progress and his future development, it is incumbent upon employers to set up certain educational standards, at least for admission to the skilled trades. Employers should recognize the fact that, even in the [illegible] automatic operations of modern complex machinery, a considerable degree of intelligence is required, and that, when this is to be combined with industrial mathematics, mechanics, science, etc., which are absolutely necessary for the apprentice's rightful progress, it is essential that the student shall have a certain educational foundation upon which the employer may build.

The Conference Board, therefore, urges upon the employers of apprentices the establishment of the following educational requirements:

(1) Where the traditional school system prevails, the employer should demand the completion of the work of the grammar school, or the passing of an examination, simple yet determining, to prove that the applicant possesses a mental equipment equal to that of such a graduate.

(2) If the school system makes rational provision for those who leave before sixteen years of age, preference should be given to boys coming directly from the school rather than to those who, having left at fourteen, come from a wandering, two-year apprenticeship in low-grade, unprogressive jobs. This preference should be given especially to pupils coming from those schools where the work is planned to give an industrial interpretation to much of the regular school work; to create an industrial interest or curiosity; and to develop an industrial intelligence.

The Conference Board would suggest, also, the selection of apprentices possessing the following personal characteristics:

1. An earnest desire to lear the trade.
2. Good moral character.
3. Good general standing in school.
4. Mental alertness.
5. Ability to work without close supervision.
6. Good health—absence of physical deficiencies.
7. Age approximately sixteen years.
8. Full average height.
9. No cigarette smoking.
10. Tidiness in appearance.

### Written Agreement Between Apprentice and Company

There should always be an apprenticeship indenture, a written agreement between employer, parent, and apprentice. Every employer who has used it declares in favor of its universal adoption, and large numbers of intelligent employees approve it.

An [illegible] employer:

a. Continuous service of the boy during a definite time.

b. A better grade of boy. An employer will not enter into a contract covering a period of years with a boy whom he does not select with care.

c. More faithful service. By such an agreement the boy realizes that his interests are bound up with his employer's

*Copyright, "Conference Board on Training of Apprentices."

An indenture guarantees to the boy:

a. An opportunity to learn his trade as a whole.

b. A fixed wage and guaranteed increases.

c. Personal interest of the employer.

An apprentice indenture thus guarantees to both parties faithful performance of mutual service, and by "guarantees" is meant, of course, reasonable certainty of fulfillment of a solemn, moral obligation.

Realizing that there should be a standardized agreement that could be adapted in whole or in part to all industries the Conference Board undertook to compile one. As there are various State statutes prohibiting what in other States would be a perfectly legal indenture, the Conference Board aimed to formulate an indenture that could be used universally if desired. Inasmuch as an apprentice indenture is simply an agreement between parties to perform certain acts which are of mutual advantage, the Conference Board came to the conclusion that an indenture or agreement, taking the form of a moral obligation only, without the customary bond given for fulfillment, would probably be permissible in all localities, and of great moral value.

## THE COST IN COAL OF AVOIDABLE BELT SLIP

ONE of the very simplest transmission losses to overcome is belt ship, and since belts are used to so great an extent it is worth while looking into the matter with considerable thoroughness. To show the extent of the loss of money through slipping of the main belt alone a chart, supplied us through the courtesy of the Cling-Surface Company, Buffalo, N.Y., is shown herewith, upon which this is easily ascertained. By glancing up and down column "D" of this chart it is evident that the "cost of avoidable belt slip per year in dollars" may vary all the way from the smallest sums into the thousands of dollars.

Where the power in the first place is generated by a steam engine and is then transmitted to a generator or to the main shaft through a main belt it is evident that the "entire coal pile" passes through that in the form of energy, literally speaking.

If the belt slips, which it should not do, a certain portion of the coal pile does not "get through," but is lost into the atmosphere in the form of waste heat. A main belt is merely a "link" connecting the engine with the generator or with the machines themselves. In fact, every belt that transmits power is a connecting link and the efficiency of that link depends largely upon the freedom from slippage and the avoidance of strain on the shafts. Slipless, easy-running belts are most desirable.

If the power plant is considered as a chain of links, the first link is the coal on the grates, which only perfect combustion can turn into maximum heat; next the boiler shell and tubes they must be clean to bring the heat link to the steam link; next the steam line from boiler to engine or turbine, large enough and well insulated; then the engine or turbine link which joins heat energy and mechanical energy—only careful design, proper valve setting and much care minimize losses here. Then, where power is distributed solely through belts and pulleys, the belts, pulleys, and shafts or electrical cables to the final motors and belts are the connecting links up to the machines themselves.

If the efficiency of every link is maintained at its highest point the power end of the plant is beyond criticism. The overall efficiency will then be very high. But if the efficiency of every link is low or indifferent the overall efficiency of the power end will be distressingly low.

Each per cent. of slip in a main drive represents a loss of 1 per cent. of the coal pile, and roughly 2 per cent. of the potential power in the driving pulley of the engine is represented by belt creep. Its loss is unavoidable because of the elasticity of the belt. This has been recognized and provided for in the chart, so the reader can proceed to connect known values, while the intersection with column "D" gives the avoidable money loss.

Simply zig-zag across the chart twice with a straight edge, as shown by the dotted lines, and the money loss is immediately found. Thus, if the total belt slip is 6 per cent. (column "A") and the cost of coal per ton is $4 (column "B") run a straight line through those two points and locate the intersection with column "C." Then from that point of intersection run over to the tons of coal burned per year (which in this instance has been stated as 1,000 tons) and the cost of ovaidable belt slip per year is shown by column "D" as being $160.

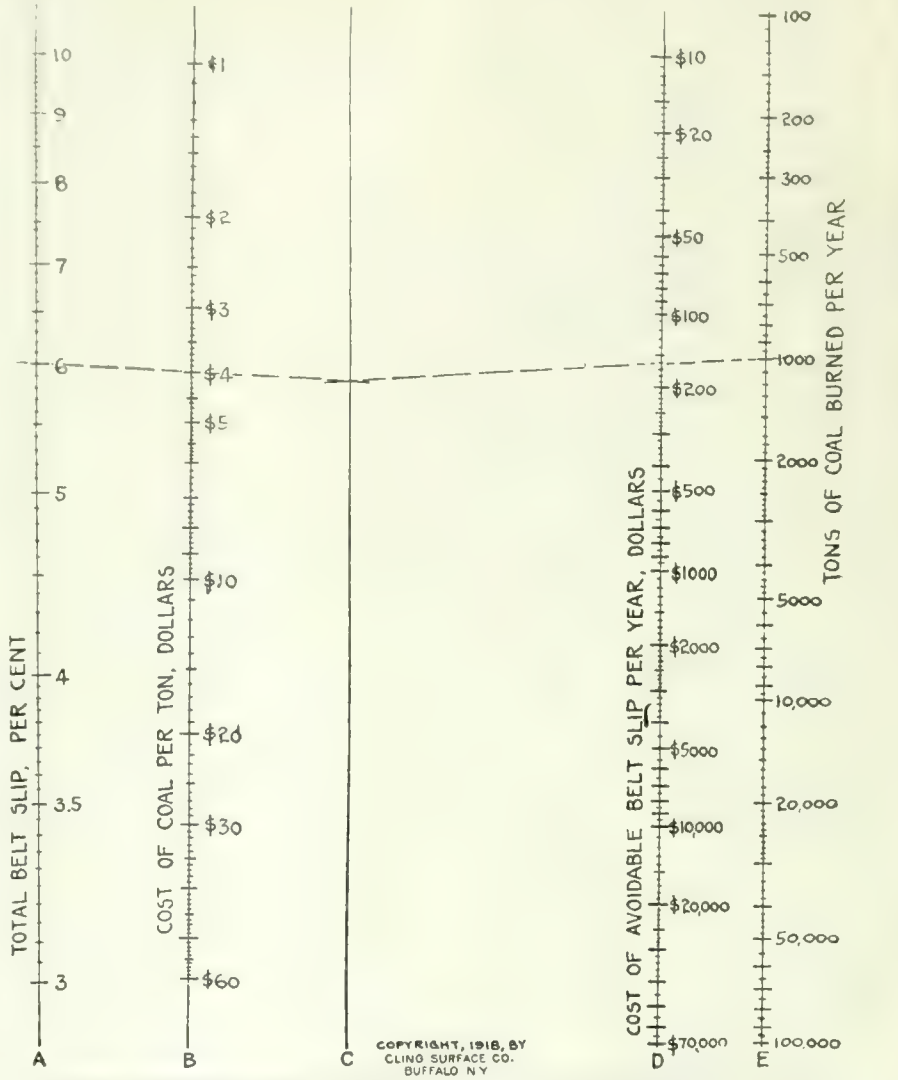



CHART SHOWING HOW AVOIDABLE BELT SLIP INFLUENCES COAL COST

To give a clear idea as to the meaning of "total belt slip per cent." take an example. It is found by means of a revolution counter that a given driven pulley is rotating only 940 times per minute, while calculations show that without slip it should rotate 1,000 times per minute; 60 revolutions per minute, therefore, are absolutely lost. Dividing this 60 by the r.m.p., that pulley should make you get 0.060 or 6 per cent., which is the "total belt slip." After having made this determination, now it is a simple matter to apply it to the chart, as has been done, and determine the money loss per year due to such slip.

# Prospects of Employment of Disabled Men in Engineering

By an Engineering Correspondent

*At the moment disabled men can find plenty of unskilled work at reasonable wages, and the simplest means of dealing with them is doubtless to put them to such employment. This, however, is not their due, the writer contending that employment in casual unskilled labor is a misfortune for any man, but doubly so for those whose health and strength have been impaired. Free and complete training in and access to any desired trade are the least they are entitled to.*

AS the war goes on large numbers of men are being restored to the community deprived in some measure of the physical means for earning their livelihood that they took with them. Some of these will have come out of the engineering trades; and the duty of those trades to make the best possible provision for bringing these men back as nearly as possible to the work in which they have been brought up does not need to be emphasized.

It will be found, however, that the proportion of men in the engineering trades who are so disabled is notably lower than in many other trades, because a large part of the engineering trades have enjoyed an immunity from military service which has been denied to their fellows. This immunity was given originally for the purposes of the State, and, at the time at which it was given, no man who was genuinely a skilled engineer had any option but to accept it. Whether or not advantage has since been taken of this immunity by persons who were in fact not skilled engineers, or whether what was given to provide for the needs of the State has since been claimed as a personal right of those to whom it had been entrusted for the time being, it must be recognized that those who have enjoyed this immunity will be found at the end of the war with a vast advantage over those who, in its absence, have lost a limb or a faculty by which a living could be earned. The most elementary sense of justice dictates that this advantage shall not be asserted as against the men who have lost it in the service of their country; and the obligation to restore to the war victims the utmost possible means of earning a good livelihood is particularly incumbent on those engaged in the engineering trades, who will have benefited so largely by the privileges of their occupation.

### Propect for the Disabled

At the present time no great sacrifice is involved in giving employment to disabled soldiers and sailors so far as they are able to undertake it. The supply of labor in most branches of work is by no means beyond the requirements of the trades, and considerably more could be absorbed if it were available. When the war comes to an end the process of reconstructing what has been destroyed may occupy as much labor as is now engaged on the means of destruction, and enough work may be in sight to ensure a good standard of employment for a few years ahead. But most of the men who are here in question are young. They have in prospect many years of life; and if they are to be prepared to provide for themselves throughout the cycles of fluctuating employment, they must in the meantime have acquired the practice of the trade in which their living is to be gained. At the moment disabled men can find plenty of unskilled work at good wages, and the simplest means of dealing with them is doubtless to put them to such employment. To do so, however, would not be to satisfy what is due to them. It would, for the most part, mean placing them in a blind-alley occupation at the time when they were most amenable to training. When the demand for labor fell off, they would find themselves without a trade, swelling the ranks of casual labor, scrambling for employment in competition with men who are more competent because they have not sacrificed their means of livelihood in the service of their country.

For any man employment in casual unskilled labor is a misfortune, but for the majority of these men it would be utter and final disaster. The stock-in-trade of the casual laborer consists very largely in the use of his body and his physical strength, and men impaired in these respects would be handicapped out of all chance of competition. To give them the opportunity of independence that they earned they must be put into the practice of whatever trades can be brought within their physical means; and in the selection of these trades it is obvious that they will be better or worse off according as the skill they acquire is more or less marketable.

The disabled man has a better chance to-day of acquiring skill than ever he had before. The efficiency of artificial limbs for those—by no means a majority—who require them has grown by leaps and bounds, and is still improving. More important still, the physical re-education of disabled men has been pursued during the war with a systematic completeness beyond all precedent. Happily it has been found that, in contrast with the sufferers from industrial accidents, those whose injuries are caused in war show an extraordinary adaptability to physical re-education; that is to say, to teaching one set of muscles, or even one sense, to do the work that previously had been done by another. The method, moreover, that is now most favored, especially in this country, offers incidental advantages to the patient, which previously were not open to him. In contrast with older practice, and to some extent with what has been particularly developed in France, the methods of English orthopædic surgeons tend to employ actually useful work as the means of re-education instead of the mere practice of exercises. Two consequences follow. On the one hand the patient avoids the mere monotony that has so often sickened him of the beginnings of his new training; while on the other his attention is directed to the actual job he is doing, and thus he is not only relieved of a good deal of monotony, but is diverted from the recollection of his own infirmity.

### The Roehampton Hospital

A number of institutions are springing up with the object of providing the necessary training in various trades. Of these the first was Queen Mary's Convalescent Auxiliary Hospital at Roehampton, and it remains among the most active. It was opened at the end of June, 1915, and up to the end of May last over 7,000 men had been discharged fitted with artificial limbs, and over 6,000 had passed either into employment or into further training with the object of securing it.

The hospital was started originally with the object of providing men who had lost a limb in the war with the latest and best artificial appliances. It was soon found, however, that this provision was only a small part of the work that needed to be done. The large majority of injured men had not in fact lost a limb; and whether they had or not, they were no less in need of physical re-education than of mechanical assistance if they were to enter a trade involving any skill. Accordingly workshops were provided in which disabled soldiers and sailors were enabled to make a beginning both in regenorative exercises and in the aquisition of skill. Among the trades that are here included are various branches of electrical work, wood-working, motor-driving, metal turning, drilling and fitting. It was often found, however, that the period of their convalescence was not long enough to enable the men to acquire sufficient skill, and arrangements were accordingly made with the Polytechnic in Regent-street, whose Director of Education, Major Robert Mitchell, had taken an eminent part in the design and erection of the Roehampton shops, whereby men discharged from the hospital could be passed on to the Polytechnic shops for further training. Since then other institutions have offered similar facilities; and although at present they are in the aggregate only on a small scale, they have served to show a wide range of [illegible]

*Contributed to a recent number of the Times Engineering Supplement.

trial re-education is open to disadvantage, and that they can acquire a considerable variety of skill. Its provision is all the more necessary because patients are kept in hospital only until they are surgically cured and restored to general physical health. In France, on the contrary, they are kept in hospital until they have become perfectly cured and have undergone a sufficient course of training.

### Auxiliary Agencies

Side by side with the development of institutions such as have been described, much activity is being shown both by the State and locally. The Ministry of Pensions provides what, as pensions go, is a liberal scale of allowances for disabled men who are undergoing industrial training. Local committees have been formed in most parts of the country to follow up individual cases and lead them into appropriate courses of education and avenues of employment. The Ministry of Munitions grants, of course, to such men as go into training for munition work the considerable allowances it has been giving for the training of munition workers. Joint committees have been formed in a large number of trades, composed of representatives of employers' federations and trade unions, for the purpose of advising and assisting. Industrial assurance companies have come forward with the liberal statement that they will accept discharged soldiers introduced into industry without any additional premium. Already, in fact, there is an efficient mechanism for most of the various purposes that have to be served in reintroducing disabled men into industry. As yet, however, it cannot be said that this mechanism has been turned to its fullest account; and of all public services that employers in the engineering industries could render to the country and to the men who have suffered in serving it, none is more important than to give their personal assistance to the movement for helping those men into occupations worthy of their deserts.

### Selection of Trades

For whatever can be done by the collective mechanisms that have been set up, there must always remain individual factors which can be dealt with to the best advantage only by individual employers. Many jobs in which skill is required are more or less peculiar to individual trades, and sometimes even to individual shops; and these can be discovered by those inside the works with a certainty that is impossible when the job has to be expressed in general terms, such as are necesary for collective action. When the best has been done for disabled men, they must always remain with a smaller choice of occupation, and therefore a greater risk of unemployment, than men who are free from their handicap. In any work in which they can be brought to an equality with their fellows they are most evidently entitled to priority of employment. In the engineering trades, apart from those engaged at the moment in producing munitions, it is questionable whether they are getting this priority. They are obtaining a certain amount of employment in the electrical trades, and a relatively small amount in machine shops and as fitters. Here and there a special occupation has been discovered into which they are being introduced, such, for instance as in Scotland in the work of colliery firemen who detect and disperse the gas in mines and who are in considerable demand, earning about 10s. 6d. per day of eight hours. To some extent they are being employed in acetylene welding, a very little and inexpensive mechanical assistance being, for many jobs, quite sufficient to put them on an equality with other men. But much more remains to be done, and it seems as though it is now the turn of the employers themselves individually to take the matter in hand.

### Prospects of Employment

Unquestionably the selection of a trade should be determined to some extent by the prospects of continued employment, and the operation of the joint councils that have been constituted for the purpose of furnishing local committees with advice will be watched with much interest. They have considerable opportunities before them. Entrusted, as they are, with only advisory functions, their constitution is free from criticism to which bodies with compulsory powers might be exposed; and the fact that they are composed of representatives of employers and trade unions lends a special interest to the results of their co-ordinate working. The sources of information to which they have access should give them exceptional opportunity of offering the soundest advice. In particular, so far as the prospects of employment in the various trades can be foreseen, they will be in the best position to estimate them. The value of their special knowledge in this respect depends, however, on the use that they make of it, and, in particular, on the candor with which they recognize that the disabled soldier has a claim prior to that of any other man to such employment or work as he can do. When the total numbers of the disabled men who will come into question are considered, the effect on any trade will be seen to be relatively small. But, whatever it is, there will be a considerable temptation, if this trade be one in which fluctation of employment is likely to occur, to bar the admission of these crippled men for fear either of lowering the standard of wages or of reducing the chances of employment for those already in the trade. There is already some ground for fearing that this temptation may lead to obstacles being put in the way of the engagement of discharged soldiers.

The danger of lowering the standard wage is undoubtedly one against which every legitimate precaution must be taken; but the one means of avoiding this danger that should be strictly excluded is to keep out of the trade crippled men who might physically be capable of being brought into it. It is quite likely that for other reasons than the employment of disabled men the practice of instituting minimum wages in various trades will have to be extended; and employers will be well advised to look the prospect fairly in the face, and to prefer the frank acceptance of minimum wages imposed by the sanction of the State to alteratives more provocative of strife and less certain in their action By such means the danger of interfering unfairly with the normal wage in each trade could be avoided. It must, however, be recognized clearly that no measures will prevent the fluctuation of employment nor alter the fact that to such extent as disabled men are admitted into a trade those who are already in it will have to put up with a greater scarcity of work when trade is bad. The choice will then have to be made whether those who are to be unemployed in a given trade, and for the time being or permanently to find occupation in another trade, are to be taken from those who are crippled or those who are not. No solution can be satisfactory which does not provide that the men who have been crippled in the war shall retain their employment, whoever has to put up with the disadvantage of changing. This is especially true of the engineering trades, in which so many men owe the continuance of their employment solely to the sacrifice that has been made by the men who are crippled, and by those who will work no more.

### Need for Frank Co-operation

Above all, the movement for giving their rights to those men must not be allowed to become involved in questions of social or industrial politics. Such questions may be proper and inevitable subjects for discussion when the war is over; but they must not be allowed to intrude into the present purposes of the community, and least of all to affect the community's performance of its duty to its soldiers and sailors. Neither the employers' federations nor the trade unions are entitled to make the discharge of the country's obligations to these men contingent on their adhering either to conditions imposed by a federation or to their joining a trade union. It is quite possible that advantage could be taken of the present situation to bring pressure to bear on men to one or other of these ends; yet such pressure would be illegitimate. What disabled men claim is due to them not because they are copartners in a vested interest claimed by a craft in an industry, but because they have suffered in the service of the State; and however excellent the motive with which one or other of the existing parties in industry might feel tempted to exploit the men's lonely and critical condition in order to drive them in one direction or the other, such action would be mean and discreditable, and sooner or later would hurt all who were parties to it.

### Man Power

The claim for the introduction of disabled men into any industries in which they can acquire the necessary skill is here put forward as what in the first instance it is—a means of giving disabled men what they have earned many times over. But, although this is the aspect in which alone the problem can be approached truthfully, it is not the

only or the ultimate aspect. The men who return from the wars will often find difficulty in accustoming themselves to the necessities of shop life. They will have need, so to speak, of a moral re-education, enabling them to stand up to the relative monotony of a continuous uniform hourly call on their energy, where for the most part they have been accustomed to alternations of intense activity and relative stagnation. But this re-education will be as possible and as certain as the physical re-education and a body of men who have undergone it after passing through the discipline of war will be an addition to the nation's rate the importance if the value of personal character and the habit of co-ordinate effort are left out of account. The sum total of manual skill and of mind-training to mechanical aptitude will be increased, and that in itself will be an asset in a time when the prosperity of the country is going to depend on the increasing of its productivity. But to people its workshops with men of proved character, who have been through the utmost stress to which flesh and blood can be subjected, and who carry with them indelibly the reminder that they are such men, may have an even greater value.

## THE ENGINEERS OF TO-MORROW

By J. A. L. Waddell.

THERE is an imminent matter of vital importance to the American nation concerning which very little, if anything, has been said in the newspapers. I refer to the depletion of the classes in technical schools, first, by widespread volunteering for the army and navy, and, second by conscription. This subject received much attention at the recent Washington meeting of the Society for the Promotion of Engineering Education, an organization of 25 years' standing and composed of most of the leading American instructors in all lines of applied science, and also a few prominent practising engineers. The meeting was addressed by such distinguished men as the secretary of war, the chief of engineers of the U. S. army, and the director of the bureau of standards. The five sessions held by the society on those two days were devoted almost exclusively to questions of public welfare, principally connected with the war.

As I attended all of the sessions from start to finish and took the deepest interest in the entire proceedings, I feel justified in making the following statements, and in claiming that they express the opinions of a number of the most profound thinkers of America.

**First.**—The larger part of the civilized world will have to be reconstructed after the war, not excluding our own great railroad system, which undoubtedly will have deteriorated on account of over-use and lack of adequate upkeep.

**Second.**—Such reconstruction is almost exclusively the work of engineers.

**Third.**—The European technical men have been killed off by thousands during the past three years; and their slaughter will not cease until the war ends. Moreover, it is more than probable that many American engineers who serve in Europe will never return to our shores, and that a large number of those who do come back will be more or less incapacitated from active professional work.

**Fourth.**—The technical schools of all the other warring countries than ours have practically been out of commission for three years, thus cutting down there, almost to zero, the supply of new men for the engineering profession.

**Fifth.**—The call to arms in this country by both volunteering and conscription it is feared will soon have reduced to about one-half the attendance at the technical schools of the United States, while instead of being halved it ought properly to be doubled.

**Sixth.**—In spite of the present paralyzation of many lines of engineering work, due to the cessation of large constructions, and to the absolute lack of capital for important new projects of a peaceful character, the demand for young graduates of technical schools by the manufacturers of war supplies is so great that there is already a marked dearth of such assistance, which dearth will be more and more accentuated as the war progresses, and as the call for ships, guns, ammunition, aeroplanes, automobiles, etc., increases.

**Seventh.**—Until the United States entered the war, it was almost certain that most of the reconstruction work of the world would be done by American engineers, and in any case they are sure to get a fair share of it; but it seems a shame that this country should miss such a golden opportunity as that which lies before it for securing the lion's share.

**Eighth.**—The capacity of the old, experienced, and well-established American engineers for doing work is practically unlimited, provided that there be no shortage of young, properly-educated assistants; because most technical men of mature years have developed highly the faculty of management. On that account the average total annual amount of work engineered by such men in this country could readily be increased five fold, or, possibly even ten fold, without causing undue overstress either physical or mental; and, consequently, the great mass of the work of world-reconstruction could emanate from the United States and be handled abroad by American engineers.

**Ninth.**—It is beyond question that, for the next 10 years or more, engineering is everywhere going to be the most lucrative of all the professions.

### What Deduction is to be Drawn?

From these nine premises what is the most important deduction to be drawn? Evidently it is that, by some means or other, we must manage not only to prevent any falling off in the attendance at our technical schools both during and directly after the war, but also greatly to increase it. And how can this be done?

The answer to this question is not difficult. It is as follows:

**First**—By urging more young men to go to college, and by persuading their parents that it is their duty to send the boys there for the ultimate good of both themselves and the country.

**Second.**—By inducing all sub-freshmen who have shown any special aptitude for mathmatics, mechanics, or chemistry, to take technical courses.

**Third.**—By discouraging the enlistment into the army and navy of all students in technical institutions, but, on the contrary, by encouraging them to remain and graduate, if possible. Of course, those who are drafted will have to serve; for it would, manifestly, be unfair to the rest of the youths of the country to excuse a man from going to the front simply because he is a technical student. Such drafted students, however, should generally be sent to the engineer corps, because their services in that branch of the army would probably be more effective than in any other, and because the training they would receive therein would be likely to serve them in good stead in after years when practising in the engineering profession.

**Fourth.**—By granting government aid to those youths of evident special ability in technical lines who are unable to raise the money necessary for a course of instruction.

If these four steps be taken, the unique opportunity referred to will not be lost; and this country will then become the leader of the world in activity, effectiveness, and wealth.

### An Appeal to Young Men

Let me, therefore most earnestly implore all youths who are ready for college this Fall, and who are not in any way unfitted for technical careers, to take up some branch of engineering or technology; and let me entreat the parents or guardians of such youths to exert their influence so as to induce the boys to choose that line of study for their life work. Remember: it is not only for the good of the country that I make this appeal, but also for the ultimate benefit of the young men themselves!

Some reader of this communication may remark that such an appeal would possess more force if it were to come from a national engineering society than when emanating from an individual engineer. Very true! But until quite lately there has been no engineering society which draws its membership from all lines of technical activity; and the one which is now being formed, viz., the American Academy of Engineers, has not yet received from congress the national charter for which it has applied. Were that association to-day fully organized and duly recognized by the government, it assuredly would make such an appeal as this, and, in my opinion, that appeal would immediately be responded to by the nation, for the American people certainly are sensible enough to heed seriously any words of warning coming from a select body of the most practical men in the land.

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## RECONSTRUCTION MUST PRECEDE EXPANSION

WHATEVER the ultimate distribution of the world's markets as a result of the war and despite the indefinite prolongation of involved commercial conditions such as must result from the later German conquests, the need of export business as a means of maintaining Canada's industrial status at the requisite height becomes increasingly apparent with the passage of time.

The necessity for immediate recognition and investigation of future possibilities has been periodically impressed upon manufacturing circles with each succeeding lull in munitions work, but adequate steps on a nation-wide scale do not seem to be contemplated by any responsible body, whether government or otherwise.

The whole question of export trade, its possibilities, desirabilities, difficulties, risks, is in a great measure an unknown quantity to many of those who seem to see in it a solution of post-war tribulation. It is invariably brought forward as a sort of vade mecum, a cure-all, an ultimate remedy for the many aches, pains and industrial creakings which are bound to accompany the readjustment of our country's industry.

In considering ways and means to insure a minimum dislocation of industry during the transition period, attention might be directed to certain governmental activities in Britain. Steps have already been taken in advance of conditions, and the Old Country is meeting trouble more than half way with a view to overcoming it more promptly and more effectively.

A committee composed of manufacturers and business men has been appointed to consider the provision of new industries for the engineering trades. Its duties will be to compile a list of the articles suitable for manufacture by British engineers, which were either not made in the United Kingdom or were made in insufficient quantities, and for which there is likely to be a future demand.

The articles are classified in three main groups, according to the class of labor necessary for their production, i.e., women; men and women; skilled men. Recommendations are also to be made by the committee regarding the establishment and development of these new industries by the transfer of labor or machines or by other measures; also as to the best methods for securing the co-operation [illegible]

Owing to the war industry in this country having been developed along different lines from that of Britain the absence of controlled factories, etc.,—there is not the same probability of close governmental co-operation, yet such would seem to be desirable and its occurrence would need to be prior as well as being essential to any organized effort to develop export trade as a feature of Canadian industry.

It must not be overlooked that many of the firms on whose behalf national effort is suggested were non-existent before the war, and many which did exist were not doing much else. All their strenuous activity since then has been non-competitive except as to output. As fighters for the world's markets in engineering products our manufacturers, with certain notable exceptions, were nowhere.

Industries become indigenous as a result of special conditions of materials and facilities. The Committee on Industrial Research has been actively engaged for some months and the results of its labors should soon be capable of indicating some of the directions in which manufacturers may lay plans for future development, always recognizing that lines which are based on more or less exclusively Canadian conditions will eliminate in corresponding degree the intensive competitive feature which seems destined to be inevitably characteristic of reconstruction work in all countries.

## BUYING REAL COAL

A BILL is now in the Ontario Legislature to force dealers to weigh coal on municipal scales or by municipal officials. J. A. Pinard of East Ottawa is sponsor for the measure, and it has been advanced to its second reading.

The chief objection will come from dealers who will not want to cart their coal to civic scales when delivery is to be made in an entirely different section of the city. It will not be practicable to have a civic official to check up the weight at the scales of each individual dealer.

There is a great deal more point and purpose to an announcement contained in the United States Official Bulletin of March 9. The drift of this is that bituminous coal must be mined clean or sold for less than the fixed price.

H. A. Garfield, United States Coal Administrator, has given very wide powers to the district representatives of the fuel administration. In fact, it looks as though they had really been constituted a court of last resort by the fuel administrator. Where the coal in any part of the mine is found to be naturally of such character as to be unfit for market, judging from the usual standard of the district, the district representative may order the mining suspended in said part or parts of a mine until or unless proper cleaning methods be adopted.

Not only so, but the inspectors are authorized to condemn at the mines "any coal loaded in railroad cars which in their judgment is not properly prepared. . . . If the district representative approves the inspection report he shall so notify the operator at once; in which case, unless the operator unloads and reprepares the rejected coal, the consignee shall be permitted to deduct 50 cents per ton from the authorized price for the grade of coal." Of course, the consignee, if he wishes, may go ahead and pay the full price, although this looks like a long chance once the fuel inspector has condemned the coal.

The fuel scarcity that Canada has passed through has brought to many a Canadian home a quality of coal that never could get past in ordinary seasons. This, of course, refers particularly to anthracite coal. There has been more slate and rubbish in the form of clinkers pitched out this winter than the coal burners can conveniently afford to pay for.

# The Fire Losses in Industrial Plants Can Be Kept Near the Vanishing Point

## Chief James Corbett Has Decided Views Along This Line Has Been Head of the Fire Department at the Toronto Massey-Harris Plants for Thirty Years, in Which Time the Fire Loss Has Been Less Than $500.

A FIRE loss of less than $500 in thirty years is the record of the Massey-Harris factories and warehouses in Toronto. When one stops to consider the wide area covered by the plant here, the several thousand men employed, and the large number and variety of operations involved, the record is one that will stand analysis. A cursory survey of the situation will make it

CHIEF CORBETT.
Who has been in charge of Massey-Harris Fire Department for thirty years.

certain that behind such results there is system and care, and behind the system must be a careful and efficient fire department.

Mr. James Corbett has been in charge of the fire department of the Massey-Harris plant for 29 years. To be exact, it was on the 11th of June, 1889, that Mr. Corbett went to the position where he has given such faithful service.

### A Toronto Boy

James Corbett is a Toronto boy. When quite a young man he joined the Toronto Fire Department, being for seven years at the old Court street hall. From there he went to the Winnipeg department, returning from the West to take charge of the fire fighting department of the Massey-Harris Co. As a matter of fact, it is hardly right to refer to it as a fire-fighting system—it's more correct to say a fire-prevention plant.

### Central Control

The entire time-checking devices of the plant are controlled and operated from a central station in the fire hall. When the buzz blows at noon it's because a man in the fire hall presses a button, the time having been secured exactly five minutes before from the observatory. When the time-checking devices in 25 different departments of the shop turn from "on time" to "late" it is likewise because a man in the fire hall has pressed a button. In fact, the man in the fire hall pressing the button attends to quite a heap of things around the plant.

### Mr. Corbett's Devices

The system used at the Massey-Harris has been largely brought to perfection by Mr. Corbett, who is an electrician himself. The fire alarm system is operated by the usual alarm methods. There are 33 fire alarm boxes situated throughout the plant, all directly connected to the central station; besides this the department has nine hose reels, 41 hydrants and 3,000 feet of hose. The sprinkler system has no less than 16,000 openings.

"The sprinkler system is the greatest fire preventer and fire fighter in the world," remarked Mr. Corbett to CANADIAN MACHINERY. "It is impossible to put too much stress on its importance." The Massey-Harris system is also under check at the fire hall, and a defect, through lack of pressure, will at once be registered at the central station, this starting an alarm bell automatically.

### Carefully Arranged

"The sprinklers here," said Mr. Corbett, "are all arranged so that they become operative at about 155 degrees. Of course an exception is made for the boiler and engine rooms, where a greater degree of heat is necessary to start the water. To show how sensitive the system is, we had a mechanic fixing up a room for welding. He started his furnace without any allowance for letting the heat off. In about one minute he and his plant were flooded out. The sprinkler system, you see, is very quick to detect a change in temperature and act accordingly.

### Preventing Fires

"The fire losses in Toronto are away too high," continued Mr. Corbett, "and the most lamentable feature about it is that fully half of them can be prevented. I do not think it is an exaggeration to state that the fire losses can be cut in two by attention and the use of sprinklers. We pay great attention to prevention. In every department where waste is used there are big metal receptacles for this stuff, and we have a force of men who see to it every night that every bit of waste is picked up and burned. That does away with that class of fires often referred to as caused by spontaneous combustion. They are hard to control, and the most effective work in offsetting them is to be done in the way of preventing conditions favorable to their outbreak. Another feature is a good watchman service. Only the most trustworthy men are employed on this work. Our system makes it possible for us to tell in the morning where each watchman has been during the night. We have had a number of calls this year," concluded Mr. Corbett, "in fact the number is a little higher than usual, being 13 since the first of January."

Mr. Corbett is president of the Dominion Association of Fire Chiefs, being elected to that position at the last annual meeting. He is an enthusiast in all matters pertaining to fire fighting or prevention, and in all things connected with the electrical appliances used for recording alarms. Mr. Corbett is also a frequent contributor to publications issued in the interests of fire fighters.

# Much Depends on Action of U.S. Towards New Price Schedules for Iron and Steel

## Trade in Canada is Marking Time Until Some Definite Announcement is Made—C. M. A. Officer Looks for Improvement in the Transportation Facilities Since Railroads Have Removed Most of Their Embargoes

CANADIAN dealers are, like those across the border, waiting to see what is going to take place on the last of March, when the United States Government will announce its decision regarding the schedule of prices affecting the iron and steel industries. Conferences are already under way of the various interests concerned. It is noticeable that the smaller dealers in most cases are those urging higher prices. On the other hand the men with large furnaces claim they can produce at less than the smaller workers, and that pooling supplies, which has been widely suggested, would really mean the putting of of a premium on the less highly organized concerns.

Canadian dealers are beginning to get through their orders that should have arrived weeks ago. The clearing out of railroad yards and the gradual recovery of the roads is being reflected in the stocks arriving in Canadian yards. One lot was placed in a Toronto firm's sheds this week that had been on the road from Pittsburgh since the first of December. Dealers in supplies and tools complain of having had the damper put on their business because transportation facilities are weeks behind.

An official of the Canadian Manufacturers' Association stated to-day that they looked for an immediate and decided improvement in the situation. Embargoes which the roads had placed on shipments had largely been removed, in fact the M. C. R., T., H. & B. and C. P. R. roads were open from the Black Rock and Buffalo ports, and they expected the G. T. R. would soon have a similar announcement. The handling facilities toward Detroit were also showing an improvement and travel was much more rapid. The allied governments had made a special appeal to all the roads to devote their full force to moving foodstuffs toward the seaboard, and on this account other shipments, no matter how pressing, had to wait their turn. That condition has passed and better transportation facilities are now looked for.

## NEW ORDERS KEEP TRADE OUTLOOK UP

### Deliveries Are Much Better Owing to Freer Movement on the Rails

SPECIAL TO CANADIAN MACHINERY.

MONTREAL, Que., March 18, 1918.—The general trend of industrial conditions is toward improvement in all directions. The moderating of the weather has been a large factor in the better movement that is noticed on the different railroads. With the approach of spring the undertone seems to reflect increased optimism in all circles of activity, and greater stimulus is looked for during the coming month. In addition to the announcement last week regarding the acquiring of 500 miles of rails for use on the Canadian Government railroads, it is further announced that orders for an additional 800 miles—approximating 100,000 tons—has been placed by Hon. J. D. Reid, Minister of railways, with the Dominion Iron and Steel Co. These rails will be manufactured at the Sydney plant, and it is anticipated that the entire order will probably be completed by the first of August. In addition to supplying the requirements of the Government it is thought that sufficient rails will be produced to meet the more essential needs of the Grand Trunk and the Grand Trunk Pacific. The purchase is being made on the part of the Government and the needs of the two privately owned roads will be supplied at cost plus charges of transportation. This development will enable the roads to replace rails that have been neglected during the past two years owing to existing conditions. Reports from the west are very encouraging and if sufficient labor is available it is anticipated that the acreage under cultivation in the prairie provinces will exceed that of the previous year by approximately 20 per cent. At present the Canadian Government has under consideration the fixing of a minimum price on the coming year's crop, and it is thought that it will be equal to greater than that of $2.21 which prevailed last year. Conditions generally point to improvement in the coming months.

### Steel

The gradual improvement in the weather has given added stimulus to the production of all classes of materials, and transportation difficulties are becoming less pronounced each day. Some little inconvenience was experienced during the past week, owing to a fairly heavy fall of snow in certain localities. This, however, has had but little effect upon the noticeable bettering of conditions, and a renewal of normal operations is looked for in the near future. The movement of freight on the various railroads has enabled better delivery of goods from the source to the consumer thus reducing the tension that has been felt in this connection for the past sev-

## CANADIAN MACHINERY to be Reference for Buyers for United States Ordnance Department

Buyers of advertising space, and contributors to the technical pages of CANADIAN MACHINERY will find new interest in the following letter, which speaks for itself:

WAR DEPARTMENT,
Washington, March 14, 1918.

MacLean Publishing Co.,
Toronto, Can.

Gentlemen:—I am directed by the Acting Chief of Ordnance to ask if it would be possible to place Captain Turner's name on your list to receive a copy regularly of CANADIAN MACHINERY and any other of your publications which you think would assist the writer in locating machine tools for the plant facilities branch of the Production Division.

JOHN TURNER,
Capt. Ord. Dept. R.C.

eral months. Reports from the States indicate that the situation there has become less tense and the delivery of coke and other raw materials to the furnaces and foundries, has become more regular and in greater quantities, so that production has proportionately increased. Apart from the interest that is manifest in the possible developments in the United States, in connection with further fixing of prices and regulations, the general situation both here and in the States is comparatively quiet. The Government at Washington is working for the closer co-operation of producer and consumer, with a view of minimizing the requirements of non-essentials in order that expediency be one of the chief factors in the prosecution of the war. Before the close of the present month it is anticipated that some announcement will be made regarding any readjustment of prices to govern transactions after the first of April. While few changes are looked for it is believed that better quotations may prevail regarding steel plates, as it is thought that higher prices in this connection would encourage producers to increase their production. In view of the conditions now prevailing in shipbuilding circles, it is almost conceded that the Government will grant some additional concession for greater output. The prospect of a Canadian plate mill has practically become an established fact but some little time will likely elapse before actual construction is proceeded with. An encouraging report comes from Nova Scotia to the effect that the coal production in that province has greatly increased despite the fact that fewer miners are at present available. If additional facilities were provided for taking the coal from the pits the output would be still further increased. Local dealers report a comparatively quiet situation but better conditions in respect to the movement of materials on the railroads, with the result that business is taking on a less disorganized state than that which has marked the operations during the past weeks. The more favorable weather has opened up the way to better conditions and most dealers anticipate a renewal of activity during the coming months. Prices generally are unchanged on a little better demand.

### Metals

With the exception of tin the metal situation has developed no interesting features. The movement of materials has become more regular and consumers are experiencing less difficulty in obtaining required supplies. The copper situation is steady and the trade is waiting the announcement of the American Government respecting the probable adjustment of prices in the near future. Tin has taken on a new and serious turn due to the recent development relating to the suspension of licenses to ship metal from United Kingdom. Spelter is quiet and dull. Lead is tending to weakness. Antimony is quiet and unchanged. Aluminum is not active but price is firm.

**Copper.**—Operations in the copper market are steady in character but the situation is one practically confined to government requirements, as domestic consumers find it very difficult to obtain supplies. Producers are reluctant to release any portion of their supplies to those not directly engaged in the production of essentials, owing to the uncertainty of government demands, which at any time may be such as to clean out their available stock. Minor complaints have been made by some consumers on the delay in the delivery of metal, but on the whole the conditions are considered as satisfactory. Neglecting the possibilities of labor unrest, the production is expected to show further increase under the moderating weather. It is generally conceded that the existing prices are of a character that suits both the producer and the consumer, although any revision that is contemplated before the first of June, may be favorable to the small producer, who is at present operating at high cost in relation to that in force at the time of the previous price fixing. The local situation is steady in character and the supply is normal, dealers report prices firm at last week's week's quotation of 29 and 30 cents per lb.

**Tin.**—The tin situation has become additionally acute owing to the recent report that all licenses to ship tin from the United Kingdom will be suspended for the period of one month. Whether this ruling implies that shipment of metal, already covered by license, will be included in the regulations just issued, is not quite clear, but if this is so it means that the immediate future of the tin situation will be marked by increased difficulty in the obtaining of much needed supply, undoubtedly resulting in a very strong position in tin. Negotiations have been successfully completed between the War Trade Board of Canada and the authorities at Washington, whereby the Canadian Government will be able to obtain such requirements as are recognized as essential to the production of the canneries of the country. Close co-operation between the individual canners and the government is the chief factor in the efficient operation of these new regulations. The more recent developments, however, in connection with the tin situation may increase the difficulty in meeting the needs of the can manufacturers, as the inability to obtain supplies will make it impossible for the American officials to meet, in full, the requirements of the Canadian demand. The situation here has become tighter and dealers are inclined to hold available, supplies for essential needs only. The market is undoubtedly stronger owing to recent overseas developments but quotations are nominal at last week's price of 98 cents per lb., although quotations as high as $1 have been asked.

**Spelter.**—An undertone of weakness has developed as a result of the falling off in the buying of metal. The price is not the factor that is the cause of the lack of interest as even with a lower price it is very doubtful whether additional buying would result. It would not be surprising if producers were to further curtail in production as there is little to be gained in accumulating stock under existing conditions. The market here is very quiet with a weaker tendency; quotations are, however, unchanged at 11 cents per lb.

**Lead.**—The lead situation has been marked by a weaker tone following the pronounced activity of sellers to dispose of metal to reluctant buyers; the latter becoming more cautious owing to the attitude of sellers that are forcing metal on the market. The undertone of the market is undoubtedly easier and is reflected in the slight decline that has been noted on the New York market, the quotations having fallen off ⅛ cent during the week. Dealers here report a steady situation with a slightly easier undertone but quotations are unchanged at 10½ cents per lb.

**Antimony.**—This metal is devoid of interest and the market is quiet; dealers report little buying and quotations are weak at 18 cents per lb.

**Aluminum.**—The situation is not marked with any developments and activity is not pronounced; dealers are inclined to weaken in quotations but are at present holding on to those quoted last week, namely, 55 cents per lb.

### Machine Tools and Supplies

Nothing of consequence has developed in the machine tool industry to alter the quiet tone that prevails in all departments. Inquiries for single tools for the 6-in shells have been reported and some business has been done in equipment for shipyards but the activity in either of these lines has been small. Machine tool business at the present is comparatively light. Some little interest has been shown in the report that additional orders for American shell would be placed in Canada but nothing definite in this connection has been annouced. Negotiations are reported to be on between the United States and the Imperial Munitions Board regarding the placing of considerable business in the munitions line, namely, aerial bombs for aeroplanes. The prospect of this business has renewed the waning interest of those manufacturers formerly engaged in the production of munitions, and should this new activity develop further it is expected that the machine tool interests will become more active. The demand for all classes of supplies is maintained on a pretty fair basis, particularly in connection with the munitions industry. The delivery of supplies has become much better owing to the improved weather, but difficulty is still experienced in obtaining shipment of goods coming from the States, owing to the embargo that continues on certain materials. The demand for high speed steel continues to be quite active and the price is well maintained.

### Scrap

Despite the improved conditions in the weather the trade in scrap metals has

been quiet during the week. Local deliveries have shown improvement but shipment to the States has become more difficult owing to the embargo that exists. One dealer here has a couple of car-loads of brass scrap awaiting shipment to a buyer in the States but is unable to ship it owing to the regulations that have recently been placed on such material. Generally the market is quiet and business is light. Should the present weather continue it is anticipated that present restriction will be remived as the railroads become in a better position to handle the freight that has become accumulated during the past few weeks. Scarcity of certain iron and steel scraps has strengthened the market and quotations have advanced. Machine composition on an advance of $1 per ton are quoted at $22. Heavy melting steel and wrought iron pipe are both up $1 per ton, the quotations being $24 and $20 respectively. Boiler plate and machine cast iron show an advance of $4 per ton, the price asked being $27 for the former and $31 for the latter. Red brass turnings are scarce and dealers are asking 18 cents per lb., an advance over last week of one cent per lb. Medium yellow brass is weak and is quoted 2 cents below last week, the current quotation being 12 cents per lb. Aluminum is plentiful and the present quotation of 21 cents represents a decline of 4 cents per lb.

## WAITING FOR THE PRICE ANNOUNCEMENT

### Canadian Trade Anxious for New Schedule to be Handed Out at End of Month

TORONTO. Almost every concern touched by the iron and steel industry in Canada can be described as marking time to-day in anticipation of some changes being made by United States on March 31, when the Government will announce the new schedule of prices. Canadian dealers are, in common with those on the other side, on the anxious seat. None of them seem willing to attempt much of a forecast as to which way the price changes will swing, although labor costs and new freight schedules are strong elements in working toward a higher level in certain lines.

Canadian dealers in bars, shapes, structural and plate, car wheels, etc., are not getting the business they would if the embargo fence were down. There are lines of business which they cannot touch because they know they have small chances for getting a license to have this rolled. On this account there are certain lines of domestic trade that are dropping off, and in some cases the mills refuse outright to quote on this business. In lines that can be passed and permits allowed to roll at the mills, the business remains steady, but all lines await the announcement of new

It is a hard matter to state definitely to what extent the increased freight rates [illegible] materials. Dealers seem to see nothing else, though, that as in the case of every other commodity, the last purchaser stands a good chance of being called upon to absorb the added 15 per cent.

### Iron and Steel

With the releasing of railway traffic there is a tendency to look for improvement in iron and steel receipts and production. Importers are beginning to have cars placed in their yards that have been almost four months on the way. Drummond & McCall had a shipment unloaded on Monday that left Pittsburgh on the first day of December last. Another left on the 10th of December but as yet no trace has been found of it. Dealers claim that it is increasingly hard to get licenses and permits, and some of them are watching with considerable interest to see what may be done toward having the Government act in the capacity of buyer for much of the business.

The increased production of pig iron at U.S. points can hardly be said to be reflected in the Canadian situation just yet. It is being largely counteracted by the congestion of traffic.

The curtailment of motor car production is not likely to liberate steel supplies for Canada. There had been a falling off in demand for some time, but this will be counteracted by the announcement which has just been made from Washington that the shipyards are expected to take twice as much steel in the second half of the year as in the first half.

### Machine Tools

Orders and business brisk, but the deliveries very poor, seems to describe the present situation in the machine tool trade. The demand for chucks, reamers and high speed cutters is satisfactory. One Toronto dealer showed CANADIAN MACHINERY the bills of goods, Feb. 28, from Indianapolis; March 1, from Philadelphia and New Britain, Conn., and January 6, Ashburnham, Mass. He has no word from any of them, while in the ordinary way a week would be sufficient to have the goods delivered in Toronto. Some slight relief is noted, though, in the fact that once deliveries reach here they pass through customs more rapidly than formerly.

Dealers report a better demand for some of the heavier machinery in their lines, such as grinders, planers and lathes capable of doing large operations. Development of shipbuilding is responsible for much of this, and the demand seems likely to be maintained.

Slight changes are noticed in the list of quotations for drills, etc., several lines showing 40 per cent. off the list. High-speed jobbers' drills are given as plus 60, high-speed straight shank drills as plus 75, and high-speed taper shank at 75 on. These lines were previously on a double list, so the reduction is quite noticeable. Brown & Sharpe's list gives milling and gear carbon cutters as plus 40, also metal saws the same. A sharp advance is also noted in the same line for oil pumps, for which the demand is brisk at present. No. 1 pump, which has been selling for $9.50, has gone to the $11.20 figure, while the No. 3, B. & S. pump has jumped from the old mark of $13.75 to $16.10. Dealers admit that trade is good, but deliveries and transportation service are indifferent.

### Scrap Metals

The scrap situation is a rather uncertain matter at this date. Dealers are at sea on account of the recent embargo placed on the exportation of their line. Some of them seem certain that the ruling will be altered, but for the present it stands. No changes have taken place in the prices from last week, and there are no particular developments. The situation was explained by Mr. Knight, of Frankel Bros.: "If the embargo stays on it will mean lower prices in Canada for scrap metals. That much is certain. The consumers in Canada will take advantage of the fact that the dealers cannot sell his goods outside of Canada, and the result will be that the price will go down. Moreover," continued Mr. Knight, "the Canadian consumer cannot use all the scrap available in Canada at present. The outlook is uncertain. The prices quoted at present are correct enough, in that they represent the market value of the various lines, but we could not say to-day that we are in the market at those prices. In fact we don't want to buy much until this embargo situation is straightened out one way or the other." There is a considerable amount of scrap in the country, both in yards and from industrial plants. With

## POINTS IN WEEK'S MARKETING NOTES

**Government and private contractors in speed trial on building ships for United States war order. Result may decide future plans to be followed.**

**Canadian railways have been lifting many embargo rules, and traffic is now moving much more freely, the greatest improvement being at Black Rock and Buffalo.**

**An expenditure of $10,000,000 is called for to equip shops that have secured the new contracts for U. S. war orders.**

**U. S. Government is taking over machinery and machine tools originally bought by the Russian Government and made in U. S. shops.**

**All interest centres in probable action of U. S. Government authorities on fixing of iron and steel prices at end of present month. Drastic changes up or down are not looked for, but Government is urged to make price period long to give stability to market.**

**Canadian dealers in scrap metals in uncertain position over embargo put on against shipping out of country. They claim Canada cannot use all the scrap at present in country.**

the breaking of the weather it is moving more freely.

**Non-Ferrous Metals**

**Copper.**—There are few outstanding features in connection with copper trading. Although June 1 is some weeks away yet, the tendency is to watch and see what will happen on that date when the U.S. price agreement expires. No change in price is reported locally.

**Tin.**—The outstanding feature of the tin market is that it is scarce and hard to get. Canadian dealers find it hard to get much of it past U.S. officials, who are apparently always on hand to grab supplies that may be required for war business. Deliveries are not improving, largely on that account. In the general market some dealers claim that the way in which unfilled orders are piling up may have the effect of shoving up the price, but there are other influences that work against this.

**Spelter.**—Spelter is quoted here at $11, showing no price change. Small quantities of cheaper spelter are finding their way to the New York markets, but these are not sufficient to change values, and cannot be accepted as reliable indications of real values.

## TIME TESTS MADE TO DECIDE FUTURE PLAN

### Corporation and Government Speeding Up on Trial in Shipbuilding Programme

SPECIAL TO CANADIAN MACHINERY.

WASHINGTON, March 16. — Fully aroused to the needs of tonnage renewed efforts are being made to-day by the United States Shipping Board to speed up the shipbuilding program.

Within the past week information has reached Washington which shows that the program of United States must be materially speeded up if the full force of this nation and the Allies is to be felt by the enemy during the present year.

One of the first steps taken has been the proposal to construct several more shipways. It is not proposed to build any new yards, but to increase the capacity of the existing yards wherever possible. In order to make tests of the relative speed of government work and private work, the Shipping Board is now planning on taking over some of the contracts let to private firms to be carried out by the Government. It is the plan to take two ways, side by side, and let one work under a private contract and the other to be under Government operation. Time tests will be made and if it is shown that the Government can carry on the work as rapidly and as efficiently as the private concerns then all the contracts now in the hands of private concerns will be cancelled and taken over by the Government.

**Fewer Restrictions**

In order to help with the speeding up, the Shipping Board has let down the restrictions upon timber used for the wooden vessels under consideration. Specifications for the Ferris type ships which are being built call for long timber. It has been found that this timber is particularly hard to secure, while there is a great plenty of timber of shorter lengths. After tests it has been shown that the vessels can be built faster and as well with the shorter length of timbers. Consequently the specifications have been made to conform to the supply of timber.

**Concrete Ships**

Another step which has been taken in the speeding up program is the letting of contracts for concrete ships. As set forth in this letter some weeks ago the Shipping Board has been investigating the feasibility of concrete ships. This week the first concrete vessel was launched at a Pacific port. Reports on the vessel have been so favorable that Chairman Hurley of the Shipping Board has taken steps to lay as many keels as possible for ships of this type. Concrete vessels can be turned out of the yards in sixty days and it is hoped that by the use of this type of vessel that the shortage of tonnage can be tided over until all of the American shipyards begin quantity production. There is still some doubt about the length of service of these vessels, but the Shipping Board has taken the attitude that the vessels will earn their cost if they are able to make three trans-ocean voyages.

**Two Vessels Per Day**

According to Senator Fletcher of the Senate Commerce Committee, which has been making a thorough investigation of the shipping problems, vessels are now being launched in United States at the rate of one a day. He declares that within a short time the launchings will be at the rate of two a day. This estimate includes vessels of all types. On the Pacific coast four vessels have been launched this week, some of them of the large steel type, and wooden vessels are now being turned out in quantity by southern shipyards.

According to figures offered by the Shipping Board the production during the month of February was fifteen vessels with an aggregate tonnage of 114,100. Figures now in the hands of the Shipping Board show the estimated March production at twenty-three vessels, with an aggregate tonnage of 188,275.

**Coal from Alaska**

In order that the coal shortage may be relieved the Department of the Interior is making haste in preparing Alaskan coal fields for opening. It is announced that 19,000 acres of coal lands in Nenana field are now ready for lease and development.

Estimates of the bituminous coal output of the past week show a continued increase. The output for the week of March 2 was 11,055,000 tons.

**To Co-operate**

The establishment of a War Trade Board in Canada is expected to facilitate the shipment of goods between Canada and the United States and to work to the benefit of both Canadian and American manufacturers. It is expected that the Canadian board will work in close co-operation with the War Trade Board of United States and that the rulings of the two boards will follow along the same lines, and erase any possibilities of embarrassments to the manufacturers of either country.

Labor disputes which have threatened to hold up war operations in United States have been settled during the past week.

Admission is now made by officials that the aeroplane program of United States is lagging. According to an unofficial estimate the program is now 74 per cent. behind time. It is claimed, however, that this can be greatly decreased and that the fault does not lie with the manufacturers but is chiefly in the matter of shipment. It has been shown that shipments take ninety days from the factory to the front. Efforts are now being made to shorten this time and officials declare that by July United States will have sufficient aircraft to protect its own front.

**Steel Figures Rise**

Production of steel in United States is greater this week than for several weeks past according to reports here. Labor troubles are becoming less, reports show, and the lack of transportation is now

## INDUSTRIAL LEADERS POINTING TO CANADA'S BIG WAR PROBLEM

"It is only by exercising the greatest care and devoting earnest attention to the conservation of energy and materials in the employments most natural to Canada that manufacturers may hope to survive the pressure of low prices from foreign sources after the war. If labor is suddenly thrown out of employment, with their sources of food supplies gradually drying up, while many empty chairs in the home remind them of their sacrifices and losses, it will make a very serious situation in the country for manufacturers and Government."—Col. David Carnegie, Ordnance Advisor of the Munitions Board.

"After three or four years of war the affairs of the manufacturing industries of Canada are not wholly in a satisfactory condition. We already find the Governments making large inroads upon the profits of manufacturers through additional taxation. With labor conditions still very acute, we must bear in mind that further war orders will soon cease. It is now time to make immediate preparation to meet conditions after the war. This and other problems should receive the attention of every Board of Trade, manufacturers and corporations of all kinds, in order that they may not be allowed to drift."—C. A. Bogart, President Toronto Board of

practically overcome. Reports show that transportation facilities are nearer normal than for many months and it is hoped that within a few weeks conditions will be normal.

Action by Congress during the past week has made it possible to wipe out the German influence in American industry. Authority has been given for the sale of all German properties. It is planned to sell these properties to citizens of the United States and the end of the war will find Germany without a foothold in United States.

## RUSSIAN ORDERS GO TO U.S. ARMY NOW

### Large Amounts Being Put Out By Holders of New U. S. War Contracts

SPECIAL TO CANADIAN MACHINERY.

NEW YORK, March 16.—Manufacturers holding United States Government contracts for ordnance, projectiles, aviation motors and other war munitions are placing heavy orders for machinery, and, as additional contracts for guns, railroad equipment and ships are placed, a heavier strain will be placed upon manufacturers of machine tools. It is estimated that contracts for equipping manufacturing shops now pending will call for the expenditure of approximately $40,000,000. To carry out the Government's programme for increased manufacture of big guns it will be necessary to provide new facilities to manufacturers of large size tools, as present capacity of all such plants has been fully sold for the next twelve to eighteen months. The Ordnance Bureau of the War Department has called upon Congress for another appropriation of $400,000,000 to be used in the manufacture of heavy artillery. It is proposed to use a substantial portion of this sum to expand capacity of the plants of the present manufacturers of guns. Field artillery and shells up to 16 inches are to be produced and large purchases of machinery will be necessary for this purpose. One of the large ordnance plants in Eastern Pennsylvania is preparing to largely increase capacity.

#### A Million for Tools

The Wright-Martin Aircraft Corporation, which is manufacturing Hispano-Suiza aviation motors at its Simplex plant, will expend $1,000,000 for 500 tools, for which it has just issued specifications. The Symington-Anderson Co., Rochester, N.Y., is now to manufacture 1,000 75-mm. field pieces for the War Department instead of continuing the manufacture of 3-inch guns, called for by its original contract. To meet the new conditions purchases of machine tools will be necessary. The Remington Arms U.M.C. Co. is purchasing additional shop equipment for its Ilion plant for the manufacture of rifles. Many of the New England manufacturers of machine tools continue to receive supplementary orders from the five gun plants in that territory.

#### Use Russian Orders

The United States Government continues to take over much of the machinery and machine tools originally bought by the Russian Government for export as well as for the equipping of factories making rifles and munitions of the Russian type. It is believed that a thousand of such tools will become available to manufacture guns and shells for the United States Government. It is reported that 800 Russian tools held at one New England factory have never been used, and appraisal of the value of this machinery is being made. The probability is that these tools will be returned to the tool builders to be changed to meet the requirements of American shop practice. The Fiat-San Giorgio Co., Ltd., having ship and engine building plants at Torino and at Spezia, Italy, is endeavoring to purchase shipbuilding equipment in this country.

#### More Contracts

The Emergency Fleet Corporation has awarded several additional boat contracts in the last few days, the building of which will require about 25,000 tons of steel plates and shapes. The McDougall-Duluth Co., Minn., will build ten steel ships of 3,500 tons burden, two of which are to be delivered on June 1st, two on July 1st, and the remainder on or before May 15th, 1919. The Baltimore Drydock & Shipbuilding Co. has been awarded a contract for six steel boats of 6,000 tons each to be delivered from May to December, 1919; and the Hartman-Greiling Co. of Green Bay, Wis., will build two steam tug boats to be delivered by December, 1918. Six or seven ship-building plants are now in the market for various kinds of machinery.

It is estimated that the railroad equipment to be purchased by the United States Government for domestic roads will call for the expenditure of $1,000,000,000 to $2,000,000,000. Upon the basis that 150,000 cars and 2,500 locomotives will be ordered, the builders will call upon the steel mills in the next nine months for approximately 2,000,000 tons of steel. The equipment orders, however, will be placed probably in installments.

### CANADIAN GOVERNMENT WAR PURCHASING COMMISSION

**The following gentlemen constitute the new war Purchasing Commission. Sir George Foster, Minister of Trade and Commerce; Frank P. Jones, Montreal; J. W. McConnell, Montreal; James H. Gundy, Toronto; Charles McNaught, Toronto, and Joseph Gibbons, Toronto. C. A. Magrath, as Fuel Controller, and Hon. H. Laporte, as chairman of the War Purchasing Commission, are members of the board ex-officio. Sir George Foster is Chairman of the Board.**

## PITTSBURG MUCH INTERESTED IN PRICE

### Forecast from Steel Centre Does Not Indicate Much Change Either Up or Down

SPECIAL TO CANADIAN MACHINERY.

PITTSBURGH, Pa., March 16.—In current discussions of the iron and steel situation by producers, more reference is being made to the high level of costs that has obtained lately, in connection with the question soon to be settled as to what prices are to prevail after March 31. It is pointed out that costs are much higher than when the original price agreement was reached between the Government and the producers late last September. It is clear, however, that the producers are not using these arguments in expectation that higher prices will be granted, but rather as an offset to the expected request of the War Industries Board, at the meeting called for next Wednesday, that prices be lowered. The argument of the Government's representatives will be that the past three months have constituted an altogether exceptional period, on account of the traffic breakdown, and that no similar interruption to regular operation, entailing extraordinary production costs, is to be expected in future. The balance of probability remains strong that there will be no material alteration in the set prices. The period for which they will be extended is in doubt, and it is possible that no precise period will be named. Producers desire an extension to the end of the year, if not to the end of the war, and this would rather suggest that their private belief is costs will decrease rather than increase. No announcement is likely to be made until several days after next Wednesday's conference, as the War Industries Board will doubtless desire to consider the matter at some length, and the conclusion must then be submitted for the President's approval.

#### No Serious Complaint

Noting the fact that the complaints as to present prices are very far from general, and that the specific complaints relate to details of the relations between prices, the general conclusion may be reached that the price schedule as a whole is a more satisfactory one than it would be supposed could be drawn up. There is nothing about which there is not some complaint.

#### Traffic Conditions

Transportation conditions have continued to improve. In the past fortnight the improvement, on the whole, has been greater as to the movement of coke from the Connellsville region to blast furnaces than as to the movement of finished steel products from the mills. This means that intermediate products are accumulating to a still greater extent than formerly, and a complete restoration of shipping facilities at the steel

(Continued on page 313.)

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago. | 37 50 |
| Standard low phos., Philadelphia. | ..... |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 33 00 |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | ..... | ..... |
| Victoria | ..... | 50 00 |

## FINISHED IRON AND STEEL

| Per lb. to Large Buyers. | Cents |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 5 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 5 75 |
| Chequered floor plate, 3-16 in. | 12 20 |
| Chequered floor plate, ¼ in. | 12 00 |
| Staybolt iron | 8 50 |
| Bessemer rails, heavy, at mill | ..... |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | *3 50 |

F.O.B., Toronto Warehouse

| | |
|---|---|
| Steel bars | 5 50 |
| Small shapes | 5 75 |

F.O.B. Chicago Warehouse

| | |
|---|---|
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

## FREIGHT RATES

Pittsburgh to Following Points

| | Per 100 lbs. C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 38.1 | 50.5 |
| Halifax | 39.1 | 51.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

## METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $30 00 | $28 00 |
| Electro copper | 30 00 | 28 50 |
| Castings, copper | 29 00 | 28 00 |
| Tin | 98 00 | 100 00 |
| Spelter | 11 00 | 11 00 |
| Lead | 10 50 | 9 50 |
| Antimony | 18 00 | 17 00 |
| Aluminum | 55 00 | 52 00 |

Prices per 100 lbs.

## PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¼ to ½. | $10 00 | $10 00 |
| Heads | 10 30 | 10 25 |
| Tank plates, 3-16 in. | 10 10 | 10 10 |

## WROUGHT PIPE

Effective Feb. 5, 1918.

| | Black | Galvanized |
|---|---|---|
| **Standard Buttweld** | Per 100 feet | |
| ⅛ in. | $ 6 00 | $ 8 00 |
| ¼ in. | 5 16 | 7 29 |
| ⅜ in. | 5 16 | 7 29 |
| ½ in. | 6 55 | 8 12 |
| ¾ in. | 8 28 | 10 41 |
| 1 in. | 12 24 | 15 39 |
| 1¼ in. | 16 56 | 20 82 |
| 1½ in. | 19 80 | 24 89 |
| 2 in. | 26 64 | 33 49 |
| 2½ in. | 42 72 | 53 53 |
| 3 in. | 55 85 | 70 00 |
| 3½ in. | 70 84 | 87 86 |
| 4 in. | 83 93 | 104 10 |
| **Standard Lapweld** | | |
| 2 in. | $ 29 60 | $ 36 08 |
| 2½ in. | 44 46 | 54 70 |
| 3 in. | 58 14 | 71 53 |
| 3½ in. | 72 68 | 90 62 |
| 4 in. | 86 11 | 107 37 |
| 4½ in. | 97 79 | 122 56 |
| 5 in. | 114 00 | 142 82 |
| 6 in. | 147 80 | 185 28 |
| 7 in. | 192 80 | 241 57 |
| 8 L in. | 202 50 | 253 75 |
| 8 in. | 233 30 | 292 32 |
| 9 in. | 279 50 | 350 18 |
| 10 L in. | 259 20 | 324 80 |
| 10 in. | 333 70 | 418 18 |

Prices—Ontario, Quebec and Maritime Provinces.

## WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

## OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 22 50 |
| Copper, heavy | 22 50 | 22 50 |
| Copper wire | 22 50 | 22 50 |
| No. 1 machine composition | 22 00 | 21 50 |
| New brass cuttings | 16 00 | 14 00 |
| Red brass turnings | 18 00 | 17 00 |
| Yellow brass turnings | 12 50 | 12 50 |
| Light brass | 10 00 | 9 50 |
| Medium brass | 12 00 | 12 00 |
| Heavy brass | 15 00 | 14 00 |
| Heavy melting steel | 24 00 | 21 00 |
| Steel turnings | 12 00 | 12 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 27 00 | 18 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 23 00 |
| No. 1 machine cast iron | 31 00 | 25 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 20 00 | 13 00 |
| Car wheels, iron | 26 00 | 25 00 |
| Steel axles | 38 00 | 35 00 |
| Mach. shop turn'gs | 9 00 | 8 50 |
| Cast borings | 12 00 | 12 00 |
| Stove plate | 19 00 | 19 00 |
| Scrap zinc | 6 50 | 6 50 |
| Heavy lead | 7 50 | 7 00 |
| Tea lead | 5 00 | 5 75 |
| Aluminum | 21 00 | 20 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, ⅜" and less | 10 |
| Carriage bolts, 7-16 and up | net |
| Coach and lag screws | 25 |
| Stove bolts | 55 |
| Plate washers | List plus 20 |
| Elevator bolts | 5 |
| Machine bolts, 7-16 and over | net |
| Machine bolts, ⅜ and less | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | 10 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | add 25 |
| Nuts, square blank | add $1 50 |
| Nuts, square, tapped | add 1 75 |
| Nuts, hex., blank | add 1 75 |
| Nuts, hex., tapped | add 2 00 |
| Copper rivets and burrs, list plus | 30 |
| Burrs only, list plus | 50 |
| Iron rivets and burrs | 15 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 37½ |
| Wood screws, O. & R., brass | 32½ |
| Wood screws, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

## MILLED PRODUCTS

| | Per Cent. |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil. Head Cap Screws | net |
| Flat But. Hd. Cap Screws | plus net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. & Semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2 in. | plus 10 |
| Studs | net |
| Taper pins | 40 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | list plus 20 |
| Collar screws | list plus 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | 65 |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add 7 00 |

## BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $47 50 |
| Open-hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.

F.O.B. Pittsburgh.

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails | $5 25 |
| Cut nails | 5 70 |
| Miscellaneous wire nails | 60% |
| Spikes, ⅜ in. and larger | $7 50 |
| Spikes, ¼ and 5-16 in. | 8 00 |

## ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 41 |
| Plumbers' oakum, per lb. | 0 09 |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila rope | 0 33 |
| New Zealand hemp | 0 33 |
| Transmission rope, Manila | 0 45 |
| Cotton rope, ¼-in. and up | 0 47 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | net |

### MISCELLANEOUS

| | |
|---|---|
| Solder, steelly | 0 [illegible] |
| Solder, guaranteed | 0 40 |
| Solder, commercial | 18 to 70 |
| Soldering coppers, lb. | 0 53 |
| Steel wool, per lb. | 0 16 |
| Putty, 100-lb drums | 1 75 |
| White lead, pure, cwt. | 16 05 |
| Red dry lead, 100-lb kegs, per cwt. | 15 50 |
| Glue, English | 0 35 |
| Tarred slater's paper, roll | 0 95 |
| Gasoline, per gal., bulk | 0 31½ |
| Benzine, per gal., bulk | 0 30½ |
| Pure turpentine, single bbls., gal. | 0 73 |
| Linseed oil, raw, single bbls | 1 95 |
| Linseed oil, boiled, single bbls. | 1 98 |
| Plaster of Paris, per bbl. | 2 50 |
| Sandpaper, B. & A. | list plus 20 |
| Emery cloth | list plus 20 |
| Sal Soda | 0 03½ |
| Sulphur, rolls | 0 05 |
| Sulphur, commercial | 0 04½ |
| Rosin "D," per lb. | 0 03 |
| Rosin "G," per lb. | 0 03½ |
| Borax crystal and granular | 0 12 |
| Wood alcohol, per gallon | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

### CARBON DRILLS AND REAMERS

| | Per Cent |
|---|---|
| S.S. drills, wire sizes up to 52 | 40 |
| S.S. drills, wire sizes, No. 53 to 80 | 40 |
| Standard drills to 1½ in. | 40 |
| Standard drills, over 1½ in. | 40 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 |
| Bit stock | 40 |
| Ratchet drills | 15 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 40 |
| Sleeves | 40 |
| Taper pin reamers | net |
| Drills and countersinks | list plus 40 |
| Bridge reamers | 50 |
| Centre reamers | 10 |
| Chucking reamers | net |
| Hand reamers | 10 |

### COLD ROLLED SHAFTING

| | |
|---|---|
| At mill | list plus 40% |
| At warehouse | list plus 50% |

**Discounts off new list. Warehouse price at Montreal and Toronto**

### IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 8 00 | $ 8 25 |
| Sheets, black, No. 10 | 10 00 | 10 00 |
| Canada plates, dull, 52 sheets | 9 00 | 9 00 |
| Can. plates, all bright. | 9 50 | 9 50 |
| Apollo brand, 10¾ oz. | | |
| Queen's Head, 28 B.W.G. | | |
| Fleur-de-Lis, 28 B.W.G | | |
| Gorbal's Best, No. 28 | | |
| Colborne Crown, No. 28 | | |
| Premier, No. 28 U.S. | 9 45 | 9 20 |
| | 9 75 | 9 50 |
| | 20 00 | 20 00 |

### PROOF COIL CHAIN

[illegible] $11.85; [illegible] in., ½ in., $11.20; [illegible] $11.10; ¾ in., $11.00; ⅞ in., $10.90; 1 inch, $10.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $15.50; 3-16 in., $11.70; ¼ in., $8.40; 5-16 in., $7.40; ⅜ in., $6.35; 7-16 in., $6.35; ½ in., $6.35; ⅝ in., $6.35; ¾ in., $6.35.

**Prices per 100 lbs.**

### FILES AND RASPS.

| | Per cent |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 40 |
| Black Diamond | 40 |
| J. Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 37½ |
| Disston | 50 |
| Whitman & Barnes | 50 |

### BOILER TUBES.

| Size | Seamless | Lapwelded |
|---|---|---|
| 1 in. | $36 00 | $ ... |
| 1¼ in. | 40 00 | ... |
| 1½ in. | 43 00 | 36 00 |
| 1¾ in. | 43 00 | 36 00 |
| 2 in. | 50 00 | 36 00 |
| 2¼ in. | 53 00 | 38 00 |
| 2½ in. | 55 00 | 42 00 |
| 3 in. | 64 00 | 50 00 |
| 3¼ in. | ... | 58 00 |
| 3½ in. | 77 00 | 60 00 |
| 4 in. | 90 00 | 75 00 |

Prices per 100 ft., Montreal and Toronto.

### OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | |
| Royalite, per gal., bulk | 17 |
| Palacine | 20 |
| Machine oil, per gal. | 26½ |
| Black oil, per gal. | 15 |
| Cylinder oil, Capital | 45½ |
| Cylinder oil, Acme | 36½ |
| Standard cutting compound, per lb. | 0 06 |
| Lard oil, per gal. | $2 50 |
| Union thread cutting oil antiseptic | 88 |
| Acme cutting oil, antiseptic | 37½ |
| Imperial quenching oil | 39½ |
| Petroleum fuel oil | 13½ |

### BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30-5% |
| Standard | 40% |
| Cut leather lacing, No. 1 | 1 95 |
| Leather in sides | 1 75 |

### TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 06 |
| Emery glue | 15 to 20 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 35 |

**Prices Per Lb.**

### BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 38 |
| Brass sheets, 24 gauge and heavier, base | 0 43 |
| Brass tubing, seamless | 0 46 |
| Copper tubing, seamless | 0 48 |

### WASTE.

| White. | Cts. per lb. | | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 18½ |
| Peerless | 21 | X Empire | 17¼ |
| Grand | 19¾ | Ideal | 17¼ |
| Superior | 19¾ | X press | 16 |
| X L C R | 18½ | | |

| Colored. | | | |
|---|---|---|---|
| Lion | 15 | Popular | 12 |
| Standard | 13½ | Keen | 10½ |
| No. 1 | 13½ | | |

| Wool Packing. | | | |
|---|---|---|---|
| Arrow | 25 | Anvil | 15 |
| Axle | 20 | Anchor | 11 |

| Washed Wipers. | | | |
|---|---|---|---|
| Select White | 11 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING.

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

### ANODES.

| | |
|---|---|
| Nickel | .50 to .54 |
| Cobalt | 1.75 to 2.00 |
| Copper | .44 to .46 |
| Tin | .49 to .56 |
| Zinc | .23 to .25 |

**Prices Per Lb.**

### COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | 42 50 | 43 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 46 00 | 44 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 48 00 | 48 00 |
| Copper sheet, planished, 16 oz. base | 57 00 | 45 00 |
| Braziers,' in sheets, 6x4 base | 45 00 | 44 00 |

### LEAD SHEETS.

| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $13 25 | $13 25 |
| Sheets, 3½ lbs. sq. ft. | 13 25 | 13 25 |
| Sheets, 4 to 6 lbs. sq. ft. | 12 50 | 12 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra

### PLATING CHEMICALS.

| | |
|---|---|
| Acid, boracic | $ .15 |
| Acid, hydrochloric | .05 |
| Acid, hydrofluoric | .14½ |
| Acid, nitric | .10 |
| Acid, sulphuric | .05 |
| Ammonia, aqua | .08 |
| Ammonium carbonate | .15 |
| Ammonium, chloride | .11 |
| Ammonium hydrosulphuret | .40 |
| Ammonium sulphate | .07 |
| Arsenic, white | .12 |
| Copper, carbonate, anhy | .35 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .70 |
| Iron perchloride | .20 |
| Lead acetate | .16 |
| Nickel ammonium sulphate | .12 |
| Nickel carbonate | .35 |
| Nickel sulphate | .15 |
| Potassium carbonate | .75 |
| Potassium sulphide (substitute) | .20 |
| Silver chloride (per oz.) | .65 |
| Silver nitrate (per oz.) | .55 |
| Sodium bisulphite | .10 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .41 |
| Sodium hydrate | .04 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | .14 |
| Tin chloride | .60 |
| Zinc chloride | .60 |
| Zinc sulphate | .09 |

**Prices per lb. unless otherwise stated.**

## PITTSBURG MUCH INTERESTED

(Continued from page 311.)

mills would result in the release of a very large tonnage, equal not simply to the current production, but to the production plus the stocks accumulated. Mill warehouses and yards are carrying a very large tonnage of finished steel, while steel ingots have accumulated, awaiting rolling into finished form, and there is also some accumulation of pig iron.

Connellsville coke shipments last week were 334,585 tons, against 297,000 tons in each of the preceding two weeks, and an average of 267,000 tons a week in the first nine weeks of the year. Car supplies in the coke region this week have been still better than last, indicating even larger shipments this week. At this rate the blast furnaces should soon be operating at full capacity, against about 80 per cent. at present and say 60 per cent. in January.

It is still the common view in trade circles that the only restricting influence in the matter of finished steel shipments from mills is the traffic situation, but there is some doubt about this. It is true that cars are scarce, no mill having a surplus, but there is the fact that shipping permits carry car supply with them, and shipping permits are granted only when the consignee applies. It is quite possible that some consignees are purposely refraining from applying for permits because they do not desire shipments just yet.

### Business on Books

At the beginning of this month the Steel Corporation had 9,288,453 tons of unfilled obligations on books. As the corporation's capacity is a trifle less than 45 per cent. of the country's total, and as the independents are at least as well filled up as the corporation, it may be assumed that the corporation's total of 9,288,453 tons represents between 40 and 45 per cent. of the total on the books of all producers, which would thus be 21,000,000 or 22,000,000 tons. A considerable part of this tonnage is represented in contracts upon which delivery will be long deferred and it is quite possible that some of the business will never be carried out. As a matter of fact the mills do not have specifications and definite shipping instructions for any large amount of business, except that due on war work. Customers in most cases would take more material than is being shipped them, but a little further loosening up in shipments, as is promised by the improving railroad conditions, would probably cause them to ask the mills to slow down on their deliveries.

In circumstances like these the finished steel market can hardly be described as a strong one. It is firm, as there are no concessions offered from the set prices. One of the strongest lines is sheets, there being few sellers for delivery in less than about ten weeks. Oil country goods are very scarce, buyers taking everything offered for early deliveries, while standard steel pipe is in better request. In plates, structural shapes, merchant bars and rails there is scarcely anything being done.

### Government Requirements

The Government's war steel requirements for the second half of the year are now being made up. The striking feature is the great increase in the shell making program indicated by the fact that the shell steel tonnage for the second half of year is placed at 2,500,000 tons, whereas the purchases made to date have totaled only 1,500,000 tons, for delivery to June 15, and many of these purchases were made five or six months ago. Shipbuilding will, of course, absorb more steel in the second half, and there will be heavy consumption of steel in car and locomotive building. The various items of steel that have been involved in new construction, on the other hand, will be largely out of the way, so that the total war requirements may not be greater in the second half of the year than in the first half. Some rough estimates may be made as a foundation, say, 400,000 tons a month of shell steel, 250,000 to 350,000 tons of steel for cars and locomotives and a like amount for shipbuilding, the last named item, however, increasing from month to month. Taking the three items roughly at 1,000,000 gross tons of steel a month, and adding 500,000 tons a month for miscellaneous needs of Government, together with requirements of the Allied Governments, there would be a total of 3,000,000 gross tons. Capacity may be estimated at 3,000,000 gross tons a month, in finished rolled steel. As there is little purely commercial or peace demand for steel, it is evident that if the steel industry is permitted by traffic and other conditions to operate at 85 or 90 per cent. of capacity, and there is special reason why it should not be, there will be an ample supply of steel. It will be only a matter of time until this fact is generally realized. There are many more who consider the condition a possibility than there were three months ago.

## RECENT PATENTS

THE following is a list of Canadian patents recently issued through the agency of Messrs. Ridout & Maybee, 59 Yonge Street, Toronto, from whom further particulars may be obtained: George W. Berry, combination cigar piercer, match ejector and indicator; James Dobson, means for obtaining the weight of railway rails, girders, beams and similar sectional lengths; Otis G. Gilbert, vegetable and dough cutter; Otto Higel, player-piano mechanism; John W. Anderson, apparatus for shaping metal channel bars; Robert E. Brown, vehicle top; Hans A. Christensen, digging machine; William E. H. Humphrys, cushion tire; Jonathan D. Loudon, spring centering attachment for automobile steering apparatus; Woodstock Electric Co., electric heater; Louis E. Barton & Henry A. Gardner, linoleum; Titanium Alloy Mfg. Co., rubber and methods of obtaining same; Toronto Type Foundry Co., Limited, wire reel.

## THE U. S. ZINC PRICES ARE NOW FIXED

### War Industries Board Acts On Advice of Federal Trade Commission

WHEN fixing zinc prices, the U. S. War Industries Board issued the following statement:

"After investigation by the Federal Trade Commission as to the costs of production, the President has approved an agreement made by the War Industries Board with the producers of grade A zinc, fixing a maximum price of 12 cents per pound f.o.b. East St. Louis, subject to revision on June 1, 1918, and also an agreement made by the War Industries Board with the producers of sheet and plate zinc f.o.b.. plant, and 15 cents per pound for sheet zinc f.o.b. plant, subject to the usual trade discounts.

"The conditions are: First, that the producers of grade A and of plate and sheet zinc will not reduce the wages now being paid; second, that they will sell to the allies, to the public, and to the Government at the same prices; third, that they will take the necessary measures, under the direction of the War Industries Board, for the distribution of the zinc to prevent it from falling into the hands of speculators who might increase the price to the public, and fourth, that they pledge themselves to exert every effort to keep up the production of zinc so as to insure an adequate supply so long as the war lasts."

## C. M. A. STATE THEIR VIEWS AT OTTAWA

### Want Duty Off Raw Material if it is Taken From Finished Product

ABOUT thirty-five of the leading manufacturers of Eastern Canada and as far west as Winnipeg formed a deputation which waited on the Government on March 14. S. R. Parsons, Toronto, president of the Canadian Manufacturers' Association, was the chief spokesman.

The delegation asserted that various changes and restrictions imposed upon industry had brought about considerable alarm among manufacturers, especially since it had been stated that what had already been done was nothing in comparison with what was in prospect.

A particular point raised by the delegation was that of opposition to farm tractors being placed on the free list, unless at the same time raw materials used in the manufacture of tractors in Canada were admitted duty free. The manufacturers also asked that in case of any further suggested changes in the tariff industries affected should first be consulted.

The manufacturers expressed a fear that as the recent regulations and restrictions on packers were much more drastic than those put into force in the United States they might result in a narrowed market for hogs and cattle.

In his reply Sir Robert Borden promised full consideration of the representations made.

# INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

## ENGINEERING

London, Ont. [illegible] plant of T. M. Knowles Co. Loss, $15,000. Will rebuild. Require new machinery. Manager, Thos. Knowles, 36 Weston St.

**Highland, P.Q.**—The Montreal West Realty & Contracting Co., 347 Westminster Avenue N., Montreal West, have the general contract, and the Dominion Bridge Co., Dominion Station, Lachine, Montreal, the steel contract for the erection of a $11,000 addition in height to felt warehouse for the Standard Paint Co. of Canada, 52 Victoria Square, Montreal.

## MUNICIPAL

**Guelph.**—Gordon Street will likely be paved this season, and an oil tank built with a two-car capacity.

**Ottawa.**—The preliminary financial arrangements have been made for financing a $50,000 bridge across the Rideau.

**Brockville.**—The installation of switchboards and equipment is under consideration by the local Hydro-Electric Commission.

**Gananoque, Ont.**—About $15,000 will likely be spent by the council for extensions to the waterworks and sewerage systems. An electric pump may be included.

**Kingston.**—Electrical equipment will be purchased by the Utilities Commission to the extent of four k.w. transformers for the hosiery mill, and a meter for the Campbell power line. A transformer for the street railway will be purchased from the Canadian General Electric.

## GENERAL

**Kitchener, Ont.**—Ernest C. Getty, of Galt, has secured the three-storey factory building of the Kitchener Leatherette Co., on Water Street, and is fitting it up for a new shoe industry in this city.

## PERSONAL

**A. A. Maver**, master mechanic at the Grand Trunk Railway shops, Montreal, has retired at his own request, after a service of fifty-two years.

**William Cook**, the newly elected president of the Kingston Board of Trade, is superintendent of the Kingston branch of the Dominion Textile Co. and takes a [illegible] in the business development of that city.

Walter J. Francis, consulting engineer, of Montreal, has been elected chairman of the Montreal branch of the Engineering Institute of Canada, known until recently as the [illegible]ty of Civil Engineers. Arthur Surveyer was elected vice-chairman.

**George J. Fox** has been appointed superintendent of the Calgary division of the Canadian Pacific Railway, succeeding Paul F. Weisbrod, who is on leave of absence. Mr. Fox, who has taken over his duties, came from Schreiber, Ont., where he was superintendent.

**Capt. Ernest V. Moncrieff**, son of William C. Moncrieff, president of the Cataract Refining and Mfg. Co., has earned three promotions in the last year. He was appointed captain of the 102nd Ammunition Train last week. He was a member of Troop 1, and has already seen service in Mexico. The Cataract Refining Co., of which his father is head, have a Canadian office at 86 Don Esplanade.

**Paul T. Irvin**, who has been associated with the Wells Bros. Co., and the Greenfield Tap and Die Corporation for twelve years, has resigned his position as sales manager of the gauge division to accept the position of general sales manager of Lincoln Twist Drill Company of Taunton, Mass. Edward Blake, Jr. (formerly of Wells Bros. Co.), is vice-president and general manager of this company, and Frank O. Wells, president, and Frederick H. Payne, vice-president of the Greenfield Tap and Die Corporation are directors.

**Harold B. Chillas**, Toronto manager of the Standard Machinery and Supply Co., and the son of George Chillas, of Montreal, died at Toronto on March 11, after a brief illness. Mr. Chillas was apparently in good health a few days ago when he was in Montreal on business. He was thirty-nine years of age, and is survived by a widow and two children. His brothers are Ralph Chillas, who is overseas with the Canadian forces, and A. Shirler Chillas, of the staff of O'Brien & Williams, of the Montreal Stock Exchange.

**Collingwood.**—One of the early wooden shipbuilders of the Canadian lakes, William Andrews, died here on March 12, aged seventy-seven years. He was born at Clayton, N.Y., and when a boy came to Port Dalhousie, at which point his father established the Andrews Shipbuilding Yards, which were conducted by the family until the construction of the new Welland Canal, which took up their property. Later Mr. Andrews moved to Welland and then to Port Robinson, coming to Collingwood to continue wooden shipbuilding with his brother, Stephen D. Andrews, who was one of the originators of the shipyards now owned by the Collingwood Shipbuilding Company. During the operations of the Andrews' yard on the Welland Canal, William Andrews took part in the construction of many vessels, among others the steamers Zimmerman, City of Toronto (afterwards the Algoma), Alma, Munro, Isaac May, Lake Ontario and Silver Spray. While at Collingwood he was engaged on the Majestic, Germanic and others. He is survived by his wife and his brother, who is Dominion Inspector of Hulls, with headquarters at Collingwood.

## BUILDINGS

**Montreal, Que.**—As the result of a fire which broke out on March 11 in the premises of the Samuel Fisher Co., engineers' supplies, 57 St. Sulpice street, damages to the extent of over $25,000 was done to the contents of the building, while the building itself, which belongs to the Hotel Dieu, is practically a total loss.

## CONTRACTS

**Three Rivers, Que.**—The City Council has awarded a contract to Oliver & Co., Montreal, for a five-ton crane for the new pumping station.

## MARINE

**Oakland, Cal.**—Three new 9,400-ton steel merchantmen were launched at Oakland, California, yesterday.

**Halifax.**—Capt. Fred J. Trotter, of Amherstburg, has been awarded the contract for raising the Canadian lightship Faulken.

**Detroit.**—The U.S. lighthouse tender, Aspen, recently reported seeing an iceberg in Lake Erie about 25 feet high and 200 feet square drifting before the wind towards the mouth of the Detroit River.

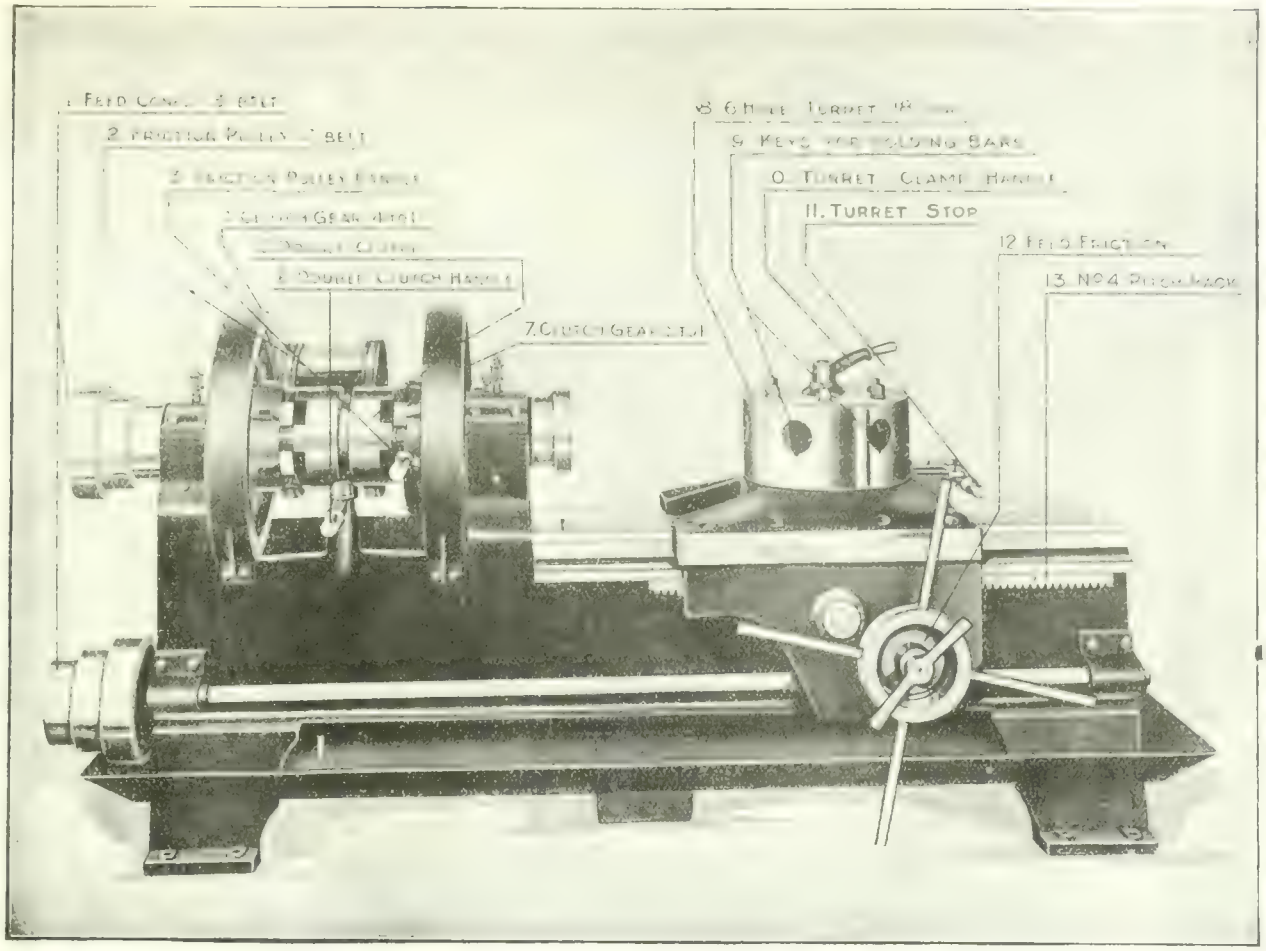
**Vancouver, B.C.**—The wooden steamer War Selkirk was launched at the Western Canada Shipyards on March 6. Mrs. W. A. Armstrong christened the vessel, which is the fifth being constructed for the Imperial Munitions Board.

**Prince Rupert, B.C.**—All work at the big dry dock here has been ordered shut down. Although no official announcement has been made, it is stated this move foreshadows the leasing of the plant to American interests.

**A Pacific Port.**—So successful was the launching here of the world's largest reinforced concrete ship that her builders announced they immediately would begin construction of fifty-four similar ships of larger size, and expected that all would be completed within eighteen months.

**Toronto.**—The city has been given permission by the Private Bill Committee to make a temporary $1,750,000 loan to the Harbor Board. The City Solicitor said the board planned to spend between $12,000,000 and $14,000,000, but was held by its contract with the Canadian Stewart Co. to provide this amount.

**Midland, Ont.**—Seven car loads of steel reached the Midland shipbuilding yards during last week to be used in the con-




# The "MONTREAL" Shell Boring Lathe

***A massive machine proven in actual service capable of withstanding continuous operation under severe conditions***

## Special Features:

- Headstock integral with bed
- Broad flat ways
- Long carriage
- Large turret
- Unbreakable apron gears

## Specifications:

| | |
|---|---|
| Swings over bed | 20" |
| Bed—length | 9' 4" |
| width | 18" |
| Front bearing—length | 8½" |
| diameter | 10" |
| Drive pulley—width | 8" |
| diameter | 19" |
| Feeds | 1/16, 5/64, 3/32" |
| Turret, diameter | 18" |
| Height floor to centre | 40" |
| Weight | 7800 lbs. |

# The A. R. Williams Machinery Co., Ltd.

**64 West Front Street** **Toronto, Canada**

*If any advertisement interests you, tear it out now and place with letters to be answered.*

struction of new vessels and in repair work. The company has been seriously inconvenienced by lack of materials, but conditions are gradually improving.

**Winnipeg, Man.**—The report that F. Hutchings of this city will establish a shipbuilding plant at or near Vancouver has not been confirmed, although it is understood that Mr. Hutchings will have no trouble in obtaining a contract if [illegible] can be obtained from the Federal Government.

**Victoria, B.C.**—That a syndicate of New York capitalists is prepared to establish a ten million dollar shipbuilding yard in the vicinity of Victoria was made known in a letter received last Thursday by the Board of Trade, and referred to the city council. It was stated that the construction of the plant contemplated would involve an expenditure of between $8,000,000 and $10,000,000.

**Detroit.**—"In comparison with the same period last year, there is about the same quantity of ice in Lake Superior, less in Lake Michigan, about the same quantity in Lake Huron, less in Lake Erie, and more in Lake Ontario," says the second ice bulletin of the season, issued by the United States Weather Bureau. On comparison with the ten-year average there is nine inches more of ice at Duluth, seven more at Sault St. Marie, thirteen more at Mackinaw, and eight at Escanaba.

**Ottawa.**—With the arrival of the steamer War Viceroy at London on Feb. 16, with a cargo of wheat from Vancouver via the Panama Canal, the first stage has been completed in an experiment which may have far-reaching benefits for the great grain-producing areas of Western Canada. The War Viceroy cleared from Vancouver on November 14 last for Nanaimo, whence she sailed on the 16th, making a call at Portland. She had 100,000 bushels of wheat on board. A full report is expected in due course from the special officers who accompanied this shipment to England.

**Washington.**—Naval experts anticipate an unfavorable report from the board headed by Rear-Admiral Albert G. Winterhalter, which has just completed tests of the former Austrian steamer Lucia, which has been equipped with interior "buoyancy boxes" designed to make her unsinkable. That the ship will remain afloat after receiving injuries which would sink a craft of ordinary construction is conceded, but constructors are of the opinion that the "buoyancy boxes" would not prevent a torpedo damaging the vessel to such an extent that she would be of no further value as a supply ship or cargo carrier.

**Vancouver, B.C.**—The Wallace shipyards will launch the steel steamer War Power about the middle of March, according to a statement to-day by A. Wallace. The vessel is a sister ship to the [illegible] May 17 last. [illegible] cargo vessel [illegible] Columbia. [illegible] keel for [illegible] dead- [illegible] yard proposes to build at least two new slipways, and possibly three, and on these additional ways will construct the four 5,100-ton steamers recently ordered by the Dominion Government.

**North Vancouver, B.C.**—This city had a most encouraging programme in shipbuilding last year and launched one steel steamer and six auxiliary schooners. This year will see six wooden steamers and several steel steamers sent into the water and the industry has meant a great deal to the north shore city. Last year's launchings were the steel steamer War Dog and the five-master auxiliary schooners, Mabel Brown, Janet Geraldine Wolvin, Jessie Norcross, Janet Car ruthers. Mabel Stewart and Marie Barnard. The War Puget heads the 1918 programme with five other wooden steamers to follow from the Lyall yard and several steel steamers from the Wallace yard; the ambitious city will have good cause to congratulate itself on doing its bit in solving the tonnage problem.

**Vancouver.**—The Standard Shipbuilding Co., with offices in the Dominion building, has just closed contracts with Sir Joseph Maclay, head of the Imperial Shipping Board, for ten composite steamers, which will be built at Ruskin, near the junction of the Stave River with the Fraser. Negotiations have been in progress for some time, and Patrick J. Donohoe, naval architect, will be superintendent of the plant. His designs for the vessels have been approved, and a representative of the company is now on his way to London with the final plans, according to a recent announcement. By March 20 at least 200 men will be at work preparing the site and the building ways, and by next month at least eight keels will have been laid, it was stated. The company has 2,200 feet of frontage on the Fraser River, and already has a sawmill, a machine shop and a smithy in operation. The vessels will be 281 feet long, 48 feet beam and 27 feet deep, will have a speed of ten knots loaded, and a deadweight capacity of 3,500 tons.

# TENDERS

**Kitchener, Ont.**—Tenders are being called for the erection of a $12,000 factory addition for George Schlee, 30 Edward Street. Architect, Charles Knechtel, 31 Courtland Avenue W.

**Ottawa.**—Tenders addressed to the chairman and members of the Board of Control will be received by the secretary, City Hall, Ottawa, up to 4 p.m. Thursday, March 21, for motor driven street flusher.

**Sifton, Man.**—Tenders for "Grading Roads" and laying concrete pipe culverts will be received up to Tuesday, April 9th. Plans and specifications can be had on application to R. Hockin, Sec.-Treas., Oak Lake, Man.

**Ottawa.**—Tenders will be received until Monday, March 18, for the construction of structural steel work, Dominion Government office building, Ottawa. Plans and forms of contract can be seen and specification and forms of tender obtained at the offices of the Chief Architect, Department of Public Works, Ottawa, the Overseer of Dominion Buildings, Central Post Office, Montreal, P.Q., and the Clerk of Works, Postal Station "F," Toronto, Ont.

**Melbourne, Australia.**—Tenders for the following may be addresed to the Director of Navy Contracts, Navy Office, Melbourne: Supply, delivery and erection at Garden Island, of one (1) 200 horse-power prime mover set of either semi-Diesel type or other heavy oil engine direct coupled to 2-65 K.W. 240 volt D.C. electric generating set. All accessories, tank and fittings to be supplied by tenders as per specification. Date of closing, June 7, 1918. Tender forms are open for inspection at the Department of Trade and Commerce, Ottawa. File No. 20117.

# INCORPORATIONS

**The Nepigon Reserve Iron Co., Ltd.,** has been incorporated to explore, develop mines and mineral lands, etc. The capital is $375,000, and head office is in Toronto. Provisional directors are J. U. Newcombe, F. E. Abbott, J. R. L. Starr, L. M. Heal and E. Staples .

**The Auto Oil Co., Ltd.,** has been incorporated in Toronto, with authorized capital of $250,000, to develop and work gas and oil lands, and to operate in mineral lands, etc. The provisional directors are B. T. McAvoy, E. Barry, L. Sleeth, B. A. Clark and D. O'Connell.

**The Geo. F. Foss Machinery & Supply Co., Ltd.,** has been incorporated at Montreal, to do business as engineers and engine manufacturers, general contractors, bridge builders, boiler makers, machinists, tool makers, etc. Letters were granted to G. Davenport, L. Delarge, L. Potvin, J. Bernier, A. David.

**The Canadian National Carbon Co., Ltd.,** has been incorporated at Toronto, to deal in calcium carbide, and all gas producing materials and gas, especially acetylene gas, and machinery, etc., for purposes relating to the process. The incorporators are: H. Harrison, barrister-at-law, R. E. Laidlaw, W. Robertson and S. D. Gardiner, students-at-law, and J. F. Van-Lane, accountant, all of the City of Toronto.

**Crane, Ltd.** is the name taken in incorporating at Montreal a company to manufacture, merchandise, buy, sell and in every manner deal in and with all kinds of steam, gas, water, oil, mine, mill, foctory engineers; plumbers; railways, hardware and builders' supplies and materials of all kinds and agricultural machinery and supplies, and to carry on a general engineering business. The incorporators are E. G. Bennett, A. B. Wright, C. Arnold, A. Charers and A. Mathieu.

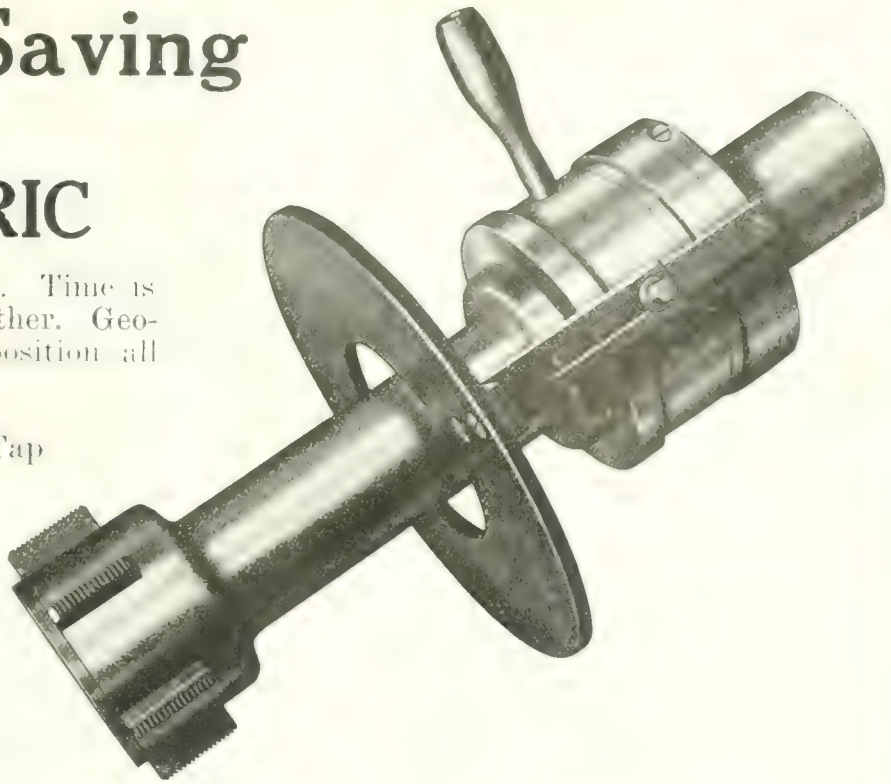
**Knight Metal Products Ltd.,** has been incorporated at Toronto to manufacture, sell and deal in iron, steel and other metals, to carry on in all its branches the business of an engineering, repair and construction company and to carry

# Daylight Saving

## with a

# GEOMETRIC

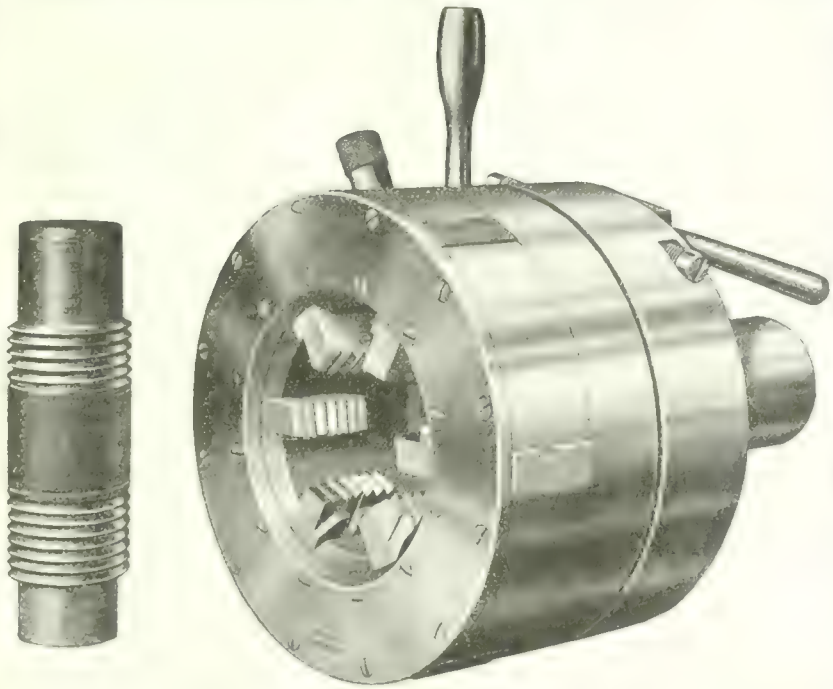
That is what it amounts to. Time is not the only thing saved, either. Geometrics are a saving proposition all around.



This Geometric Collapsing Tap is specially arranged for deep tapping in Projectile Caps.

All classes of thread tapping above $3_4$-inch diameter are taken care of by Geometric Collapsing Taps.

***Twenty-five years of specializing in Screw Thread Cutting Tools has made the name GEOMETRIC stand for all that could be asked in Screw Thread Production.***



When it is an outside thread, Geometric Die Heads cut every style from 1/16-inch size up to greatest required diameter.

A U.S. Navy Yard is using this 4½-inch size Style "D" Geometric Die Head. United States Navy Yards accept no second quality.

Do your Screw Machines and Turret Lathes swing Geometrics?

You have as much right to Geometric benefits as any other manufacturer.

## The Geometric Tool Company, New Haven, Conn., U.S.A.

***Canadian Agents:***

Williams & Wilson, Limited, Montreal. The A. R. Williams Machinery Company, Limited, Toronto, Winnipeg, St. John, N.B.

on the trade or business of iron makers, steel makers, steel converters, smelters, engineers, tin plate makers, munition manufacturers, iron founders, repairs, etc. The incorporators are J. S. Lovell, A. [illegible] K. C., J. J. [illegible]wood and J. Henry, all of Toronto.

## TRADE GOSSIP

**Want Supplies.**—McDougal Bros. of Besserer St., Ottawa, wants to purchase 2 locomotives, 12 to 15 tons, 36 in. gauge; 15 four-yard dump cars, 36 in. gauge, [illegible] derrick on low broad [illegible] and 70 tons of 40 lb. re-laying rails.

**Will Make Sales.**—A firm, composed of Toronto people, has been incorporated under the name of the Bisco Doll Co., Ltd., with capital of $40,000, to manufacture dolls, toys, etc., and deal in same. Provisional directors are M. Magi, M. Hands and W. H. Davis.

**Moved to New Plant.**—The Curtiss Aeroplanes and Motors, Ltd., have removed from 70 Pearl St., Toronto, to their new premises, (formerly occupied by the Toronto Furniture Co.,) at 163-189 Dufferin St., Toronto.

**To Increase Capital.**—The Ottawa Gas Co. will apply to the Parliament of Canada, at the next session, for an Act further amending its act of incorporation by increasing the capital of the company to $5,000,000.00, and by increasing the borrowing powers of the company.

**Winnipeg, Man.**—Tenders for structural steel ornamental lamp posts for the Provencher Ave. Bridge, addressed to J. B. Cote, secretary of the Joint Committee, St. Boniface, will be opened on March 28. Plans and specifications to be obtained from the Bridge Engineer, 802 Confederation Life Building.

**Montreal, Quebec.** — The Canadian China Clay Co., St. Remi d'Amherst, has just shipped the first carload of fire brick to the Canadian Steel Foundries at Welland, Ont. A plant for producing silica sand for cast steel molding and furnace sands, organized by Prof. Bell of McGill University, has been started in the same vicinity.

**Business as Usual.**—The Samuel Fisher Co., 57 Surplice Street, Montreal, had a bad fire in their premises, damage to the extent of about $25,000 being done. Considerable of the damage will come from the rusting of material. Temporary offices have been secured next door, and business will be carried on as usual. The question of a new location has not been settled.

**A New Proposal.**—Several replies were received from Brantford manufacturing firms at the city hall relative to the request of the civic finance authorities to do away with fixed assessments for the duration of the war. Some of the replies were favorable and others were not, and the whole matter will be again taken up in committee before the tax rate is struck for the year.

**Vancouver, B.C.**—A. F. Proctor, Provincial Government engineer, announced last week that he hoped to have the Pacific and Great Eastern Railway constructed to Williams' Lake, and even 120 miles further, to Soda Creek, this year. If it is possible to push the construction to Soda Creek it will mean that water and rail transportation will be opened between Fort George and Vancouver.

**Montreal.**—The War Trade Board of Canada has been successful, it is understood, in making an arrangement with the War Trade Board of the United States whereby the fruit, vegetable and fish canners of Canada will be enabled to obtain supplies of tin plate from the United States at a price which will approximate to the price of $7.75 per base box of 300 pounds now paid by American canners.

**Ottawa, Ont.**—Tenders will be received until Tuesday, April 2, 1918, for the construction of a Dominion Government Office Building, O'Connor street, Ottawa, Ont. Plans and forms of contract can be seen and specifications and forms of tender obtained at the offices of the Chief Architect, Department of Public Works, Ottawa; the Overseer of Dominion Bldgs. Central Postoffice, Montreal, and the Clerk of Works, Postal Station "F," Toronto, Ont.

**Winnipeg.**—A regular examination of applicants for license as Steam Engineers under "The Steam Boiler Act" for the Province of Manitoba will be held in the Legislative Chambers, Parliament Buildings, Winnipeg, on Friday, March 22nd, 1918, commencing at nine (9) o'clock a.m. Address all communications and make all money orders and cheques payable to the Bureau of Labor, 301 Boyd Building, Winnipeg.

**Sydney, N.S.**—J. C. Watters, before leaving for Inverness and Stellarton, where he will endeavor to patch up differences between the coal companies and miners at these places, said that following an interview he had with Mr. Adams, manager of the Scotia, the wage and union questions had been settled to the satisfaction of both the men and their employer. The steel workers had threatened a strike, and previous to the arrival of Mr. Watters the situation was critical.

**Winnipeg.**—The official announcement is made that the Winnipeg Electric has decided to put on a motor 'bus service in Winnipeg to compete with the jitneys. The contract has already been let for the first 'buses. These will run on residential routes, and will give and accept transfers from street cars. The announcement is making a big stir in the city, and the opinion is freely expressed that the company has adopted the most efficacious method of dealing with the situation.

**Extend Line to Toronto.**—The T., H. & B. Ry. will apply to the Parliament of Canada at its next session, for an Act authorizing the extension of its railway from its present north-westerly terminus at Hamilton to a point in or near Toronto; also authorizing it to make and enter into with the Canadian Pacific Railway Company and the Grand Trunk Company of Canada for a term not exceeding 21 years any of the arrangements or agreements authorized to be made between railway companies by section 364 of the Railway Act, and for other purposes.

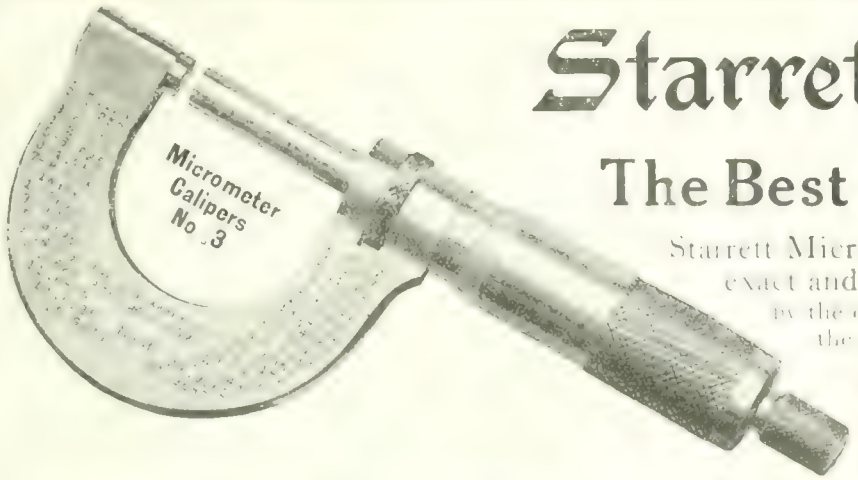
**Export of Rods, Sheets, Plates and Bars Prohibited.**—An order-in-council has been issued from Ottawa prohibiting the exportation from Canada of the following goods except under license issued by the Minister of Customs, at the request of the War Trade Board:—Abrasives and all materials entering into their manufacture, ammonium sulphate, calcium carbide, electrodes, machinery, chemical wood pulp, mechanical wood pulp, newsprint paper; iron or steel, comprising wire rods, wire, plain or galvanized, or otherwise coated; sheets, plates, bars.

**The R. H. Howes Construction Co.,** of Boston and New York, has established a shipyard at Meteghan River, N.S. A lease for a term of years has been taken of the late James Cosman's shipyards at the mouth of the Meteghan River. Mills, together with pattern shops, equipped with the latest improved machinery, have been erected and are now working. The company recently closed a deal for a tract of 500 acres of very valuable timber land on the Meteghan River and intends to enter into shipbuilding on a very extensive scale. It already has one schooner entirely in frame and other keels will be laid immediately.

**Ottawa, Ont.**—Tenders will be received until April 11, 1918, for the switchboards, panel boards and transformers required in the construction of the Parliament Buildings. All tenders to be based on the execution, completion, and delivery on the site, together with the furnishing of all material, tools, appliances, labor, etc., for the work as required and described by the plans and specifications for switchboards, panel boards and transformers. Plans and specifications and any other information required can be obtained at the office of the general contractor, P. Lyall and Sons Construction Co., Ottawa.

**New Bridge at Niagara.**—The Canadian Niagara Bridge Co. will apply to the Canadian Parliament for incorporation with power to construct, maintain and operate a railway and general traffic bridge across the Niagara River, with the necessary or proper approaches and terminal facilities, from some point in the Township of Bertie or in the Township of Willoughby, in the County of Welland, and to charge tolls for the passage of engines, cars, vehicles, pedestians and general traffic over the bridge approaches and terminal property or for the use thereof. The head office is in Hamilton, Cahill & Soule acting for the applicants.

**World's Aluminum Output.**—The world production of aluminum has increased 20 fold since 1900, while that of tin has scarcely doubled meantime. Aluminum production in 1900 was 7,200 tons and in 1916 135,000; tin production in 1900 77,200 tons, and in 1916 117,500. Of the




# Starrett Calipers

## The Best Money Can Buy

Starrett Micrometer Calipers have a more exact and easier way of adjustment than by the old method of a movable anvil. Over the barrel is a thin, graduated sleeve, and on this sleeve is the zero line, instead of on the barrel itself. The thin sleeve keeps dirt from the screw and after years of use a turn of this sleeve brings the zero line correct to

For measurement by thousandths up to one inch. Has lock nut and ratchet stop, or can be furnished with lock nut at end of frame.

### Compensate for Wear

A knurled locking nut contracting a split bushing around the spindle tightens and keeps the spindle central and true, or by a slight turn locks it firm, making a good gauge when desired. Anvil and spindle are hardened, ground and lapped.

### VERNIER CALIPERS

Graduated in either or both English and Metric divisions for outside and inside measure—warranted accurate. Points are on the beams and slides for setting dividers to transfer distances. Jaws are carefully hardened and accurately ground. A finely finished plush-lined case, unless otherwise ordered, is sent with each caliper as well as full directions for using.

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AIKENHEAD HARDWARE LIMITED

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The gripping power of the Wahlstrom Chuck is governed by the resistance on the tool in its jaws. There cannot be slippage.

It enables your operators to make tool changes in less than two seconds, because it automatically self-centres the tool. Your machines never stop.

The Wahlstrom for straight shank tools is made in three sizes:

1 takes from 15/64" to ½"
2 " " ⅜" to ¾"
3 " " 17/32" to 1"

***Another style takes Morse Taper Shank Tools.***

# Wahlstrom

**Time-Saving**

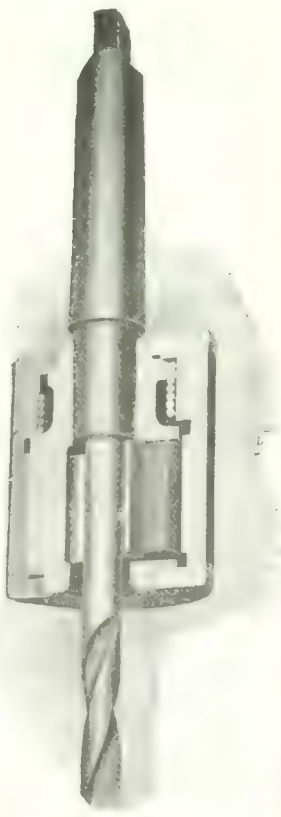
# Chuck

Walk into almost any big machine shop in Canada and see Wahlstrom Automatic Chucks at work. The man in charge will probably tell you they started with one. It saved so much time that they ordered 10 or 50 more, as the case may be, and that each and everyone still maintains the splendid ability demonstrated the first day put in use.

*For all facts write.*

## Aikenhead Hardware Limited

**17, 19, 21 Temperance St., Toronto**



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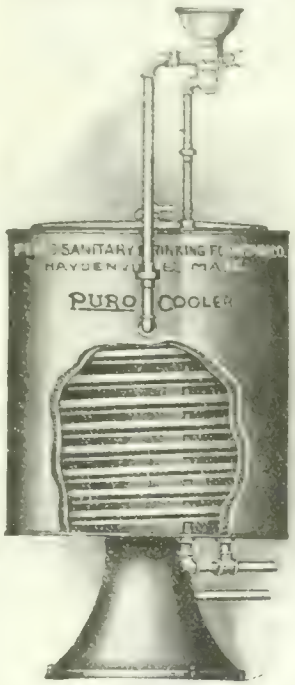


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output of aluminum in 1916 approximately 62,000 was the product of the United States, 20,000 produced in France, 16,000 in Norway, and 8,000 in Canada. Figures differ radically as to Great Britain, ranging from 4,000 to 12,000 tons production. In Switzerland the normal product is about 20,000 tons, but has been materially reduced by inability to obtain from France the bauxite from which aluminum is produced

**Ottawa, Ont.**—Tenders will be received until March 28, for rolled steel casements and bronze-covered frames and sash for the Parliament Buildings. All tenders to be based on the execution, erection and completion; together with the furnishing of all materials, tools, appliances, labor, etc., as required and described by the plans and specifications for (a) rolled steel casement; (b) bronze covered frames and sash. Separate tenders to be submitted for "a" and "b." The work included under this contract shall be commenced immediately on the signing of the same, or at such time as may be directed, and be carried out in such a manner as to insure the completion thereof by Sept. 30, 1918.

**Ottawa, Ont.**—Tenders will be received until Tuesday, March 26, 1918, for the construction of fifty-one (51) section houses at various points on the Canadian Government railways (National Transcontinental Railway) between Moncton and Winnipeg. Plans, specifications and blank form of contract may be seen at the following offices: Chief Engineer Dept. of Railways and Canals, Ottawa, Ont.; Chief Engineer, Can. Dept. Rys., Moncton, N.B.; Resident Engineers at Edmundston, N.B., Levis, P.Q., Quebec, P.Q., Cochrane, Ont., Fort William, Ont., the Terminal Agent, Montreal, P.Q., the General Western Agent, Toronto, Ont., and the General Manager Western Lines. Winnipeg, Man.

**Rushing Work At Ft. William.**—The Canada Car and Foundry Co. of Fort William have their plant in shape now, and the capacity is up to the point where it is possible to turn out a completed freight car every 20 minutes. This huge car factory, which is now working on an order for 5,000 cars for the Canadian Government railway, is located in west Fort William. Twelve hundred workmen are now employed. It is one of the most modern factories in Canada, being built exclusively of brick, steel and glass. Power is derived by the use of huge producer-gas engines. Contracts have been let for a shipbuilding plant to be erected on a site adjacent to the factories shown above, the company having received large orders to build mine-sweepers for one of the Entent powers.

**Looks Good.—The "Scientific American"** tells us that Bradford, England, has been operating a municipal trackless trolley since June, 1911, and finds a number of advantages in such a system as compared to regular trolley lines. There are now in Bradford 9½ miles traversed by the trackless service, and in 1916 there was a car mileage on such routes of 322,300. Eighteen cars were operated and the total operating cost, including interest and sinking fund charges, was 15.5 cents per car mile. The number of passengers carried was 3,402,985. The average fare per mile was 1.3 cents, fares being rated according to the distance travelled. Each car seats twenty persons, and is run by a motorman and conductor. The current is obtained from overhead trolley wires and the vehicle runs upon the pavement on solid rubber motor truck tires.

**Bond Engineering Works Ltd.**, who recently took over the plant of the Queen City Foundry, announce that they are about to construct another addition on to their foundry located in the harbor industrial district at Toronto. In the new building will be a core room; cleaning and grinding room; and storage for foundry supplies; coke; moulding sand, etc. Facilities will also be provided for babbitting, painting, and assembling of the line of power transmission specialties which they will manufacture. Modern equipment of the best type will be installed, to facilitate the efficient handling of raw materials and the finished product. Special attention is being given to the welfare of the employees; in the way of light, heat and ventilation. An adequate system of dust collectors is one of the improvements contemplated. The locker room is to contain a locker for each employee; and shower baths; wash basins; drinking fountains; etc., will be provided.

**U.S. Steel Corp. Unfilled Orders Decline.**—The U.S. Steel Corporation reports that unfilled orders on hand Feb. 28, 1918, amounted to 9,288,453 tons, as compared with 9,477,853 tons on January 31, a decrease of 180,400 tons. Unfilled orders on hand Dec. 31, 1917, amounted to 9,381,718 tons; on November 30, 8,897,106 tons, and on February 28, 1917, 11,576,697 tons. The shrinkage of 189,400 tons in the unfilled orders of the United States Steel Corporation in February reflects the absence of buying on the part of domestic consumers. The Steel Corporation has a capacity for shipping over 55,000 tons of finished steel daily, but as a result of inadequate transportation facilities, shipments in February could not have averaged much more than 60 per cent. to 65 per cent. of capacity. In view of this, total incoming orders of United States Steel last month could not have been much more than 50 per cent. of capacity.

**Wasteful Coal Mining in Canada.**—Speaking on the waste of coal in Canada, before the Canadian Mining Institute at Montreal, W. J. Dick, Sydney, C.B., said a large proportion of the coal mined in Canada was lost or wasted owing to the practice of mining lower seams of better quality first, with the result that by the caving in the recovery of coal from the upper seams was generally impossible. In other countries leases were granted only on satisfaction being given the authorities that a proper

scheme of operations was to be carried on. In Canada there was indiscriminate leasing of coal lands without restrictions, and if the mines were worked to their capacity the output would be 16,000,000 tons per annum. He depreciated the opening up of farmer or "snowbird" mines, about 400 of which had been abandoned in Alberta alone, as they not only destroyed the entrance to a coal field for large operations, but were a menace to safety in the workings.

## REFRIGERATION

**Vancouver, B.C.**—With a view of placing British Columbia deep-sea fish on the prairie markets, a company has been formed to operate cold storage plants on this coast. This concern will be known as the Union Fisheries & Cold Storage Co. Already a contract has been let for laying down the first plant, which will be located at Clayoquot, on the West coast of Vancouver Island. The capacity of this factory will be 1,000,000 pounds of fish, and the company contemplates constructing two other factories. One of these will be on the east coast of the island and the third at Prince Rupert. George Brown is president of the company.

## CATALOGUES

**Bakelite Micarta Gears.**—Technical information regarding Bakelite Micarta D gears is contained in a pamphlet, A-2132, recently published by the Westinghouse Electric and Manufacturing Co. of East Pittsburgh. The distinctive features of this material for noiseless gears and pinions are listed together with its physical properties. Methods of turning and drilling and gear cutting are described and illustrated with many half-tones and drawings. Methods of attaching to the driving shaft, which have proved suitable for gears of all sizes, are shown, and tables of pitch, teeth and other gear data are also given. There are formulas for the horse-power rating, the amount of power which can be transmitted through press fit and for calculating other variables in gear practice. The book, which is of twelve pages, is a valuable addition to the library of anyone who has to do with noiseless gears. It will be sent on request to the company's nearest office.

## LOCOMOTIVES INCREASE IN SIZE

THE size of locomotives has increased in less than ninety years from the four and one-half tons of Stephenson's "Rocket" of 1829 to the 380 tons of the latest Mallet articulated freight locomotive. Captain H. R. Sankey, English engineer, finds that in Great Britain the growth was fairly rapid until 1870, when it had reached forty tons, but there was then a pause until 1897; followed by an increase to eighty tons by 1914. The latter size is believed to be the maximum practicable for passenger locomotives under the conditions of the country. In the United States passenger and freight locomotives were of nearly the same


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"Business men and wage-earners cannot lend money to the Government unless they can make money. And business must earn more money this year than last year.

"Increase in prices resulting from expansion of credit gives industry a stimulus. Extra demands of government finance and increased industrial needs absolutely require expansion of credit."

Thrift: Production: Expansion.

The two quotations and the three words above are point from the most forceful and constructive address on finance in war time that has been written since the outbreak of the conflict. The author is by Charles H. Sabin, president of the Guaranty Trust Co. of New York, and you can read it in THE FINANCIAL POST this week. It is very much worth your attention. Not only is Mr. Sabin head of the greatest Trust Company in the world, but his understanding and knowledge of the fundamentals of business in relation to finance mark him out as an authority of whose words you can rely. Read this article. Act on its advice. Improve your business by the knowledge you gain.

THE FINANCIAL POST This Week

Business interest this week is focused on several important matters, one of which we deal with in THE FINANCIAL POST under head such as the following:

C.P.R. Earnings Will be Less Under Tax.
U.S. Munition Orders to Right our Exchange.
Regulation of Packers Will Hit Industry.
Western Soil in Better Shape This Year.
Royal-Northern Crown Bank Merger Raises Query.
Bank Clearings 7½ Ahead of Last Year.
Banks May be Forced to Close Earlier.
Should Bank Managers Act as Solicitors?
Judges Charged by Officer of Loan Co.
Saskatchewan Tax System is Inadequate.

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SEE THE FINANCIAL POST

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C. M. E.

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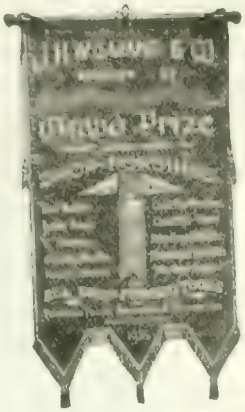
Dependable Construction
Sufficient Performance



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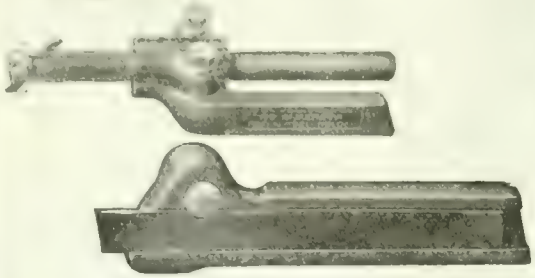

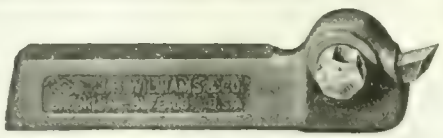

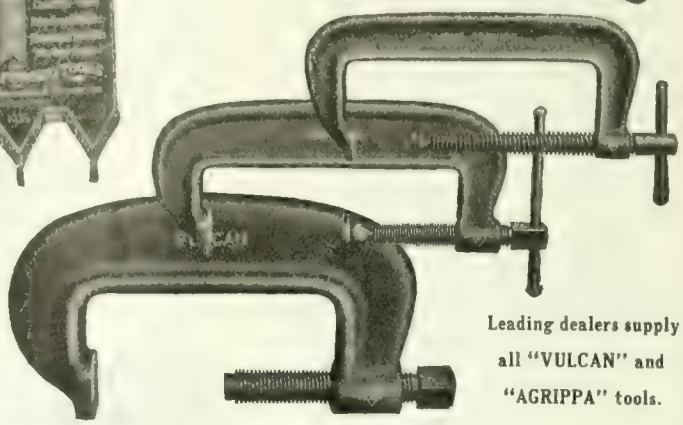

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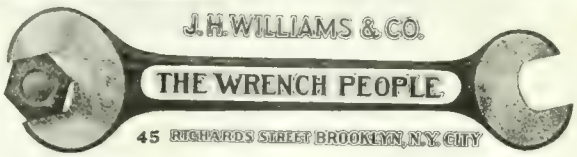


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# 75-mm. Shell Forgings

Our Chilled Iron Dies for nosing the various sizes of Shrapnel and H.E. Shells, have proven so entirely satisfactory in use in our own shops and in the shops of our many customers that experiments have been made to try out this same material in the making of Shell Forgings, and we are happy to be able to announce that Chilled Iron has proven equally as satisfactory in the making of the Shell Forgings as in the forming of the nose on the shell.

We are now supplying regularly Chilled Iron Drawing Dies and Chilled Iron Piercing Dies for making the forgings for 75 mm. shells.

Chilled Iron Dies are harder on the wearing surface than tempered steel. They are chilled or hardened to the same extent over the full wearing surface, but are soft and easily machined elsewhere. That is why they last so long. We ourselves have nosed 40,000 shells with one die.

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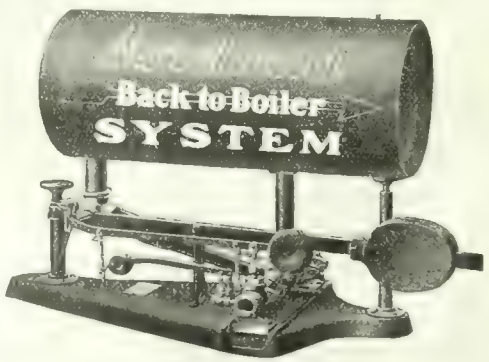
That's where the condensation in your steam lines should go—immediately back to your boiler as pure, hot feed water. That is where and how it will go the day you install Morehead's Back-to-Boiler System. The economy in fuel cost alone is at least 8%, and the increased efficiency of steam-heated machinery is another big consideration. Write for the Morehead Book on Steam to-day.

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weight up to 1895, but the latter have doubled in weight since that time. The great Mallet engine has six cylinders, the tender, as well as the boiler, assisting in giving adhesive weight. The tractive effort of this engine, 166,000 pounds, is nine times that of the most powerful British locomotive, but the opinion is expressed that it may be further increased to 300,000 pounds. A Mallet locomotive of only three tons, built in France in 1887, is an interesting contrast.

### FORTUNE IN WORNOUT TIRES

According to the statistics of a rubber expert the world discarded 183,000 tons of automobile tires during the year 1916. Adding to this the large number of bicycle tires thrown away every year by their owners, it appears that the world spends, every year, at least $600,000,000 for pneumatic tires alone. During the last automobile exposition in New York it was pointed out that nearly 5,000,000 automobiles are now in use in the United States. To supply these with tires, nearly 80,000 tons of indiarubber are needed every year, and the American automobile owners pay every year as much as $200,000,000 for their tire bill.—"Scientific American."

### LONDON MAN PRESIDENT OF HYDRO ENGINEERS

**Officials of Municipally Owned Electric Utilities Admitted to Membership in Organization**

THE engineer's section of the Ontario Municipal Electric Association has been reorganized to include in its membership officials of all the municipally-owned electric utilities in Ontario, in addition to officials of the local Hydro-Electric bodies.

Officers elected for the ensuing year are as follows:

President, E. V. Buchanan, London, Ontario; vice-president, E. I. Sifton, Hamilton, Ontario; secretary, S. R. A. Clement, Hydro-Electric Power Commission, Toronto; treasurer, R. C. McCollum, Hydro-Electric Power Commission, Toronto; chairman of standing committees, Oswald H. Scott, Belleville, Ontario; V. S. McIntyre, Kitchener, Ontario; E. J. Stapleton, Collingwood, Ontario; R. H. Martindale, Sudbury, Ontario.

The first meeting of the reorganized association will be held at Niagara Falls on June 14 and 15, 1918.


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Phone Adel. 908
Cutting off and rough facing machines for 6-inch shell.
Repair parts for Williams type 6-inch cut-off machines.

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PORTABLE PLANERS
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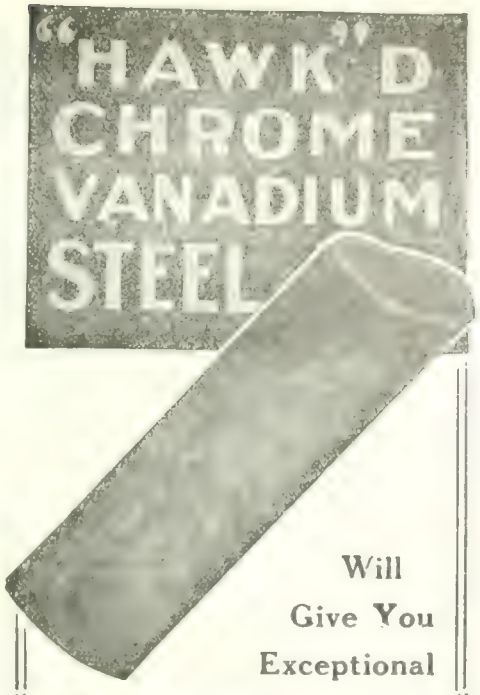

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It does not stick to the work.
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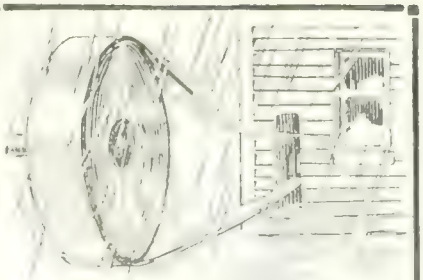
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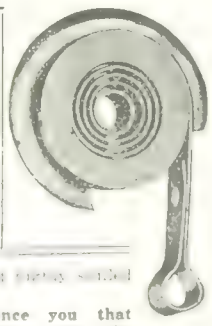
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# CANADIAN MACHINERY

## AND MANUFACTURING NEWS

*A weekly newspaper devoted to the machinery and manufacturing interests.*

Vol. XIX. TORONTO, MARCH 28, 1918 No. 13


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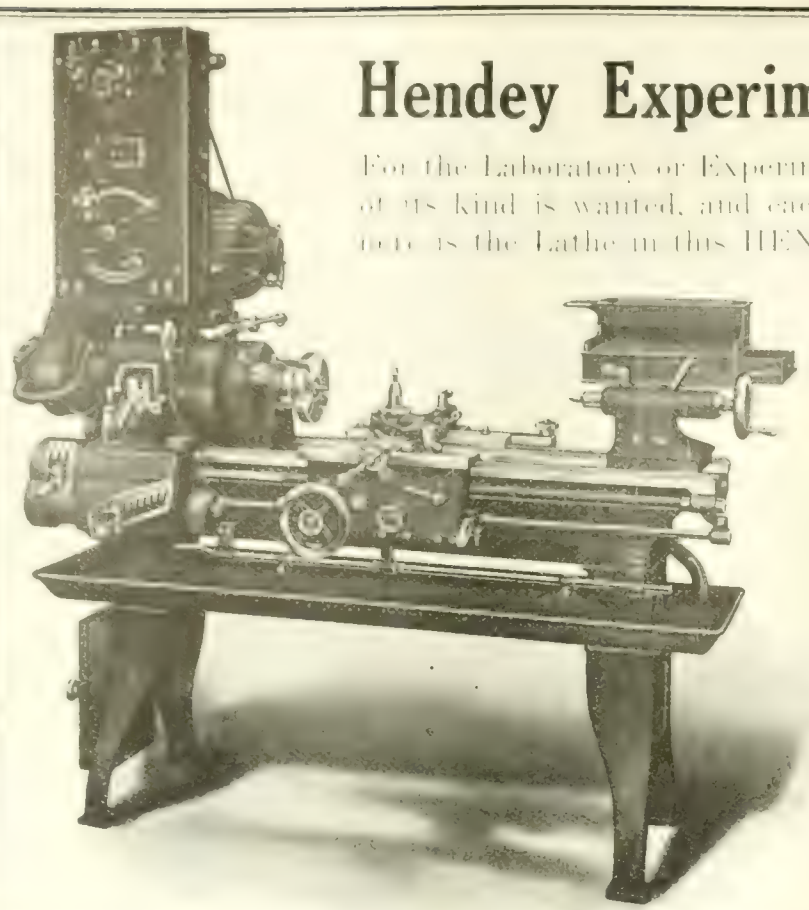

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# Repair and Maintenance of Locomotives in War Time

By E. R. Battley

*The conditions under which locomotive engineering is carried on to-day are beyond all precedent. High wages, much inexperienced help and dearness does all possible to all tend to make the repair and maintenance of locomotives a great problem, and one which cannot be side-tracked. The methods outlined by the author indicate measures which are found necessary and desirable in taking care of motive power.*

REPAIRING and maintaining running repairs on locomotives are two of the great problems with which railroads have to deal. On account of the abnormal conditions and the vast amount of freight waiting to be moved, it is essential that railroads keep their engines in constant service, and in dealing with this problem at the March meeting of the Canadian Railway Club, at Montreal, the author laid emphasis on the fact that due to the demand for locomotives in the Allied countries our locomotive builders cannot supply sufficient new engines for export and for home use, therefore it has been deemed advisable to ship a large part of the output abroad, using our present power to its capacity. By so doing we must expect the outlay for repairs will be in excess of that of former years. The wages paid to-day are high, and in the majority of repair shops, railroads are forced to employ mechanics inexperienced in regard to railroad work, and it necessarily follows repairs take longer and the work requires closer supervision.

In the past few years the Government has exercised considerable authority over the railroads in regard to the building and maintenance of power, setting down certain rules and regulations concerning standards, defects, etc., and have assigned inspectors to certain districts to see that rules are observed. While these laws added considerable extra work to most roads it has, no doubt, been the means of improving the power and prolonging the life as well.

As previously stated one of the great trials of all railroads is to keep up the repairs on their motive power. To accomplish this we must provide proper facilities for repairing and handling at roundhouses and general repair shops.

### Roundhouses

It is difficult to do quick work at terminals unless we provide proper facilities, such as suitable roundhouses and equipment. The key to the power handling situation of the roundhouses is the ashpit, therefore we must provide large pits equipped with a sure and quick means of handling the accumulation of cinders. Ample room must be provided on both sides of the pit so that in rush hours fires can be cleaned or dumped and engines moved along out of the way to await their turns on the turntable. If this space is not provided, and after an engine or two has been dumped, it means the work on the engines following is at a standstill until those ahead have been moved. Conditions of this kind causes ashpit gangs to be idle and at a busy terminal a large waiting list is the result.

In close relation to the ashpit is the turntable and shop leads. The former should be of rigid construction and power operated. The leads should be of sufficient length to accommodate outgoing engines and provided with suitable crossovers and water-cranes to facilitate the despatching of power.

A valuable addition to any roundhouse is good machinery. A great mistake sometimes made by railroads is filling up roundhouse machine shops with antiquated tools. When a machine job is required in a back shop it is usually a rush order, therefore speed and accuracy is required. If modern tools are used you get what is desired without delay. All our terminals of importance have been equipped with portable oxy-acetylene welding and cutting outfits, and needless to say they have proved invaluable.

Organization is another valuable asset to the shop. One may have a splendid layout, good tools, etc., but without system efficiency is reduced. We have found by arranging our roundhouse staff in special gangs good results have been obtained. These gangs are grouped as follows: passenger, freight and switch, air-brake, spring and brake-gear, rod and box packing, lighting up, and, last but not least, the boiler gang. The different gangs are controlled by chargemen, who report to the shop foreman.

Engineers upon arrival book the necessary work in a book provided for the purpose. A competent inspector also makes an examination of the engine and records defects found. The work is then copied by a man assigned to this work, who distributes the slips to the respective charge hands. When the work is completed a notation is made in the report book on the oposite page to the one on which the engineer placed his report.

In dealing with roundhouses I might mention an important item that contributes to shop efficiency, but which is sometimes treated lightly, and that is, cleanliness. We have found by experience that in keeping our premises clean and tidy better work is produced and time saved, as spare material can be quickly located. Accidents due to employees falling over old material are reduced to a minimum. In addition to these beneficial results it looks well and gives one the impression that the foreman in charge is "master of the situation."

During the busy season when locomotives are at a premium, the cripples at roundhouses accumulate quickly unless a close check is kept on the shipment of repair parts. We have a system of checking up and forwarding repair parts to out stations that has proved very satisfactory, and has been the means of keeping our locomotives in service during the past severe winter. Foremen at each station send a joint message to the road and shop master mechanics as soon as they find repair parts required. In addition to this, they send in a daily report of engines undergoing repairs which will take over twenty-four hours, stating when engine was taken out of service, what material is required and on whom ordered. This gives the master mechanic an excellent opportunity of keeping in close touch with the situation on his division. To ensure requisitions being filled promptly and to avoid delays in shipment or at transfer points a material man was appointed by the road master mechanic. His duties are to check requisitions, receive telegrams for material, consult shop master mechanics and subordinates as to when material can be secured, see that there is no delay in handling, also advise out stations on what train material is going forward so that he can be prepared to have it removed promptly on arrival.

### General Repair Shops

General repair shops should be of sufficient size to care for the power assigned to the division and centrally located.

When an engine is to be shopped the nature of repairs is mainly controlled by the road master mechanic. Any unusual repairs are decided upon after a boiler inspection and hydrostatic test has been applied. After the engine has been stripped the shop inspector makes out a final report and repairs are made accordingly. Accompanying each engine to the shop is the locomotive foreman's report of repairs which forms the basis from which shop master mechanic works.

There is approximately 10 per cent. of our power under repairs at all times; this is necessary to keep our engines in good condition, and also provides sufficient work in advance for the shop staff, who work entirely on the bonus system. Output and bonus system are so closely related that in speaking of one it is necessary to mention the other. The subject to-night being repairs, the bonus system will only be mentioned when necessary to show why we handle certain operations in certain ways.

over the entire system, but as Stratford shop was the first to try this system we will use it as an illustration.

The repairs required are designated by a certain letter which is in itself a symbol and indicates what kind of repairs are necessary, also approximately how many days engine will be in the shop. If you will refer to the following you will find the letters used with a brief explanation:

B.S.—Boiler to be converted to superheat and will be 24 working days in the shop. (Spare boiler and cylinders are ready before engine comes in.)

B —New firebox to be applied. 21 working days allowed.

C. —Firebox will receive new half side and possibly new flue sheet. 21 working days will be allowed.

D. —Boiler is to be retubed and machinery given a general repair. 18 working days allowed.

D.C.—Same as D except new cylinder or cylinders will be applied. 21 working days will be allowed.

F —Wheels removed, tires turned, boxes and rods repaired. 12 working days allowed.

I —Light repairs, such as replacing broken rods, light patch in firebox, or any work which roundhouse cannot conveniently handle.

S. —Specific repairs. Some special job which is really roundhouse work, but for some legitimate reason is handled in the main shop.

As each kind of repair is allowed a certain number of days in the shop, the list of engines turned out weekly has to bear a certain relationship to this in order that output may be regular, both as to quantity and weight of repairs.

The foremen meet in the master mechanic's office each Friday and incoming engines are assigned to their proper places on the outgoing list. A new list is issued each week.

The engines are booked in in such a manner that each week's output will represent about the same weight of repairs on the whole, although the number of engines may be more or less.

As time is limited I cannot describe the methods as applied in all departments, but would take it for granted the various parts have been repaired and are now in the erecting shop. This department was formerly handled with nine regular gangs, consisting of approximately ten men per gang, controlled by a chargehand who was responsible for three pits. In addition to the nine gangs we had three or four special gangs, such as shoe and wedge, guide bar, and steampipe. Our regular pit gangs carried the engine through from the time the engine was stripped, with the exception of the detailed work above mentioned. Under [illegible] we accomplished good work until our forces became depleted through enlistments, and upon looking carefully into the situation we found where a gang usually had five or six mechanics it would probably have one or two, the remainder being unskilled help. It was, therefore, necessary for us to meet the new conditions in order to keep up the repairs. To do this we re-arranged our men into special gangs, mainly to centralize our machinists on work that really required mechanics, and use the unskilled labor on the coarser work. With this arrangement, instead of a gang having three pits on which to work they have the entire erecting shop, therefore delays were reduced to a minimum. The gangs were arranged as follows:

**Stripping Gang.**—Strip engine complete, with the exception of mountings and pipes. These are taken off by the strippers of the steampipe department.

**Frame Gang.**—Main frame applied and rebolted, front frames applying and rebolting complete (when cylinders are not off) back and front deck castings, waste sheet and cross-tie casting. Furnace bearers back, front or side renewed or bolted, furnace bearer brackets on frame, friction casting and wedge, lining up boiler when engine is rebuilt when the original cylinders are used, steel running boards and brackets with all necessary studs.

**Shoe and Wedge Gang.**—Line up, mark off, machine and fit up all shoes and wedges.

**Guide Bar Gang.**—Set all guides, face all valve seats, apply steam chests and bore cylinders in erecting shop.

**Brake and Spring Gear Gang.** All brake and spring gear complete, fitting up and applying, including brake hangers, brackets, etc.

**Motion Gang.**—Pistons, motion plate and motion plate knees, piston valves, cylinder covers and studs for same, rocker boxes, tumbling shaft and brackets, transmission bars, links, etc., eccentrics, valve rods and other necessary motion work.

**Front End Gang.**—Buffer beams complete, draw casting, coupler and connections, hand railings and columns for same.

**Steam Pipe Gang.**—Stripping the mountings and pipes from engines, repair and grind throttles, steam pipes, headers and units, and apply same complete.

**Trimming Gang.**—Air pump and other air-brake work, inspirators and all small jobs.

**Cylinder Gang.**—Apply all new cylinders.

The foregoing covers practically all operations in the erecting shop. Other work, such as carpentering, tinsmithing and painting is done by the respective departments.

In passing, I would like to touch upon one special feature of our bonus system, which is the key to the success of that system; that is, the demonstrating end of the bonus department. The prices set by demonstration when possible are known to be fair and correct. The chief demonstrator and his assistants have charge of this work over the entire system, and travel continuously from shop to shop. These men do not worry a great deal about prices, as this has been efficiently handled by the bonus department of each shop, which sets the prices according to the peculiar conditions surrounding the different plants, but being our most expert men they concentrate their efforts in bringing each department in all shops to a higher state of efficiency by transferring best methods, and, if necessary, men from one shop to another. As a result of this method workmen are free from the worry of price cutting, therefore the standard of work has shown a steady improvement. This department also controls the method of applying the bonus system, with the result that the method of application is the same at all shops. It is needless to say the results obtained from this system have been highly satisfactory, and in spite of the unfavorable labor conditions we have maintained repairs on our locomotives, and in addition to keeping up the ordinary repairs we have been able to convert 57 engines from saturated to superheated steam.

## GERMAN v. BRITISH GUNS

DURING the years immediately preceding the war the respective merits of British and German naval ordnance formed a topic of frequent discussion in the technical press of both countries. German writers insisted on the better qualities of Krupp guns compared with British, and particularly claimed an overwhelming superiority in lightness, durability and precision of fire. The Krupp 12 in. 50-calibre gun, it was pointed out, weighed only 47 tons, as against the British 12 in. 50-calibre model of 69 tons, which also had a lower velocity. It was alleged further that the British wire-wound guns lacked girder strength, and soon began to droop at the muzzle, which meant falling off in accuracy. These and many other statements derogatory to British ordnance were assiduously circulated by the Krupp advertising agency ,and brought forth rejoinders from gun-makers here. But as no really official facts could be given on either side, the controversy was more or less a barren one. That the German claims, though doubtless exaggerated from commercial motives, had some foundation in fact, was not denied by unbiassed observers of ordnance progress.

The past record of the Krupp works was a sufficient guarantee of the high quality of their products, and there was also the fact that, ton per ton, German naval guns cost considerably more than British. On the other hand, most of those foreign governments which purchased the naval armaments abroad showed a decided preference for British guns, and it speaks well for the reputation of these weapons that practically the whole of the navies of Japan and Italy, and numerous warships of the South American States, are armed with guns either built in England or constructed to English design.

War experience has justified the prediction that German gunnery would be found to be very accurate, particularly at the longer ranges. Salvoes fired from a great distance wrought great destruction at Coronel and Jutland. On the other hand, the almost purely mechanical nature of the German system betrayed it-

self at Jutland by the rapid deterioration of the enemy's shooting when his own ships came under effective fire. That scientific gunnery will become even more important in the future is the conviction of all who have studied the lessons of the war and are informed as to the present trend of ordnance development. Guns of unprecedented size and power are virtually certain to make their appearance, and improved methods of sighting and control may extend the extreme range to 30,000 yards, if not more. Under such conditions victory will, in all probability rest with the side that registers the first hits, for no armour or subdivision is likely to be proof against the devastating effect of the ponderous projectiles of the future.

## CO-ORDINATION OF DEPARTMENT HEADS

EFFICIENCY is a term very frequently used, but is often difficult to define. In no place is this more in evidence than in the average industrial plant, and one of the chief reasons is probably the vagaries of the human mind—a factor that is a relatively unknown quantity in the problem of manufacture and production. Maximum output at lowest cost is generally recognized as a reasonably accurate definition for the word efficiency, but while this phrase may be acceptable to many, the hitch comes when further explanation is desired as to the relative meaning of maximum output and lowest cost. In large establishments, requiring various separate and distinct departments, the efficiency of each department may have attained to the maximum, but the plant efficiency may fall short of possibilities owing to the lack of mutual understanding and co-ordination of the heads of the different departments.

In the general run of engineering industries there are what might be termed five distinct sections in productive manufacture, namely, designing, pattern-making, moulding, machining, and erection. Each is, as it were, a tooth in a gear, the harmonious and free operation of which requires the absolute absence of friction between any two or all of the teeth. Where these departments are operated in complete accord with one another, with the various heads conversant with the requirements pertaining to operating details, the basis of production is pretty well established. However, in many plants contrary currents are often responsible for marked inefficiency. Designs are frequently developed, and drawings made without due consideration of the economic production of the pattern or the casting, and also the possible contingencies arising from the molding of the same, together with the difficulties incidental to the machining of the work. As all subsequent operations are generally carried on from the diagramatical instructions of the drawings, it is very important that these be of such a character as to eliminate, as far as possible, unnecessary difficulties in the construction of the pattern, the molding of the casting, and also the machining and erection of the assembled parts.

### Weakness of Individual Design

As the efficiency of a plant is dependent, largely, upon the work of the drawing office, it is fairly reasonable to assume that the designer and also the draughtsman should be familiar with the working methods of the different departments, and the facilities provided for turning out the work. Where the work is of a standard character it is not often that confusion arises in the sequence of operations between the designing office and the assembly floor. However, in those plants where a large variety of work is turned out, it is imperative that the heads of the different departments work in perfect harmony towards the attainment of the highest standard of plant efficiency. Many designers have a tendency to produce machines and auxiliary parts so that they will have a pleasing appearance when completed. Others will strive to eliminate the artistic and concentrate on the design from an economic standpoint. Both methods undoubtedly have commendable features, but the chief consideration, apart from the serviceability of the machine—which is the all-essential factor of manufacture—is to accomplish the desired purpose at the least possible cost. This in itself is a very important problem, and where various castings are involved in construction, the cost of producing them may entail considerable unnecessary expenditure unless much forethought is exercised by those responsible for the execution of the work.

### Co-ordination of Ideas

The thoughts or ideas of few men run in like channels, so that in the production of castings, particularly of the larger and complicated variety, it is essential that the designer be perfectly familiar with the many detail requirements involved in the construction of the pattern and the casting, the moulding process and the possibilities contingent to the cooling and setting of the metal. Where a pattern is to serve for a number of castings the pattern-maker is generally confronted with a number of questions. How to make the pattern give the longest life? How to eliminate or minimize warp? How to construct the pattern to produce the truest castings? How to produce the pattern as cheaply as possible? All of these questions are of considerable importance, but the point of greatest significance in the making of a pattern of large and irregular dimensions, is the production of a casting that will be perfectly homogeneous and free from shrinkage defects and internal stresses.

Perfection, in the ordinary definition of the term, is virtually impossible in the casting of large and intricate pieces, but the greatest efficiency is achieved when, in addition to a well-made and low cost pattern, the same is made so that a casting will be produced in which the shrinkage imperfections are reduced to the lowest minimum. It is a recognized fact that the moulder is the proper man to consult when pieces out of the common are to be made, but frequently the moulder is not very conversant with blue prints or graphical sketches, so that the pattern must be partly developed before he is able to understand the nature of its construction. In order to avoid unnecessary expense in the making of the pattern and the subsequent casting, it is not advisable but essential that the pattern maker and the moulder should be agreed upon the way the pattern is to be made. Of course, it frequently happens that the requirements are of such a character that little alteration can be made to conform to the best moulding practice, but where changes can be made at the suggestion of the moulder, without materially affecting the design, the same should be given careful consideration as a possible means of producing more accurate and homogeneous castings.

### Necessity of Practical Design

The further benefits from closer department co-operation can be seen in the machining of the work after the castings have been made. The multiplicity of faulty or inefficient design is amply exemplified in the difficulties that are often experienced in devising ways and means for machining the desired portions. And again, we have the trouble of the assembly department, the efficiency or inefficiency of which may be due, very largely, to certain conditions created in the initial design, and overlooked until the piece was actually being assembled. Intentionally or otherwise, many draughtsmen seldom enter the foundry, and the same is sometimes true respecting the pattern-room and machine shop; this is a serious mistake, as the men are permitted to design parts to be made of a material of which they know little or nothing. Even the simplest rib that a draughtsman may incorporate in the design to strengthen a certain portion may be the means of weakening the casting due to the initial strains or crystallisation, accompanied by the variable setting and contraction of the material.

The day has passed, apparently, for the man who is "jack of all trades and master of none," as the tendency at the present time is for specialists in some particular branch of activity. While the latter system undoubtedly has its advantages, it is nevertheless a good thing to have a fairly comprehensive knowledge of those contingent branches that are directly or indirectly connected with your own individual work. Particularly is this true in respect to engineering. In the manufacture of machinery the different departments are so closely related and so dependent on one another, that effective results can only be attained when harmonious co-ordination is the key-note of operations.

SATISFACTORY results, it is reported, are being obtained from the plant erected at Risden, Tasmania, for the electrolytic production of zinc from Australian ore and concentrates. The plant is said to have at present a capacity of 15 tons per day, and obtains the necessary electric power from the state's Great Bear hydro-electric installation.

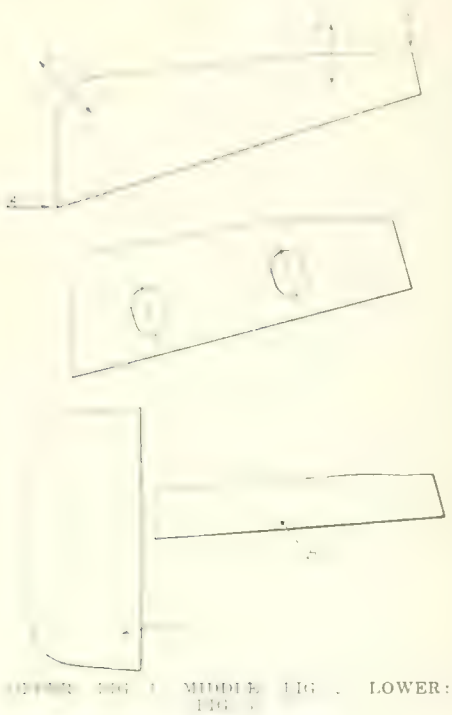
# PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

## SHELL BORING TOOLS AND DEVICES

By M. H. Potter.

PROBABLY the most difficult operation in the machining of shells is the boring those with closed bottoms. The combination of straight bore, taper bore radius and flat surface make these shells especially difficult to machine. The following article gives details of the equipment necessary for the boring of shells from 3 in. or 75 mm. to 6 in. inclusive.



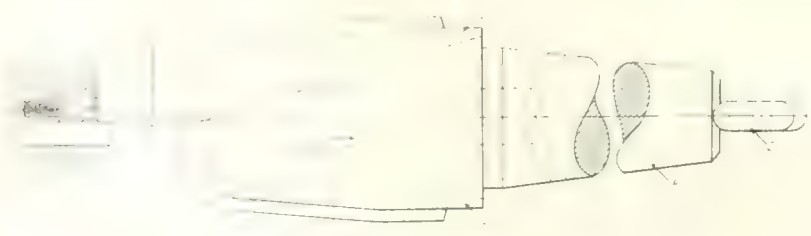
UPPER FIG. 1. MIDDLE FIG. 2. LOWER: FIG. 3.

### The Blades

Various styles of blades have been found satisfactory; each one has its own special features and adaptabilities. While one person will swear by one style, another will favor the other. Figs. 1, 2 and 3 show the different blades in detail. Fig. 1, is probably the best from a general standpoint. It is held in the boring head by means of a tapered block (strip) and fillister head machine screws. The three different styles of blades shown are all shimmed up to size (proper diameter and form) and are ground with the following clearances (see Fig. 1). A to B, 7°, B to C, 11°, from C to D, the straight part, from top of cutting edge to 5/32 in. below, 4° and the remainder 11°. These clearance angles apply to the 6 in. H. E. British shell and were obtained from actual experiment and produce a smoothly bored shell. The blades were ground to a thickness of .500 in. (slide fit in slot).

The blade shown in Fig. 2 is identical with Fig. 1; with the exception that they are held in place by means of two ½ in. fillister head machine screws. The objection that many have to this style of blade is the slotted hole which weakens the blade and tends to cause breakage. Two blades are required of both Fig. 1 and 2.

Fig. 3 shows a somewhat different type. A is the front cutter, one required, and is held in its slot by a ⅝ in. fillister head machine screw. The blades B (Fig. 3) (two required) are held by a clamping block, similar to that shown in Fig. 4. They are placed at right angles to the blade A. Although this style is not as simple as either Fig. 1 or 2 it has given first class results, its advantage being that the blades being smaller are somewhat cheaper to replace.



FINISH BORING HEAD

### The Boring Heads

Fig. 4 shows boring heads which are very neat and dependable types. Their features are simplicity of operation and replacement and wearing qualities. Fig. 4 A shows the ordinary two bladed (single pointed tools) boring head for roughing the straight part of the bore.

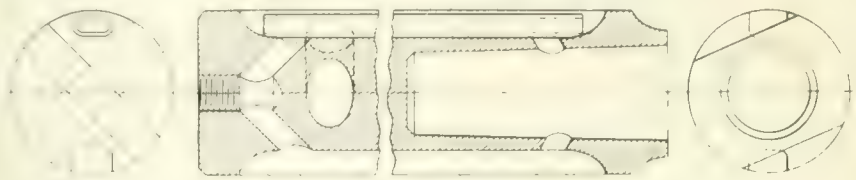


FIG. 5. BORING BAR.

Fig. 4 is used for roughing the contour, re-roughing the straight part and finishing to size. The two heads are identical, the only difference being that old finishing blades notched are used in the head for roughing. The taper of the tang A should be a little greater than that of a standard Morse taper, this will prevent wedging due to the heavy cut at the bottom of the shell. The taper centers the boring head while the tapered slot for a standard taper key not shown in tang holds the tool against the cut. The other tapered slot D is machined in the boring bar for driving off the boring head.

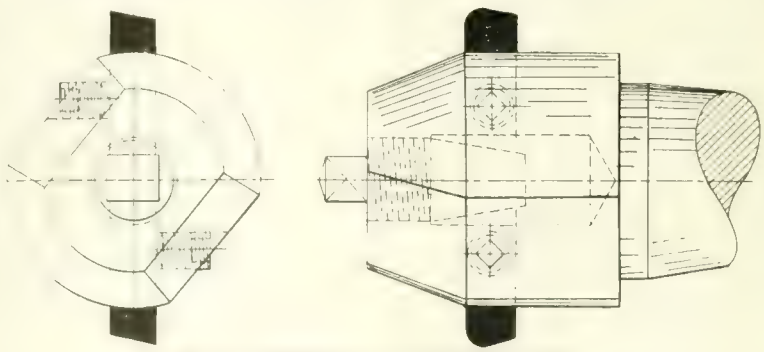


FIG. 4a ROUGHING OUT BORING HEAD.

### The Boring Bar

The boring bar Fig. 5 is the result of careful designing and study. The section drawing, Fig. 5, shows the general arrangement. Attention is called to the method of supplying the cutting compound to the blades. The brass tubes (¾ in. outside diameter) were hammered in place and soldered.

The correct way to make this bar, in order to secure the necessary accuracy required to bore a shell within the limits is as follows: First, center the stock,

second, bore out and reamer the tapered hole for tang of boring head, third, center the bar, at the tapered hole end, by means of a mandrel driven in and turn or grind the outside of bar to the required diameter.

### The Grinding Fixture

The form block grinding fixture, Fig. 6 was used for grinding and regrinding the roughing and finishing blades, Figs. 1 and 2 after they were roughed to shape on a shaper. The plate A was bolted to an old style plain grinder. A dished grinding wheel B, 10 in. diameter, was used. C which has the contour of the blade at D is slid along the straight strip H, the clamps E hold the blade G in position. J shows the blade clamped in position against the grinding wheel. The two adjusting screws K maintain a constant distance between the blade and the form block, see L, and insure a true contour. A gauge was made to permit quick adjustment.

One of the most important parts of this fixture which must be accurately machined is the surface upon which the blade is clamped. Special attention should be paid to same so that when ground the blade will have the same clearances as explained under the description of the blades. This fixture will be of special interest to those who have been grinding blades by hand, as correct clearance angles on the cutting edge are the only solution to properly bored shells. The use of this fixture eliminates to a very great extent the rectification of bores.

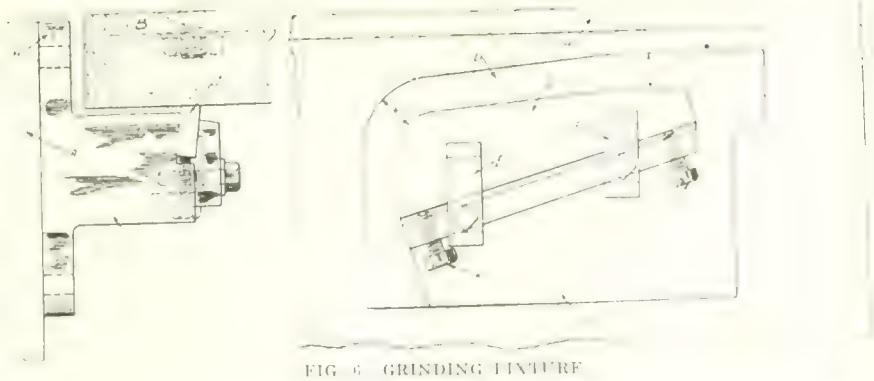


FIG. 6. GRINDING FIXTURE

screw M locks the gauge when in position. It should be noted that the horizontal movement of H must be great enough to permit of taking the boring head on and off. When the blades are placed in the slots they are shimmed out to the proper diameter, a snap gauge being used to determine same (diameter of straight part of blades). This fixture is easily operated and insures the correct contour to the blades, not only that, but if a little care and judgment is used in its use it will place the blades so that each will do the same amount of work, preventing a chattered bore.

JAPAN intends to devote a large amount of money to the construction of good roads during the next few years.

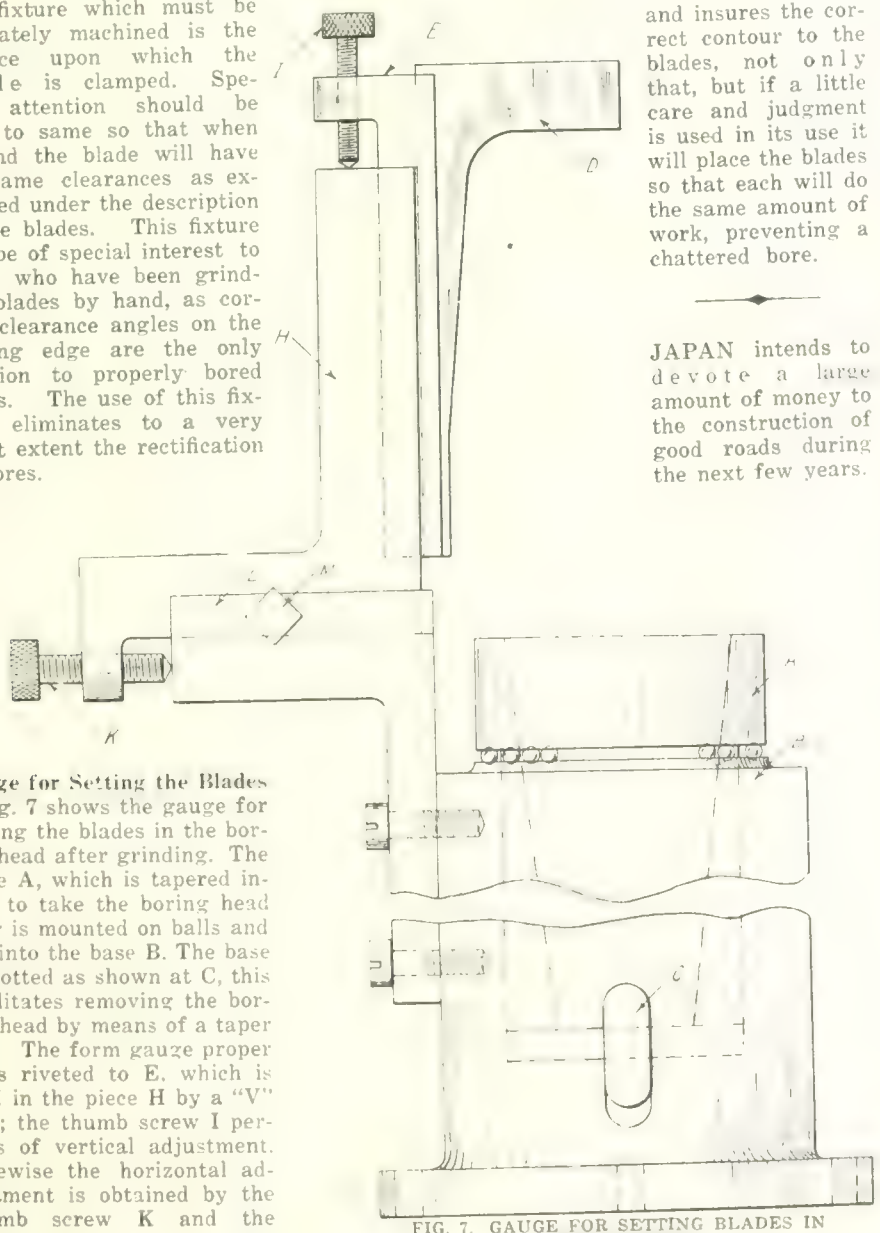


FIG. 7. GAUGE FOR SETTING BLADES IN BORING HEAD

### Gauge for Setting the Blades

Fig. 7 shows the gauge for setting the blades in the boring head after grinding. The piece A, which is tapered inside to take the boring head tang is mounted on balls and fits into the base B. The base is slotted as shown at C, this facilitates removing the boring head by means of a taper key. The form gauge proper D is riveted to E, which is held in the piece H by a "V" slot; the thumb screw I permits of vertical adjustment. Likewise the horizontal adjustment is obtained by the thumb screw K and the "V" slot L. The set

## NOTES ON MACHINE SHOP PRACTICE

By J. Davies

IN selecting the stock for making templates care should be taken to have the stock as flat as possible, particularly if the template be large and made from thin stock; any kinks or buckles are hard to get out. Template stock may often be straightened out by taking a few cuts off the outside, a narrow strip being taken off each time by holding the chisel at an angle so that it helps to stretch the metal.

After the metal has been straightened out and roughly cut to size it is ready for marking off. Some kind of coating should now be put on upon which to mark off the template. If the template is a small one, coat it all over, if a large one, coat where the marking off lines will fall. Probably the best coating is a solution of bluestone or copper sulphate applied with a brush or clean rag; as the coating dries, the surface is covered with a thin layer of copper, upon which lines may be scribed.

The method of marking off depends entirely on the shape of the finished template but generally speaking center lines or some well defined point of measurement should be taken first. Then for all subsequent lines measure from the same place, avoid the common error of measuring from the first line to the second, and from the second to the third and so on, as the amount of error is accumulating all the time, and if a mistake is made in one line the mistake will be repeated in other lines. By measuring every line from the center lines this source of error is avoided.

If the template has any holes or slots in it these should not be cut out with a chisel if a flat template is desired but a series of small holes should be drilled just inside the lines, the metal removed and the opening then filed to size.

Suppose we have a template to make to dimensions given in Fig. 1. This is a depth gauge and is typical of many others in which the same principle can be used to advantage. A high and low side are provided and it is seen at once that the depths .830 and .750 are the important sizes. Probably the most accurate way to make this gauge is to first make the stock parallel, testing by the micrometers and then deduct .750

which will give the remaining depth to [illegible] gauge. A similar operation will enable the high side to be laid out.

### Marking Off Circles

Suppose we have a circle to mark off our circle into three divisions and then

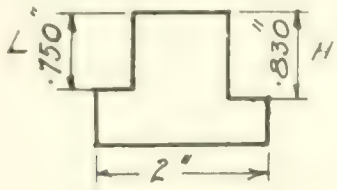



FIG. 1. TEMPLATE

the distance of each division and proceed to step round the circle with the dividers, by the time we get round we have multiplied our error by 24, and this process would have to be repeated very many times before we would get the right space.

On the other hand if we marked off our circle into three divisions and then subdivided each division, we divide the initial error and get our circle spaced off much quicker and more accurately. Fig. 2 shows how to divide a circle. Set your dividers to A any size and mark off lines at B-B, then from B-B divide the remainder of the circle and mark line C; this divides the circle into two parts. Find center between A and C and mark off B; this divides the circle into 4 parts; find centres betweeen C and D and you have 8 parts, and so on. By using the well known rule that one half the diameter will divide a circle into six equal divisions, then subdividing, a number of divisions can be readily obtained.

### Making an Eclipse

A simple and quick way to make an eclipse is by the string method. Tie a string so as to make it endless, use two pins or tacks for centers, and place the loop over both centers and use the pencil or scriber inside the loop. In Fig.

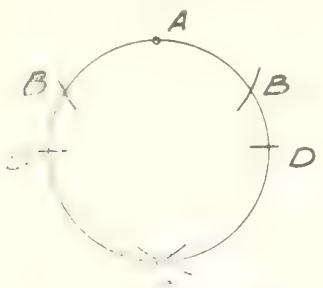



FIG. 2. DIVIDING A CIRCLE

3 the angle inside the eclipse represents the loop, A and B are the two centers and C the pencil.

### Filing Hexagons

File the first flat until the width is equal to half the diameter, then set your bevel or protractor to 120 degrees and file to this angle making the second flat the same width as the first and so on until six sides are completed and you [illegible]

In filing or shaping a square make the two opposite side parallel and the right size, then square up the other two sides to size.

Old files serve some very useful purposes, owing to their very often being of the shape required for some particular purpose. They can be used as drifts or center punches and an old square file is often handy for extracting broken studs by drilling a hole in the stud and driving in the file, then turning out the stud. When using files for any of these purposes, never strike the hardened end with an hammer; have it annealed before using.

In setting up an irregular job in the shaper vise it is sometimes more convenient to pack up the vise than it is to pack up the job, because the job is liable to move every time you tighten up the vise.

If you want to tighten up a foundation bolt for any machine or engine where the bolt is in an awkward place heat the body of the bolt before placing in position and the contraction as it cools off will tighten up the bolt.

In fitting keys make the sides an easy sliding fit, the back flat and parallel and do all the fitting on the taper side.

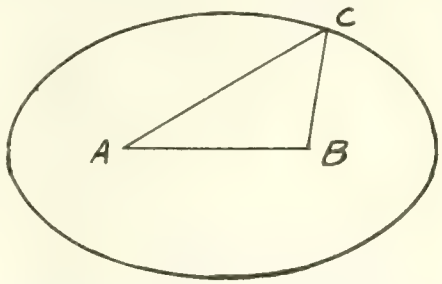



FIG. 3. LAYING OUT AN ELLIPSE.

If you want to ornament a finished piece of flat work, put a piece of hard wood in the speed drill about ½ dia., sprinkle flour of emery and oil over the surface and bring down the polishing or marking stick on work, move it all over the work, and it will produce a pleasant mottled effect. If you want a piece of small round stock for dowels pins or rivets that must be a driving fit, a very useful emergency job can be done by drilling a hole through a piece of tool steel, hardening, then driving pieces of the nearest stock through; often the shanks of wire nails will make good rivets.

When drilling raw hide with a twist drill, to prevent the clogging of the flutes of the drill, hold a cake of ordinary soap against the drill every little while.

## ROPE STRAIN

ROPE STRAIN is a factor that often occasions considerable controversy regarding the actual tension upon the rope when loaded. This subject has frequently been the basis of lengthy discussions but the difference of opinion invariably arises from the lack of sufficient knowledge respecting the fundamental principles of forces in action. To fully understand the question of rope strain it is necessary to familiarize one's self with the third law of motion, namely, "action and reaction are equal and opposite;" that is, when a force is applied, a corresponding force is exerted in the opposite direction. One of the apparently debatable points, in connection with the strain upon a rope, is the different ways in which this reaction takes place. If a rope is secure at one end to a hook in the wall and a man pulls on the other end with a force of 100 lbs., it is obvious that the rope is under a tension of 100 lbs. However, if the rope is removed from the hook and a man is placed to oppose the pull of the other, some persons are under the impression that the rope is under a strain of 200 lbs., due to the pull of 100 lbs. at each end of the rope. This, however, is not the case, as it is quite clear that the extra man has only replaced the functions previously performed by the fixed hook.

Therefore, irrespective of how the reaction operates, it will be readily seen that the strain in the rope can only equal the force or power applied; this not only applies to single ropes under direct pull but also to all individual or multiple systems. In the case of multiple block tackle, where the force applied is 100 lbs., this strain will be equal throughout the entire rope, with some slight variations due to the additional strains resulting from the friction of the moving parts. For instance, in a block and tackle where the free end of the rope is subjected to a pull of 150 lbs. and the weight is suspended from the lower block, which in turn is supported by five sections of the rope, the strain would be uniform in all portions of the rope. With a uniform pull of 150 lbs. the weight suspended would be $150 \times 5 = 750$ lbs., but the strain in each section of the rope would still be 150 lbs., the same as in the free end. The hangers of the upper block, however, would be subjected to a strain of 900 lbs., which is equal to the weight supported plus the force applied to balance the weight.

## U.S. CONTROLS OIL INDUSTRY

GOVERNMENT control of industry was extended to oil in a proclamation by President Wilson on a recent date putting under license the manufacture and distribution of all fuel oils. No mention is made of other oils or oil products, including gasoline and kerosene, but they, too, probably will be put under control soon.

Authority under the proclamation is to be vested in Mark L. Requa of California, recently named as Chief of the Fuel Administration's Oil Division. Licenses must be obtained before February 11 by all manufacturers and distributors whose gross sales of fuel, including gas oil, amount to more than 100,000 barrels a year.

A series of regulations drawn by the Fuel Administration estables in the East a list of preferential consumers who must be supplied in the order they are given, regardless of contracts outstanding.

## VARIABLE SPEED PULLEY

By L. E.

AMONG the advantages claimed for a variable speed pulley without gearing which has been placed on the American market are a reduction in the number of parts employed to provide the speed variation and the adaptability of the pulley for governing the speed of a heavy stamping press or delicate mechanism. It is also possible to vary the velocity ratios between the driving and the driven shafts at will without interrupting the transmission of power.

The pulley, which employs a flat belt, consists essentially of a pair of flanges, a set of segments, and six notched vanes. The segments are of two types, those known as the spring segments forming the first or smaller diameter, while the master segments are arranged underneath. The latter work between the fixed flanges, the vanes sliding through them. Guide slots, in which a roller engaging in the body of the segments travels to produce the expansion or contraction, are provided in the vanes. In this way the pulley retrains a true circumference at any diameter.

When definite variations in the speed are desired, notches are cut in the sides of the slot to facilitate setting. It is also possible to give the slots a perfectly straight outline, thus providing for minute variations in the speed if desired. The pulley is usually worked by a lever and notched quadrant, but where desired a hand wheel or a lever may be substituted. It may also be employed as a clutch in connection with machines driven by an electric motor. In this case the motor is started with the pulley collapsed, so that the bolt slips with little or no load. As soon as the motor has attained its normal speed the pulley can be gradually expanded, thus gripping the belt and taking up the loadby degrees. The addition of an idler puller pressing against the belt enables it to be used as an adjustable-speed pulley, since the slack in the belt is then taken up. The pulley which is an Australian invention, has also been applied to a motor car in substitution for the usual gear box.

## MACHINE TOOL RECORDS

IN a small machine shop no difficulty is found in charging the memory with the capabilities possessed by each individual tool, its power, its range of capacities, its speeds, feeds, and output. But in a large works this is not possible. Yet it is essential that these data should be known in the tool room if work is to be arranged in its correct and complete sequence of operations.

For this purpose a record must be kept in the tool room of the capabilities of every machine in the shop on which the dimensions centres, sizes of work tables, clearances, travels and traverses, speeds, and feeds are all stated. These records may take the form of small blue prints kept for reference in albums or on boards, duplicates of which may be attached to the corresponding machines in the shop.

It is essential to the success of a scheme like this that the times of production on which estimates are based in the tool room should be rigidly adhered to, and not be varied materially except of necessity, and then only by arrangement. Hence a loyal co-operation between the two is essential. Tool room experts are not infallible, machines have their idiosyncrasies, hence the schemes of production may have to modified after friendly consultation with the [illegible] of departments.

If a machine does not produce the quantity on the basis for which its output has been estimated, the total output will lag. The knowledge of the relative utilities possessed by different tools which produce identical results by means of dissimilar methods is a detail which is of much importance in the arrangement of operations by very considerable amounts, provided that the volume of repetitive work is sufficient to keep machines in constant service. This is the reason why it has sometimes been deemed consistent with the truest economy to throw out machines that are in excellent working order and replace them with later designs, the output from which justifies the capital outlay involved.

The movement which has brought the importance of the tool room into prominence, apart from tool making, grinding and repairs, is the ever increasing employment of jigs and fixtures. These inevitably crystallise the methods of the shop in which they are used into uniform patterns. The tool room embraces the tool stores. Within it the small tools are arranged in bins, drawers, and racks, suitably labelled and recorded on cards to be checked in and out. In a large shop this entails a good deal of clerical labor, but enables the location of any tool to be ascertained within a minute or two.

## A TRAVELLING ANTI-WASTE EXHIBIT

IN a large manufacturing plant, where thousands are employed, it is surprising to learn of the food products and material wasted each day.

To give the employees of the Westinghouse Electric & Mfg. Company some idea of the waste the management devised the novel scheme of fitting up a [illegible] of [illegible]

EFFECTIVE EXHIBITION OF MATERIALS WASTED IN A [illegible] PLANT

[illegible] cakes, crackers, pickles, cheese, fruits, etc., as well as a quantity of manufacturing [illegible] lead, mica, rubber, felt, gum, and similar material, which could be used to advantage.

It was estimated that the foodstuffs wasted per day amounts to between $35 and $50, cost of which, of course, comes out of the employees' pockets; the waste of material, amounting to hundreds of dollars per day, is a loss to the company, all of which is due largely to the thoughtlessness [illegible]

Above the material is constructed a sign reading in large letters, "Wasted," and underneath the words, "Food brought from your homes," and on the other side, "Material belonging to the company."

This truck was driven up and down the shop aisles, where the employees could look upon it and form in their minds some idea of the waste in a large manufacturing plant: such an object lesson is valuable at this time when everyone should take all precautions necessary to waste as little as possible.

FORTY-NINE per cent., or almost half of the total railroad fatalities for the year 1916, were due to trespassing on the trains or tracks, a thing that is forbidden by Law in Europe

# Notes on the Organization of a Shipyard Service Department*

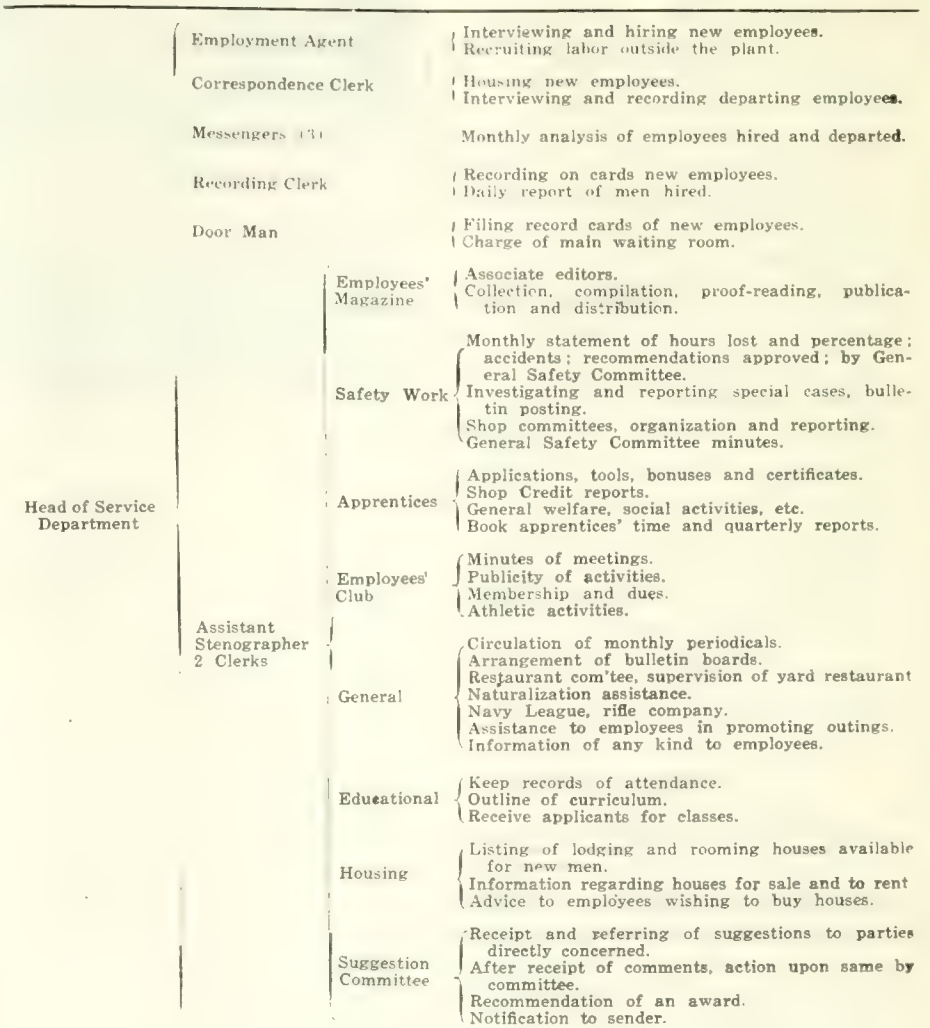
By Samuel W Wakeman

*Humanity's [illegible] help beyond all preconceived ideas are the source of not a little anxiety to [illegible] have assumed responsibility for making good the ship supply of the Allies. The [illegible] results attending the activities outlined by the author are not due to any new or [illegible] ideas but represent the application to shipyard work of what has been done by successful [illegible] in many other and varied lines of manufacturing activity.*

THE object of this paper is to describe a method of handling certain phases of shipyard work which has been successfully tried out in one large eastern plant. Although some of the functions of this department are probably being carried out in the different yards to-day, we do not know of anyone who has treated this problem in just this manner. About two years ago the president of the plant became interested in the enormous number of men that it was necessary to hire each month in order to maintain the working force then needed to carry out the work in hand. He determined that this problem must be solved, and a committee was selected from the plant, composed of workmen, foremen and others. They made a tour of the country, visiting the following manufacturing concerns: Link Belt Company, Sherwin Williams Company, Jeffery Manufacturing Company, Cleveland Hardware Company, Curtis Publishing Company, Chalmers Motor Company, Cleveland Foundry Company, Goodyear Tyre and Rubber Company, Cadillac Motor Company, National Cash Register Company, Dodge Motor Company, Packard Motor Company, Ford Motor Company, Westinghouse Manufacturing Company, Carnegie Steel Company. The most courteous treatment was accorded this committee at each of the above-mentioned plants, and the fullest information was given by them on all of the points which this committee investigated.

### Centralized Activities

On their return they prepared a report of their investigations, together with such recommendations as to the betterment of the then existing conditions as they thought should be made, these recommendations including such ideas as the centralizing of employment instead of allowing each one of the different department heads to carry this on themselves. It also recommended that a new building be erected for this purpose; that a different point of view be taken with regard to applicants for positions, namely, their treatment should be as courteous and as fair as was possible to be given; that the housing and boarding situation be investigated; that all men leaving the employ of the company should be [illegible] a chance to air [illegible] further recommended a great many lines of activities to be encouraged in the plans and touched on many lines that had to do with the physical, mental and social condition of the employees. The recommendations of this committee were printed in pamphlet form and sent to about 200 people in the plant. They were asked to freely criticise and, if possible, to make further recommendations. All of this information was then collected and formed the basis for the policy which is being pursued at the present time in regard to the service work in this plant.


Head of Service Department
Employment Agent
Interviewing and hiring new employees.
Recruiting labor outside the plant.
Correspondence Clerk
Housing new employees.
Interviewing and recording departing employees.
Messengers (3)
Monthly analysis of employees hired and departed.
Recording Clerk
Recording on cards new employees.
Daily report of men hired.
Door Man
Filing record cards of new employees.
Charge of main waiting room.
Assistant Stenographer 2 Clerks
Employees' Magazine
Associate editors.
Collection, compilation, proof-reading, publication and distribution.
Safety Work
Monthly statement of hours lost and percentage; accidents; recommendations approved; by General Safety Committee.
Investigating and reporting special cases, bulletin posting.
Shop committees, organization and reporting.
General Safety Committee minutes.
Apprentices
Applications, tools, bonuses and certificates.
Shop Credit reports.
General welfare, social activities, etc.
Book apprentices' time and quarterly reports.
Employees' Club
Minutes of meetings.
Publicity of activities.
Membership and dues.
Athletic activities.
General
Circulation of monthly periodicals.
Arrangement of bulletin boards.
Restaurant com'tee, supervision of yard restaurant
Naturalization assistance.
Navy League, rifle company.
Assistance to employees in promoting outings.
Information of any kind to employees.
Educational
Keep records of attendance.
Outline of curriculum.
Receive applicants for classes.
Housing
Listing of lodging and rooming houses available for new men.
Information regarding houses for sale and to rent
Advice to employees wishing to buy houses.
Suggestion Committee
Receipt and referring of suggestions to parties directly concerned.
After receipt of comments, action upon same by committee.
Recommendation of an award.
Notification to sender.

A brick building was erected near the main gates of the plant to take care of the hospital work, the employment department, and the general activities of that nature. These activities were grouped under the name of Service Department which, as its name signifies, is to render service to the employees of the plant. This department was put under the supervision of the general superintendent of the plant. The scope of its activities are as follows:—Employment, hospital, safety work, educational work apprentices, employees' club, works paper, suggestion committee work, yard restaurant, shop training. The personnel of this department consists of the following: Supervisor, assistant, clerks, stenographer, supervisor of instructors, employment agent, employment clerk, doorman, doctors, nurses, messenger boys for conducting applicants to shops.

### Interdepartmental Service

In order to see clearly the relationship between the Service Department and the superintendents and foremen in the yard in regard to the supply of labor, the following illustration is used: The ship carpenter may want 10 pieces of 12-in.

*[illegible] Society of Naval Architects [illegible] November.

by 12 in. yellow pine, 30 ft. long. His requisition comes to the purchasing agent, who buys this material and has the same delivered to the ship carpenter. If on inspection by him three or four pieces out of the 10 prove defective, he condemns this material and the purchasing agent replaces it. The ship carpenter decides what class of work this lumber can be used for and decides also whether the price paid for it is justified.

The same procedure holds for the supply of labor. A foreman finds he will need a certain number of men at a given time. He sends his requisition for this labor to the employment division of the service department. They send the required number of men to the foreman after interviewing these men, and weeding out, so far as is possible, such applicants as would be incapable of carrying out the work for which they are required. These men are sent to the foreman of the department, who takes or rejects whatever number he may see fit and rates those he keeps, and those he rejects are sent back to the employment department, where an effort is made to place them in some other department in the yard where they may find work which they can do.

If the men hired are not satisfactory to the foreman, he may discharge them. In no particular are any of the foreman's prerogatives in regard to the handling of labor taken from him. The advantage of this method, however, is that the foreman is not compelled to interview a large number of men who have no qualifications for the work he is supervising, and his time is conserved for the more important duties he has to perform.

### Physical Inspection.

Each applicant for a position is put through a careful physical examination by the company's doctor, and only such men are employed as are capable of doing the work for which they are hired. This has resulted in getting a very good class of men, and, where slight physical defects are found which can easily be remedied, the man is sent to the proper medical authority and taken care of. At first there was considerable objection on the part of some of the men, but at the present time practically no one objects to the physical examination.

The employment department keeps an up-to-date requisition of all labor requirements of the plant, and takes such steps as are necessary, through its various sources of supply, to keep this requisition filled. It attempts to learn, by keeping in close touch with the various departments, the probable future needs for labor, which is a virtually essential factor in keeping a steady flow of men into the yard. All applicants for work are quartered in a waiting-room in the service building, equipped with chairs, and are interviewed in turn by the employment agent, being given a private interview in a separate room. Each applicant when hired is given a book which contains all the information about the plant that it is considered a new man should have. This book has been carefully prepared and gives the hours of labor, the method of tool delivery, certain safety suggestions, times and methods of payment of wages and, in general, information in a condensed form which the new employee generally gets only after long association in the plant. This book has proven to be a great help to new men coming into the plant.

All employees transferred or leaving the employ of the company are required to be interviewed by the employment agent before they can obtain their wages. This provides an opportunity to place the man in a department where he many fit to better advantage than the one in which he was working, and also gives him opportunity to state any grievances he may have in connection with the company, his foreman or his work. These grievances are carefully tabulated and looked into and have been found to be a great source of valuable information in connection with controlling the feeling the employees have toward the company. All records for present and past employees are filed alphabetically in the employment bureau, and these records contain the name, age, trade, physical qualifications, address, place of past employment, rate, &c.There is a daily report prepared by the employment department, showing the number of men hired and leaving by trades, also daily gain or loss in the working force. The department also makes a monthly report of the turnover of labor, including the number of men hired and leaving by trades, showing the length of service and reasons for the man leaving.

### Housing Facilities.

One of the most important phases of the employment work is to provide proper housing facilities, and to this end the employment department lists, for the information of all applicants, boarding houses and available houses for sale or for rent. If there is no position open at the time the applicant applies in person or by letter, an application card is filled out and filed by trades. All applications for employment are filed and, as far as possible, the applicant is informed as to what date his services will be required, giving the minimum and maximum rate for the trade desired and the hours of labor.

Under the service department is a competent surgeon and an up-to-date hospital where all of the accident cases in the yard are treated. The families of the employees may obtain free medical attention during certain hours of the day. The safety work in the plant, which has reached a fair state of development, was combined with the work of the service department and the different shop committees, together with the General Safety Committee, use this building as a meeting place, where frequent talks by men who are specialists along this line of work are given to these men. Each department has its own safety committee, which makes periodical inspections and reports directly to the General Safety Committee. A great many ideas for work of this nature have originated in these committees and numerous appliances and safeguards have been adopted, due to suggestions received from them. All accidents are carefully investigated and the causes are immediately remedied; responsibility for accidents as far as possible is placed and steps taken to rectify them.

All of the educational work in connection with the training of apprentices and the training of men in the shops and different departments throughout the yard have been placed under the jurisdiction of the service department. During the winter months, evening schools are conducted which provide training in naval architecture, mould-loft work, plumbing, coppersmith work, machine shop design, mathematics and blue-print reading. The instructors for these evening classes are, for the most part drawn from the various departments in the yard and the instructions carried out under the direction of the local school board. These classes are open to any male beyond the age of 16 in this locality and are attended by mechanics, apprentices and helpers to the number of about 200.

All of the work in connection with the apprentices in the plant is carried out under the supervision of the foremen in the different departments, but along the lines as laid down by the educational part of the service department, and the head of this department has been very successful in this connection with the attitude of the apprentice toward the company. Each year a dinner, to which prominent officials of the company are invited, is given by the apprentices, and efforts are made to promote the best of feeling among the young men who are being trained for future service in the [illegible]

### Social Services

The service department supervises the publication of a works paper, which is issued every three months by the employees. This paper has developed to such an extent that its issue is awaited with a great deal of interest by all of the men in the plant. The company presented to the employees of the plant a club house equipped with bowling alleys, [illegible] pool table, a band room and an athletic field where the different athletic teams practise and have their games. Quarters are provided for the athletic teams of the company in this building with suitable shower-baths, etc. This club is run entirely by the employees of the company, and only such necessary supervision is given to it by the service department as is absolutely necessary. A restaurant is maintained inside the plant for the benefit of the employees. The supervision of this restaurant, although run by an outside caterer, is left to a committee of the employees who are in close touch with the service department.

One very important part of this service department work is the handling of the suggestions sent in by employees. Boxes are placed throughout the yard, and prizes are offered for suggestions sent in by the men. There is a great deal of work in connection with the

employee means, the making of sketches, the reporting of these suggestions to the proper people so that they may be acted on, and the attitude which the men [illegible] of the work must be careful'y handled in order that the greatest amount of good may come from it. The work of this committee, of which the head of the service department is chairman, is one of the very important functions of this department.

### Tracing Results

All of this work has begun to show results which it is felt can directly be traced to the work of this department. [illegible] of the large manufacturing plants throughout the country that have attempted to increase their [illegible] necessary to hire anywhere from seven to ent employee. The latest results here to ten in order to obtain one. When you and, in the main, to the general broad tion, in order to maintain a force of about 4,000 employees it was found necessary to hire, in the course of a year, 8,000 men. During the last six months the present force has been increased from 4,000 to 8,000, and this has been done by hiring 9,000 men. While these results cannot all be attributed to the work of this department, nevertheless it is felt that, in a large measure, the work which has been accomplished by them is responsible for a large percentage of this

It is not claimed that any new or radical ideas have been adopted in connection with the handling of this situation, but what has been done is to find out what successful concerns in other lines of work have done, and to combine them together in such a way that they might be adapted to the work of a shipyard. A man was employed who was thoroughly familiar with the sources of labor supply in the district in which this plant is located, and much credit is due him for the enthusiasm with which he approached this difficult problem. An outline diagram showing the relationship of the different functions of this department to each other is given in the preceding page.

## THE PINNACLE OF GREATNESS

By James E. Cooley

IN winding valleys and level plains; on rolling hills and projecting peaks of this age-old mother earth, stands man, distant from the summit of great human achievements only by the space that separates it from the base.

Of his own choice he may, if he so wills, remain in a deep abyss or land on top of the world. The choice between mediocrity and greatness is one subject to his own initiative. Mediocrity serves nothing, has nothing, arrives at nothing.

### Evolution of Greatness

Greatness is evolved only by interest [illegible] in one's self and ones work vigorously aroused to some great aim or end, and, further, by an aggressiveness that is coupled to a determination whose force develops only by the fairness of most every abounding energy.

Of his own choice, by his own personal [illegible] he may, if he so wills, [illegible] life that comes sailing to you on wings [illegible] have felt the urge to develop to the limit of your possibilities, to rise from indolence to diligence, if blood is aroused [illegible] will not been lived in vain.

### Self-Possession

All you need is to straighten and tighten your energetic wires. To become charged as earth and sea, as [illegible] and casting waves are [illegible] you need is to rearrange your perspective, discard your mental rubbish, put in thorough order each detail wherever you live and move and strive. Your decision is nothing, your resolution is nothing, you no longer need to juggle or toss the bubbles of time or chance, or believe in a faith that someone else serves you besides yourself. Only your awakened and alert spirit is your self-possession. Give it it's proper chance to work and act. And let its work be power-work, brain-work, muscle-work.

Your energy is the red-blood you, a God-given sweet possession that bids you rise from the strata of content, from the fossilized beds of vanity and self-conceit, and act and be that hustling red-blood you. Have you met the perfect physician, the perfectly skilled surgeon, the perfect lawyer and purist, the perfect artist, and the most learned scientist? You never have, because that being awaits to appear in you.

Do you know a weed from a vegetable, a stalk from a flower, the moon's phases, the planetary courses? Do you still carry a child-mind in a man's body? Are you brutish? Are you still slovenly, [illegible]—are you ready to change? Over the mountain ranges and through the valleys of existence comes now the triumphal sounds heralding in a new day of race-betterment, an era of spirited and energetic men and women. It is calling to you of the disheartened class, you who have failed and linger, you who have been dragged and supported by others, to become strong and powerful where you are now helpless and weak. It is calling you into a vast field to labor in the work of destroying ills, to help prevent wastefulness, to create new methods and conveniences and bring to pass a cradle-to-the-grave healthfulness and happiness.

### Life's Work

No life is worth living, no death worth dying, unless behind these there are unnumbered days of exertions and strivings in world-betterment accomplishments. No seed is worth planting, no harvest worth gathering, if behind these man's labor has not been to lift humankind from what it is to something high- [illegible] to broaden the mind to enrich the intellect, to throw a light in the darkness, to shift feet from aimless roads, to [illegible] sides to feed, clothe, and rest the human body.

Ask not what you can do, but see what you are leaving undone. Ask not where your talents should be directed, [illegible] Awake from your littleness and obscurity, move upward and outward. Find no labor too little or too big, but what you can and should handle with thoroughness and despatch. Don't dream, don't idle, don't waste, or talk and mimic in useless repetition. And when you have finished a task and done it well and to the best of your ability don't sit in mopish wonderment and admire it. But, rather move again forward, give yourself no rest, think not of meals, of clothes or ease, but move steadily on.

### Personal Effort

Go thou forward and accomplish greater "stunts." Revive each lagging moment with greater urge. Aspire and perspire in unceasing toil and labor. Be early at work, tirelessly alert and awake. Strive steadily on from sunrise to sunset, or from sunset to sunrise again. Let your efforts be a battering-ram across the labor of the day; a lever and fulcrum to pry each impeding obstacle. Be accurate, be punctual, be fully alive to all your possibilities.

Go thou forward with undying faith in yourself; a firm believer in yourself; held back by no weak hindrances, but with a steady outlook on a progressive path. Increase your speed, increase your skill, think out new ideas, adopt new methods, be saving, be thrifty, and above all be energetic.

Let us break away from old world forms and habits. Let us recreate from out of the old a new-world-building rich and grand. Let us make it unpopular to lie and cheat and steal. Let us make it unpopular for young men to marry un-

less they have prepared a home or saved sufficient means to get one. Let us care for the aged that there may be no longer fatal lamp burnings or broken hips. Let us see that each child born in the world is properly clothed and nourished, receives a good education, and gets a fair start. Let us protect girlhood and womanhood from moral perverts. Let us have no social outcasts. Let us rid ourselves of age-long evils. Let us live as near as possible in a scientific realm. Become forceful energetic beings, with discerning minds.

### Introspection

Let each one of us this generation go forward and create a new epoc. Be real, live, acting men and women, wakeful and alert, spiriting and urging ourselves daily in a common purpose and strive to attain the pinnacle of greatness in noble works for human-kind.

This we can do and this we will do just as soon as we begin to look deep within and see ourselves as we are, and arise to our possibilities; just as soon as we discard our cloaks of lethargy, tear down the dusty films from brain and vision, quicken our pace, increase our combativeness, and stir up within ourselves the fires of energy.

## SOME NOTES ON THE HISTORY OF ARTIFICIAL FLIGHT

While the history and development of the aeroplane and the dirigible may be said to be confined almost entirely to the present century, there were a few venturesome pioneers in the past ages who speculated with optimism upon the possibility of man's conquering the realms of the air.

### Aviation

Aeronautics is divisible into two main branches—aerostation, dealing properly with machines which are lighter than air, and aviation, dealing with the problem of artificial flight by means of flying machines, which, like birds, are heavier than air, and also with attempts of human beings to fly by the aid of wings fitted to their limbs.

As might be expected the fitting of artificial wings, being the most natural means of locomotion to suggest itself, would first appeal to the imaginations of men, and so Greek mythology and Egyptian bas-reliefs both suggest this means of locomotion.

John Wilkins, one of the founders of the Royal Society, discussed the possibility of flying to the moon and cites several myths or fables, to him true, of men who had succeeded in flying by means of wings. One of these, a monk, living in Edward the Confessor's time, was said to have flown a distance of about a furlong.

Francis Bacon likewise in his Natural History discussed the possibilities of artificial flight, but in a manner obscure and somewhat confused.

### Leonardi Da Vinci

One of the most versatile men of any age, Leonardi Da Vinci, who was painter, sculptor, architect, musician, mechanician, engineer and philosopher, devoted some of his time and inexhaustible genius to the study of artificial flight. He excelled in all of these and in engineering and scientific subjects was in many instances a pioneer.

For one living in the fifteenth century his knowledge of science in general was remarkably complete and accurate, and in one of his sketches he pictures a machine so closely approaching to the modern aeroplane in design that had it been fitted with the proper motive power it might conceivably have flown.

### The Flight of Birds

The impossibility of man's flying by means of wings and unaided by any external motive power was first clearly pointed out by G. A. Borelli in 1680. By means of an examination of the flight muscles of birds and calculations as to their enormous power he clearly pointed out the impossibility of man's being able to suspend himself in the air by means of his muscular strength alone.

Many attempts have been made to devise means of flight patterned after the wings of birds and provided with motive power for effecting the flapping of the wing members, and while the principles underlying bird flight are well understood and while excellent models have been made which have flown considerable distances, no device sufficiently large enough to sustain a man has as yet been constructed, possibly because of the many disadvantages and constructional difficulties inherent in this type of machine.

### Dr. Johnson and Aeronautics

The great English lexicographer, Dr. Johnson, was perhaps the first to state with accuracy the principle involved in any successful effort with "heavier-than-air" machines. How it happened that he, who had but a casual acquaintance with the science of his time, directed his attention to this matter, it is now impossible to say.

In 1759, to raise money for payment of charges consequent upon the death of his mother, he wrote "Rasselas, Prince of Abyssinia," a remarkable book telling of a quest for happiness. The story relates that before starting on his travels with this object, the prince, amongst other devices to relieve ennui, had consorted with men of learning and skilled exponents of various arts; amongst these, a mechanical genius, referred to as the "artist," who, to provide amusement for his patron, suggested an attempt at flight, and in discussing the matter says: "He that can swim needs not despair to fly; to swim is to fly in a grosser fluid, and to fly is to swim in a subtler.' Then follows this enunciation of principles: "We are only to proportion our power of resistance to the different density of matter through which we are to pass. You will be necessarily upborne by the air, if you can renew any impulse upon it faster than the air can recede from the pressure." This is a remarkable statement having regard to the state of knowledge at the time—159 years since. It correctly defines the principle underlying "heavier-than-air" aviation.

Dr. Johnson's was a mind extraordinarily active, and not to be deterred from addressing himself to a strange subject by its strangeness merely, so that no great surprise need be felt that he should consider this, but only that he should have made so illuminating a pronouncement with respect to a branch of study alien to his usual pursuits. By a Newton it would have been stated with more of mathematical precision and effect, but not more truly. It is not improbable that Johnson, mingling with the intellectuals of his time, got the idea, expressed so well, from one of these, but there is no evidence of this, and we need not question but that his naturally vigorous intellect was well able to go straight to the root of such a matter, even though it might be on ground unfamiliar to him. On the other hand, he may not himself have fully realized the truth of the statement, a supposition countenanced by other theories advanced by the "artist" of a much less acceptable nature.

It is of interest to note that the prince is described as having given his consent to the experiment, the mechanic stipulating that his invention should be kept secret for reasons which must appeal to us to-day. He says: "If men were all virtuous, I should with great alacrity teach them all to fly. But what would be the security of the gods if the bad could at pleasure invade them from the sky? Against an army sailing through the clouds, neither walls, nor mountains, nor seas, could afford any security. A flight of norther savages might hover in the wind, and light at once with irresistible violence upon the capital of a fruitful region that was rolling under them."

Later in life, Johnson appears to have been attracted by the attempts of the ballonists. The Montgolfer brothers were experimenting in 1783, and on September 29, 1784, the doctor wrote to a friend that he had received three letters in one day about "the air balloon."

In October of the same year, with reference it is to be supposed to some mishap, the doctor wrote: "The fate of the balloon I do not much lament, to make new balloons is but to repeat the jest again... The first experiment, however, was bold, and deserved applause and reward. But since it has been performed, and its result is known, I had rather now find a medicine that can cure an asthma."

ONE of the serious difficulties in the melting of copper in an open coke fire is the absorption of sulphur which will take place. Copper carelessly treated in this way will smell strongly of sulphur dioxide in cooling, in which event it is useless for casting until the sulphur has been removed. The most careful attention is necessary in melting copper in order to ensure good results in castings, and one means to this end is the use of salt in conjunction with the charcoal that is now universally used, says the *Brass World*. It is not necessary to go to extremes in the use of salt; just a tablespoonful to 100 pounds of metal will be a great help in all ordinary cases, but when the metal has been burnt more will be required.

# Sales Agent Caught a Tartar When He Tried to Fix Toronto Superintendent

## Had It All Figured Out How He Could Make a Good Sized Rake-off Each Month—Trap Was Laid When the Sales Agent Thought He Was Putting Grease on the Skids That Would Lead to Big Business

*The facts contained in this article were given to a representative of* CANADIAN MACHINERY *this week. An official of a large plant in Toronto outlined the whole thing as it happened. For reasons that are very legitimate he requested this paper to not use the name of his company or the company using the "greasing" method referred to here. However, he was anxious that the facts should be brought out so that this method of doing business should be suppressed.*

FIRE the purchasing agent of this city we'll call the salesman Mr. Grease from the method of his tactics of greasing the hands of those with whom he did business. The superintendent of one of the best-known shops in Toronto can here be called Mr. Blank. Mr. Grease represents a house calling on machine shops and kindred plants. He hails from a city other than Toronto. Not having been able to secure orders from the Toronto plant in question, Mr. Grease kept on persistently, and at last got in an initial order. The order was given more to get rid of the man than because it was considered that his wares had any particular merit.

### His "Follow-Up"

Now that he had driven the thin edge of the wedge, Mr. Grease sought to lay hands on the sledge hammer that would open the Toronto house up for his line of goods. He didn't bother about any of the understrappers around the shop. He went straight for the superintendent. If he could tie him up the business was his. He didn't waste much time in the preliminary wind-up. Mr. Grease figured that his snake fund was the most powerful weapon he could bring to bear on the situation. So he got Mr. Blank in his office in the factory and easily at first, and with a great burst of speed as he proceeded, he began to lay the programme.

### Lots in On This

"You don't need to be afraid of this," urged Mr. Grease, "almost every person is doing business on this plan now, and none of them who are dealing with me have ever had any trouble. The goods will not cost your company any more on

Superintendent.

this account. The thing is square enough. I spend money this way instead of advertising. I will pay you one per cent. on every dollar's worth of business you place will me from your company or any of the other concerns [illegible]. I have gone into this matter carefully and I want your business. I am prepared to make it worth while for you. I reckon that I can get for your own pocket, if you can switch your whole plant to my line, at least $1,000 per month.

### He Was Doubtful

Mr. Grease left the vision of the thousand per month in thin air for a moment. He reckoned that it would not take long for a four figure harpoon to ride through the skin of Mr. Blank's scruples. But Mr. Blank was not quite certain. If he was going in for the snake fund he wanted to grab a good big fat snake instead of a skinny little garter snake that the hired man can kill with the hoe handle.

"But one per cent. is not much for me to get out of this," argued Mr. Blank, "considering all the money I make for you and the chances I take in doing this kind of work. What's more, I understand that you pay a higher rate than this to some of the other men you deal with."

### A Bright Idea

"The rate I offer to pay you," replied Mr. Grease, "is exactly the same as I am allowing to the others who are in on this offer. However, if you want to raise it a little, I believe it can be done. Prices are jumping in all lines just now, and it wouldn't be much of a trick to raise the price to your firm a little. That increase is yours," concluded Mr. Grease with an impressive wave of the hand.

"Looks easy enough," remarked Mr. Blank, "but it would be safer if we could get the purchasing agent in on this, too. The two of us can swing such a proposition much easier than one. We practically have the whole thing in our hands here. When you come again on Friday I'll arrange to have the purchasing agent on hand. By then I can have a favorable report on your line, and we can fix it up to get started at once."

So Mr. Grease left, having made an engagement for a visit with Mr. Blank and the purchasing agent on Friday.

### Ready for Him

Mr. Blank at once got into touch with the officials of his company. He had been with them for twenty years, and he

Superintendent Advises Secretary that "Grease" Should Get on Casualty List.

knew they trusted him implicitly in everything. He outlined Mr. Grease's plan of campaign, and suggested that he would be a good man to kill off quick. So plans for the killing were arranged. Mr. Blank and the buyer were to meet Mr. Grease, while another official, whose office was contiguous to that of the superintendent was to be an unseen witness to the handing over of the coin, for this was one bit of evidence that they were particularly anxious to hang around Mr. Grease's neck.

### They Were Ready

The salesman was on deck at the appointed hour on Friday. When a man's going to swing a big deal he can't afford to sleep in in the morning. Mr. Grease believes in this. Mr. Blank and the purchasing agent believed it too. Introductions followed after the office door had been carefully closed. Mr. Blank assured Mr. Grease that the third party to the deal was O.K. This relieved the element of doubt and brought about the very at-

The Sales Agent Brought in. Superintendent Assures Grease That He's O.K.

mosphere in which big deals are hatched and where millions come to existence.

Mr. Grease led. In fact he played his whole nine innings before the others had a chance to come to the plate. The thing looked good to Blank. Likewise it appeared a pleasant thing for the purchasing agent to gaze upon. Mr. Grease took a pencil, a jacknife and a sheaf of paper. He put it down in black and white, showing how there was a good fat

thing in the deal for two on a fifty-fifty basis.

**He Had the Cash**

"But how about the commission on the first order?" asked Mr. Blank, who was anxious to speed up the game to the point where Mr. Grease would produce the actual cash.

But they couldn't stall Grease. He had apparently not forgotten anything. He was prepared to put salve on the skids right from the start. With a bland smile that comes but few times to few people and often not at all to many, he let his strong right hand glide to his inside pocket. He produced an envelope from a spot close to his heart. Said envelope had five new ten dollar bills. Grease handed them over with the remark that a procession like that would come in handy. He also suggested that a real order could be accepted right now.

**What Happened**

Mr. Blank took the snake fund in his hands. It seemed to make an excellent tonic for his vocal chords. It also put some ginger into his make-up that Mr. Grease had not noticed before.

"You poor, miserable cur," snapped Blank. "I have been with this concern for twenty years. I have handled deals that would make you dizzy. The company has been on the level with me and I have been the same to them. This is the first time I have ever been insulted by such a dirty low-down offer. You

The Handing Over of the Coin put Lots of Action in the Superintendent

will never do another cent's worth of business with this or any other concern that I can head you off from." Then, tossing the bills across the table he concluded "you'd better take your dirty little bills and clear out while the way's still open."

Poor Grease gathered up his snake fund, his hat, and cleared out.

**Would Deduct it**

The secretary of the Toronto concern was on the point of writing the firm represented by Mr. Grease to the effect that they were sending them cheque for the goods minus one per cent. which they understood they had been overcharged. A better way was suggested. It was found that the goods were still intact. They were shipped back, a letter following stating that owing to the rotten business methods followed by the concern it was not their wish to have any dealings with them at all.

"Do you come in contact with much of this sort of business?" inquired CANADIAN MACHINERY.

"Very little that comes to the surface," answered the official. "It is hard to find evidence that you can lay your hands on, although cases have come to the top where the scheme has been tried. The men who follow the graft game generally keep a good distance from the factory. They aim to 'fix' some person in our organization whom they can use to advantage. Fortunately we have an airtight staff that can't be fixed," he concluded.

**From the Legal Point**

CANADIAN MACHINERY discussed the matter with a gentleman well qualified to speak from the legal point on this question.

"In such a case," he stated, "the man who gives a bribe and a man who takes it are open for a charge. Of course it would be different where the man took it in this case with the knowledge of his company. Not many of these cases are ever followed up. Companies do not like the publicity they get in court. There is also an element of injustice in it for the companies that are proceeded against, for the actions of one dishonest salesman may be taken as the policy of the entire organization, which might be quite honorable and honest. Were there a desire on the part of the company to follow up such a case it could be done," he concluded. "The Crown attorney would have good cause to go ahead and issue the papers."

## THE CARE OF SAWS

THERE is a very great deal of bad work by those who use a saw, which no influence of any kind can improve, and a good deal of this bad work is due to the state of the saws, which will not cut straight unless the teeth are all of one height, and set equally to the right and left. If a board has to be planed after sawing, much more labor has to be expended on it to give it a good surface when badly sawn. In spite of the progress of wood-working machinery, the hand saws will never entirely disappear in remote districts, or in places where they are required occasionally, and the chief consideration is the amount they will cut in square feet without re-sharpening. Much depends on the nature of the wood and the amount of dirt that lies on the surface, which, when carried into the path of the saw, rapidly spoils the cutting action of the teeth. But more depends on the complete regularity of the tooth points both as regards height and projection to right and left after "setting." When half a dozen teeth in various positions on the saw are found to have a rounded point, due to wear, while all the rest of the teeth are quite sharp, it is plain that this half-dozen are projected so much beyond the others as to prevent them from engaging in the work of cutting. The progress of sawing is thus proportionately reduced. A well-filed saw shows equal wear on all the teeth engaged in work, and if the setting is equal it will cut in a straight line with very little guidance. The width of the cut must be nearly twice the thickness of the blade to permit the sawyer to guide it against the influence of knots or change of direction of the wood fibre. Saws of good quality wear out more files than [illegible] longer, and being spring tempered they remain perfectly straight. There is no profit in a cheap saw for a man who uses it often. The circular saw, after a long period of popularity, is now giving place to the band saw, which is more easily managed. The circular saw requires very careful management, and if twisted or buckled needs an expert to set it right. Its popularity depended a good deal on the ease with which it could be fitted up on a wooden bench. The frame of the band saw costs much more, but the blades are comparatively cheap, and it will deal with much thicker logs than can be cut by the circular saw. It is estimated that there can be from 50 to 65 thousand feet of average wood cut on one sharpening.

## ELECTROLYTIC ZINC

THE complex ore question now has been practically solved. What under old conditions was waste has suddenly become valuable. Even if only 80 per cent. of the zinc in complex ores can be recovered successfully by the electrolytic process in its present state of development, the removal of this large percentage of a deleterious element from a complex ore will simplify the extraction of the remaining more valuable elements. Western metallurgists now estimate that they can treat the so-called complex ores by the new method, crediting to the process the value from the sale of silver, gold, copper and lead, and producing zinc at a price that will compete with the retort process under normal conditions. Even had the war not broken out when it did the electrolytic zinc process would still have been developed. The directors of the Anaconda Copper Mining Company were so impressed with this belief that they authorized a series of experiments at large cost, and they were concluded under the direction of Frederick Laist. They constructed a plant that produced 10 tons of zinc per day, and later increased this to a capacity of 35 tons. They decided then to build a modern plant close to the source of power, as this is the principal item in the cost of the process, erecting the largest zinc refinery by the electrolytic process in the world at Great Falls, Montana, U.S.A. The plant as designed will consist of five units. Late in December, 1916, three units were in operation producing 95 tons of metal per diem, assaying 99.92 per cent. zinc. The completed plant will have a capacity of from 160 to 175 tons daily. During the experiments in the test plant at Anaconda the process originally proposed by Laist and Frick was much simplified, consisting essentially of the following steps: First, careful roasting of the concentrate at temperatures not exceeding 730 deg. Cent.; dissolving the zinc, together with a little iron, by spent electrolyte in Pachuca tanks. A small amount of manganese dioxide is added to oxidize the iron, which is then precipitated by powdered limestone, bringing down any arsenic or antimony that may be in solution. This is leached through Oliver filters, containing only zinc sulphate, with a little cadmium and copper, is treated with zinc dust and again filtered, the filtrate being the pure zinc-sulphate solution which is sent to the tank room. The anodes are of pure lead and the cathodes [illegible] 48 hours only, when the zinc is stripped from the cathode sheets and melted into slabs.

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## BUSINESS ON AN HONORABLE BASIS

THE "greasing" method of doing business is not dead. It's been killed as many times as the Turk cruiser "Goeben" has been sunk, and as many executions have been performed on it as are registered up against the iniquitous practice of political patronage.

But it has a powerful come-back. Its recovery is always a little better than its recoil.

When one man or class of men are ready to drop it, there's bound to be another set coming along to pick the old thing up.

However you look at it, it's a poor way to do business. An article that can't travel on its merits is expensive at any price.

The system of paying a man to get a certain line of goods used or introduced into a factory where he occupies a responsible position is a miserable subterfuge for clean methods.

Sooner or later the thing will play out. The straw and wood will burn up and your greased organization will go down in such a heap that its knees will be driven up to its chin. After that the old cripple can never be straightened out again.

Whether you are selling, buying or manufacturing, go it clean. Get your business methods up level with your head where you can look them straight in the face. Make certain that your business is done in such a way that you won't have a brown tongue the day after.

Don't make the mistake of thinking that a little bit of temporary success can be worth as much as a permanent organization, built on legitimate and honorable lines.

And don't forget that there are very, very few firms who want to do business on the "grease" plan. They want to spend a dollar and get a dollar's worth of real value in return. That, and nothing else, is the real basis for successful and lasting business relationships.

## TELLING THE PLAIN FACTS

SIR ERIC CAMPBELL GEDDES, First Lord of the Admiralty, has been telling the people of Britain some plain facts in regard to the sinking of tonnage by the German submarines.

He has not stopped to mince matters. He has not attempted to cover rough spots by a smoke barrage of oratory. He has stated the facts, and in so doing has blazed the way for more plain talk from men in a position to command attention.

Sir Eric declared that it was possible to make good the losses to Allied shipping, but modified this with an IF that lends an element of doubt to his statement: "If we are given an adequate supply of men and material."

During the last quarter of 1917 Britain had lost on an average of 260,000 tons monthly. In that same period the construction had amounted to 140,000 tons monthly. In other words, the German submarine campaign in that period was winning against the best efforts of the British shipyards at the rate of 120,000 tons per month.

That is not a pleasant thing to look at. It justifies the use of the word "serious," which is noticed several times in Sir Eric's address.

Men skilled in the shipbuilding craft have been taken from the army in large numbers, and the military authorities contend that in many cases this has brought about an almost complete disorganization of certain units in which these mechanics held important positions.

When men in leading positions call a serious situation by its name, and cease to temper their words to suit the wishes and expectations of the people, the public will soon come to want the truth, and, once having secured it, brace themselves to it.

No nation or body of men can do its best work unless the plain, unvarnished facts are put before them.

It's no use expecting a man to lift a ton after leading him to believe that he was in for only a 500-pound weight.

## ILLITERACY IS WIDESPREAD

SECRETARY of the Interior, Lane of the United States, has done his best to open the eyes of the American people to the extent to which illiteracy has gripped a large section of the people of the Republic. It may be that United States participation in the war has brought the matter home to the authorities in a way that nothing else could have done. However that may be, Secretary Lane has put the matter squarely up to the people of United States and if they don't act to meet the situation it will not be because they have not had sufficient warning.

Here are some of the facts that Secretary Lane shows up:

There were in United States in 1910 no fewer than 5,516,163 persons under 10 years who could not read or write.

There are 700,000 men of draft age in United States who can neither read nor write any language.

Over 4,600,000 illiterates were over 20 years of age.

Half of the illiterates were between 20 and 45 years of age.

Over 58 per cent. are white persons, and of these 1,500,000 are native born whites.

It is estimated that the labor value of an illiterate man is 50 cents a day less than that of an educated one. This means an annual loss of $825,000,000.

Ten per cent. of the country folk of United States cannot read a bulletin on agriculture, a farm paper, food pledge card, a Liberty Loan appeal, or anything else.

These men, 40,000 of whom are drafted in the army, cannot sign their names; they cannot read orders, the manual of arms; they cannot understand the signals or follow the signal corps in time of battle.

This condition is not a very pleasant commentary on the state of affairs in United States, and the same remark, in less degree, doubtless applies to Canada. In times of peace the country has allowed these great bodies of people to slip and drift through the fingers of its educational system. Now, in times of war, it will find that the men drafted into the army will have to acquire some knowledge of the English language, and probably of reading and writing it.

# CAN NEVER AFFORD TO LET UP WITH STUDIES

**T. L. Crossen's Experience May Help Some Mechanics To See How Success Can Be Achieved.**

HE reads technical papers—likes to read the advertising pages—has done so for years. He believes in putting study and practical work together—in fact reckons they're a good tandem. Used to be an apprentice in a tin plate mill. Was 17 then. Now he's superintendent at the age of 38.

T. L. Crossen came to Canada to look after the erection of the plate mill of the Dominion Foundries & Steel, Ltd. The first steel for the mill construction was laid down on the first day of July, and Mr. Crossen had rolled steel ready to ship on October 25, 1917. Since then it has been a matter of getting the organization into better shape, adding to the plant, training men for the work and trying to keep up with the expansion that is the trail of this Hamilton concern.

T. L. CROSSEN

### Where He Started

It was in Cambridge when the old Morton Tin Plate Co. was still doing business that Mr. Crossen started as an apprentice in the machine shop. He was 17 then. Not long after the American Sheet & Tin Plate Co. took over the Morton concern, and Crossen, the apprentice, was included in the word "concern." Finishing his trade he soon became machine shop foreman. The Jessop Steel Co., at Washington, Pa., got him as assistant master mechanic. He had been twelve years in the work then. "One thing happened there that I'll never forget," said Mr. Crossen: "It was when we were making some very special and exacting tests on a new process. Sydney Robinson, managing director of the Jessop concern, was waiting to see the outcome of the experiments. He was as keen as a school boy and full of anxiety. Well, the results were simply great—away beyond anything we had hoped for. Mr. Robinson, a few minutes after we had finished the test, came out and shoved a cheque for $100 into my hand. He was pleased. So was I. I don't know what pleased me most, the cheque or the success."

### A Word to Mechanics

Shortly after that Mr. Crossen went as master mechanic to the Universal Rolling Mill Co., at Bridgeville, Pa., and his next step landed him as superintendent of the plant where he is at present engaged in Hamilton.

"If there's one thing the young mechanic should get into his system," stated Mr. Crossen to CANADIAN MACHINERY, "it is the value of reading and studying. I used to do some correspondence school work myself, but combined it with shop practice. The two go well together. The advertising pages of the technical and trade papers interest me. There you will find the latest thing in machinery. Especially the illustrated ads—they are written by men trained to bring out the very best features. If a man is asked for advice about the purchasing of equipment, he is in a position to give it if he is in close touch with the advertising pages of technical papers."

### Helped This Chap

Mr. Crossen has seen a number of young men enter the mills and work up. One chap came in at Pittsburgh. His father was English and his mother a Russian. Both were dead. The young man came as a laborer, and worked hard. "He came to me three months after," said Mr. Crossen, "and told me he wanted to be a machinist. I got him a chance and he was quick to learn, but he didn't know enough. I put it up to that chap to go to night school or quit his job. He went to school. Later he was in the Carnegie Technical School. He's now assistant general engineer of the Superior Rolling Mill. He's only 28 years old, and he'll go higher. A man can't afford to quit studying or learning if he's going to keep up with the developments that are coming up almost every day now," concluded Mr. Crossen.

In recalling the use to which the products on which he has worked were put, Mr. Crossen tells of rolling 4,000 [illegible] for work on the Panama Canal. Another interesting touch is that the first steel he rolled in Canada was consigned to a firm in Tientsin, China.

[illegible]

PIGS have once more gone and shoved the lid off the price can, and are now quoted at between $20 and $21 in Toronto with their boots on. It's only a matter of time until we'll have to teach 'em to play the piano and eat with a knife and fork.

* * *

THE Dominion Railway Commission has heard and granted an application to allow oleomargarine to be carried in the same type of cars as butter, poultry, eggs, etc. But it's a wonder we don't hear of a wee bit of brick heaving when a can of oleo slows up in its voyage through a strictly dairy section.

* * *

"ON our boat they had 185 third-cabin berths empty, absolutely empty, while the wounded men and furlough men of the first contingent were confined below. They might at least have given vacant berths to the cripples in the party." Is that the best Canada can do for its first contingent men? If so, it's time there was a mighty hard rattling and shaking of dry bones in high places.

* * *

IN Guelph the City Council has gone and put a new tax on dogs, from $3 to $5 each, and $15 for a kennel. Still it won't make much difference when a dog plants a soup bone in the centre of the geranium bed. A $3 pup can make just as big a hole in the ground as the $5 brand.

* * *

ACCORDING to the Hamilton "Spectator," the slogan under which the street railway companies do business in most places is "The Public Be Jammed!"

* * *

A SHORT note in a paper announces that the contract for collecting garbage in Brantford has been awarded to a man there. The item concludes by stating that the same individual will shortly start a piggery also. These two may run together quite well, but it doesn't put much of an edge on your appetite to read about it.

# Slightly Easier Tendency Noticed In Some Lines of Steel Plate from Jobbers

## Nothing Has Leaked Out Indicating Which Way The Price Changes Are Going On March 31—Labor Conditions In United States Shipyards Are Much Improved

ALTHOUGH the indication is probably too small to be accepted as indicative of the trend of prices in Canada, dealers are quoting steel plate at a rate ten per cent. off recent prices. One well known firm is willing to accept desirable business at $9 per hundred, although the list price still reads $10. Some of the Canadian jobbers are still in the peculiar position they dropped into when United States set prices some months ago on steel at a figure below that which the Canadians were paying. It resulted in the yards on this side of the line getting stocked at a price that was higher than that at which they could sell. Now they are disposing of their holdings in a very limited market owing to the regulations surrounding the class of business to which sales can be made. An advance in crude oil prices is noted this week, amounting to 10c per barrel in Canadian points and 25c on mid-continent figures. The demand for oil is strong. Dealers anticipate an upward tendency in high speed steel cutters on the American lists. They say the very large demand for this class of product is going to make a good chance for higher values. The scrap metal situation is practically tied up. Dealers claim they are not at all anxious to buy unless the offering be at a figure a half-cent off listed prices. The embargo places business within the confines of Canadian demands, and these can be quite easily handled. A resumé of U.S. conditions leads to the belief that a much more settled era is looked for, although it is impossible to forecast its duration. Big orders are being placed for the equipping of war shops overseas. It is more and more patent that the part U.S. is to play in the war depends on its tonnage. The settlement of labor troubles in the shipping industry is good news, and greater production from the yards means more effective participation in the war.

## SMALL DECLINE IN STEEL PLATE

### Dollar Off List Price for Desirable Business—Oils Have Taken Advance

TORONTO.—Although better transportation conditions have been looked for for several months past, they have not arrived in earnest. The only improvement is in shipments of recent date, which are coming through away ahead of those that have been on the rails for weeks, and in many cases months. The various embargoes, some put on by the roads themselves, others attached by the Government, have tended to create a tie-up that cannot be straightened out in a matter of days or weeks.

The steel market is steady. Several causes may have had much to do with this, and the chiefest probably has been the changing of manufacturing life from a peace to war footing. Now that this has been accomplished the tendency toward violent changes seems to be decreasing, although it may not be very noticeable on the surface yet.

Dealers in scrap metals are in the same position as they were a week ago. There has been practically no change at all. Here, again, the embargo cuts in and stops the shipment of this material from Canada, and of course business being done is confined to much narrower limits.

A tendency is noticed for an easier price in steel plates of certain lines, a ten per cent. mark being spoken of for favorable business.

An advance is noted also in the list price of oils, Royalite going from 17 to 18 and Palacine from 20 to 21. Crude oil is up 10c per barrel, and a mid-continent rise of 25c per barrel is also reported. There is a big demand for all grades of oil and cutting compound as well.

Business is reported brisk in all lines of machinery and supplies, but deliveries are not keeping pace with the volume of trade that is offering.

#### Iron and Steel

Canadian dealers in steel are waiting for the end of the month when the price lists approved by U. S. Government will be announced. It is quite correct to state that Toronto dealers, as far as CANADIAN MACHINERY can learn, are not looking for anything drastic in price changing. A number of dealers in the Dominion are in a peculiar position just now. Plates are listed now at $10 per hundred, but one large dealer said he would be willing to quote $9 for desirable orders. "We have not quite got out of the place we got in after prices were fixed in United States," he stated. "Canadian dealers ordered a large tonnage for various peace times work before the U. S. Government set the price downward. That resulted in many Canadian yards being stocked with material that was bought at a high price. We now find ourselves selling in a very limited field, for buyers are restricted to those who are engaged in work that can secure the sanction of the Government. "Another dealer complains of deliveries. He cited one case of a car that had got its start from Pittsburg on the 10th of January. On the 25th of March Black Rock reported that there was no trace of it.

This one instance of a ten per cent. drop in price is not taken by the trade as showing a general tendency downward. Prices seem steady, with few prospects of breaks.

#### Machine Tools

Price changes are few. Business is good in all lines. The fitting out of several large war plants has resulted in a big demand for oil pumps, with the added request of immediate delivery. Prices for these are holding at the advanced figure announced last week.

Shapers are up slightly, a ten per cent. advance being quoted on these. There is a rumor that the price of high speed standard cutters is going up. The reason for this is the fitting out of a large number of U. S. munitions plants. There is nothing to substantiate this report in actual figures, but when all the circumstances are considered, and the big demand also counted in, it seems probable that the tendency of high speed steel cutters will be upward. Good business is reported in these lines, and in some cases a betterment in deliveries is becoming noticeable.

#### Scrap Metals

Dealers in scrap metals report that their business at the present moment is stagnant. The embargo is still on against the exportation of scrap material from this country, and on that account the dealers are not anxious to go ahead and purchase more, when they have sufficient in their yards for all the Canadian trade that is showing. "The prices that are quoted in CANADIAN MACHINERY, stated one dealer this morning, "are correct enough in that they represent the real value of the market, but they are not the prices that we will pay. If any person wants to trim that price by half a cent or so we might be inclined to take a chance on the business, but otherwise it would be correct to state that we are not in the market for buying now. The

claim of the Government is that by putting on the embargo they will collect a large quantity of raw material in Canada, and in this way encourage manufacturers here. But as far as real business is concerned, we can handle enough scrap in a month to supply the Canadian demand for twelve months." There is some talk of a modification being made in the ruling about the embargo on scrap materials, but it is not beyond that stage at this writing.

### Non-Ferrous Metals

The metal market is feeling the effect of the many restrictions that have been placed around it. These have been in operation long enough to have a combined effect on the Canadian market. Gradually the stocks in the Canadian shops are being reduced, and they are not being replenished in accordance. Dealers see in this state of affairs a higher level of prices, although they are free to admit that they are not anxious to see this time arrive.

Copper.—Shipments of copper are smaller than usual. United States has done a very large export business in this metal, a large amount of it having come to Canada. Russia is not turning out enough copper for her own use, due largely to the unsettled conditions that have been prevailing there. United States sent 80,000 tons of copper to that country last year. The U. S. Government, apparently at the suggestion of the Allies, is purchasing all the available copper, and as no figures are given out any guess as to the volume of trade is bound to be somewhat vague.

**Tin.**—Here the war situation seems to be a dominant factor, and the strained relations between United States and the Dutch Government is helping to make the tin market an uncertain one. The amount of this metal in trade is small, and the chances of securing the filling of orders is not encouraging. Shipments of Straits tin are not to be had. The price remains firm.

**Spelter.**—The gradual falling off in production, which has been quite noticeable since the first of the year, is being reflected in the local market conditions. The price of $11 per hundred remains unchanged.

## POINTS IN WEEK'S MARKETING NOTES

**United States has closed orders, amounting to ten million, for export to France and Italy for war shop equipment.**

**The Weehawken Drydocks Co. have purchased 700 acres of land near Peekskill, where a shipyard will be constructed to cost four million. They will be devoted to work for the Emergency Fleet Corporation.**

**One Toronto dealer stated that he would accept desirable business for steel plate at a dollar per hundred off the prices that have been listed.**

**Deliveries show very little improvement, many of them being weeks and months behind time, and in not a few cases dealers state that they believe their cars have become lost.**

**An advance is recorded in the price of crude oils, amounting to ten cents per barrel in Canada.**

**Dealers in scrap metals are not anxious to buy at all at list prices, claiming they have enough on hand to supply the Canadian trade, to which they are now confined by the embargo regulations.**

**A decided improvement is noticed in the American labor situation, especially in regard to the shipbuilding programme, and a greater production of bottoms is looked for at once.**

## LABOR PROBLEM IRONED OUT NOW

### Arrangements Made That Will Allow Programme to Go Ahead With a Rush

Special to CANADIAN MACHINERY

WASHINGTON, March 23rd.—Price fixing and ships are the subjects consuming the chief interest in Washington at the present time. Industrial leaders are interested in reported movements to further fix prices and claim that unless definite action is taken shortly business will become so unsettled as to be disorganized.

With the German drive under way America is confronted with the problem of ships, for it is admitted that the part the United States can play in repelling the present drive and in further drives depends entirely upon the amount of tonnage which can be made available.

There is more optimism over the shipping problem to-day than there has been for some weeks. This is partially occasioned by the fact that the taking over of Dutch vessels in American ports has given sufficient shipping space to clear docks and warehouses of large amounts of supplies which have been held for weeks awaiting transportation to European points.

### A Better Showing

Moreover there is a decided realization of speedier and better work. Several vessels launched on the Atlantic coast this week have given definite promise that the shipbuilding program of the United States is going forward despite pessimistic predictions of failure. Investigations conducted by the Senate Commerce Committee have acted as a prod and shipbuilders and shipworkers have both turned to with a better spirit and as a result work is going forward with more impetus than at any time since the great program was undertaken.

The labor questions have been ironed out. The Shipping Board has announced that a satisfactory wage scale for Atlantic coast shipbuilders has been reached and this removes a very dangerous obstacle in the path of the shipbuilding program.

Pacific coast shipbuilders have assured the Government that they will surpass their program. Present estimates of the capacity of finished ships from the Pacific coast ports for the year 1918 are 65 steel vessels with a tonnage of 554,900 and 18 wooden vessels with a tonnage of 622,000.

Japan is also reported to have made an attempt to reopen negotiations whereby a considerable portion of the Japanese tonnage in the Pacific would be diverted to the use of the United States and the Allies in the Atlantic. This plan was taken up last summer at the time when the Japanese mission was in this country, but no agreement was reached. Japan, however, is reported to be in need of larger steel supplies to carry on her war program and as a result she is willing to release some of her vessels to the United States in return for a greater supply of steel.

### A Non-Sinkable Type

Chairman Hurley has announced that several experiments are being tried now which will test the possibility of furthering the shipping of the United States. He announces that contracts have been let for three vessels of a tonnage of 15,500. These are the largest vessels yet undertaken by the United States Shipping Board and if they prove successful more contracts of this nature will also be let. The Shipping Board has also widened the scope of its efforts to defeat the U-boat by attempting to secure a non-sinkable vessel. At the present time tests are being made of a vessel of this description, invented by Hudson Maxim, inventor of the Maxim silencer for guns.

In the House of Representatives a bill has been introduced to give the President the power to fix the prices on practically all commodities entering into manufacture. The bill includes provisions for price fixing on wool, leather, hides, steel, cotton, machinery and equipment.

### Those New Prices

According to well founded reports President Wilson is about to announce a new schedule of steel prices. It is understood that the large producers of steel in the United States have held a conference with the President and that an agreement has been reached on new prices. These prices, it is reported, will stimulate production and are expected to work to a considerable degree towards wiping out the prospects for a steel shortage in the United States. It is expected that the new prices will be announced within a few days.

Railroads in the United States have been granted a fifteen per cent. increase in freight rates by the Interstate Commerce Commission. At the same time there come reports that the Railroad Wage Adjustment Board is about to make a report recommending increases in pay to railroad workers to the amount of three and a half million dollars annually.

The War Trade Board has issued its export embargo list. This list includes all articles which can not be imported in the United States during the period of the war. Copies may be secured from the War Trade Board, Washington, D.C.

Reports of bituminous coal production for the week ending March 18 show the largest production since the week of November 24.

Labor conditions in the United States are improving. The Adjustment Board of the Department of Labor announces the adjustment of labor difficulties during March which affected some 50,000 workers. There are few important labor troubles reported at the present time.

## BIG ORDERS TO KEEPS SHOPS BUSY

### American Firms Exporting Much Equipment Now to France and Italy

Special to CANADIAN MACHINERY

NEW YORK, March 23rd.—The Eastern machinery markets are active. Manufacturers of machine tools are making better deliveries on priority orders and it is an encouraging fact that manufacturers of turret and engine lathes are now able to make deliveries in from one to three months, but makers of heavy tools are still far behind in deliveries on contracts. It is significant that smaller premiums are now being demanded by dealers who have second-hand equipment to offer. Prices of new machine tools are without essential change.

#### More Big Orders

The main feature of interest in the last week has been the placing of large orders for export by United States and allied Governments, all of which are to fill war needs. It is estimated that recent contracts for shop equipment closed for shipment to France and Italy have aggregated about $10,000,000 and as much more business is pending. The largest purchases have been made by the French High Commission, including several hundred tools for aviation work. Gio Ansaldo & Co., who have placed orders for $6,000,000 worth of tools already in this country, mainly for shipyards and munition plants, are now buying $5,000,000 worth of machinery, including 200 machines of various types for aviation work. All of the airplanes, ships, ammunition work being executed by this firm is for the Italian Government. Prospective purchases are for plate shop equipment, cranes for shipyards and hydraulic equipment for various plants. This company is preparing to build five additional ship ways and will construct 18 more standard cargo carrying ships. All of the engines and other equipment will be manufactured in Italy of rolled steel and finished steel which is being purchased in this country. Lancia & Co. are also buying tools for the manufacture of aviation motors in Italy through their local representative.

Machinery purchases are being made by the J. G. White Engineering Corporation for the United States Signal Corps in France and the Pennsylvania R. R. Co. has made additional purchases of tools for railroad shops in France serving the American military road. The Sota & Anzer steel plant in Spain is buying 50 cranes and machine shop equipment in this country through Frank C. Roberts & Co., Philadelphia. The purchases will amount to several million dollars.

#### Making Guns

Manufacturers of ordnance continue to place orders for shop equipment, the most notable buying recently being done by the Colts Patent Firearms Manufacturing Co., Hartford, Conn., which is manufacturing heavy type Browning machine guns for the United States Government. The Marlin-Rockwell Corporation, New Haven, is building a new factory for the manufacture of light type Browning machine guns and will soon be in the market for additional shop equipment.

Admiral McGowan, of the Navy Department, is taking bids on 29 machine tools for various navy yards, including engine lathes, boring mills, shapers, grinding machines and drills. The Vulcan Iron Works, Jersey City, will purchase machine tools to install in its plant extension which will be utilized for the manufacture of marine engines for the Emergency Fleet Corp. The United States Government has purchased the manufacturing rights of a standard type malleable iron wheel for army motor trucks. Orders to make these wheels will be distributed among a number of manufacturers who will purchase turret lathes and boring machines.

#### For Shipbuilding

Shipbuilders continue to purchase cranes and shop equipment. The Merchant Shipbuilding of Bristol, and the Chester Shipbuilding Co., of Chester, Pa., are receiving bids on cranes and miscellaneous machinery. The most interesting development, however, is the purchase of 700 acres of land near Peekskill, N.Y., by the Weehawken Drydocks Co., where a shipyard will be constructed to cost about $4,000,000. The Emergency Fleet Corp. is closing a contract with this company for 14 steel ships of 7,500 tons burden, 12 concrete vessels of 3,500 tons and 100 barges.

## FIGURING AHEAD ON PRICE BREAK

### Pittsburgh Trying to Line Up the Situation in Advance of March 31

Special to CANADIAN MACHINERY

PITTSBURGH, Pa., March 23.—Various reports are in circulation, coming chiefly from Washington, regarding Government prices on iron and steel. The conference between the War Industries Board and the producers, called for last Wednesday, extended over to Thursday. While the more common view is that the matter rests entirely with the board, with an announcement in prospect next week after the President has approved whatever conclusion the board may reach, there are rumors that the matter was finally agreed upon at the meeting. The most generally circulated rumor is that the changes, effective after March 31, are simply that basic pig iron will be reduced $1 a ton, to $32 at furnace, with a corresponding reduction in Bessemer, and scrap will be reduced $1 to $2. This report does not have the right ring, as it would make the following pig iron schedule: Basic, $32; No. 2 foundry, $33; malleable, $33.50; Bessemer, $35.20, all f.o.b. furnace, wherever located. It would be good form to put basic below foundry, or rather leave foundry above basic, as furnaces are less disposed to make foundry than basic, but malleable at $1 above foundry and $1.50 above basic would be quite indefensible. As to scrap, it is hardly in line for iron and steel producers to "consent" to a reduction, for it is material they buy, not sell. There may be more extensive reductions than have been hinted at in the schedule as a whole. If not, and with an extension to June 30, as seems more probable than the extension to the end of the year desired by producers, one may well look forward to reductions by June 30.

#### Light Commercial Demand

The outstanding feature of the market situation is the lightness of commercial demand for steel products. There is continued pressure for oil country goods and for small spikes, also perhaps for sheets, and some demand

## FINDING CAPACITY OF CANADIAN PLANTS FOR AMERICAN BUSINESS

Some days ago the rumor was spread that large orders for aeroplane bombs had been placed in Canada. Some papers went so far as to state that contracts for very large amounts were pending, and that it was only a matter of a short time until the work was started.

It is well known that Canadian manufacturers have been sounded in regard to this business, and that several of them have submitted figures regarding the capacity of their plants for such work.

CANADIAN MACHINERY has received the following wire from official sources at Ottawa:

"Replying your telegram 18th, no contract is pending from United States for aeroplane bombs.

"We are ascertaining possibilities of manufacturing these bombs in Canada in order to submit particulars of Canadian capacity to Ordnance Department, Washington."

for deliveries of standard steel pipe, but outside of these items the commercial demand is certainly very light. This condition cannot but be regarded as significant, seeing that Spring has come, when usually there is much heavier demand for steel products, and seeing also that shipping conditions have greatly improved and consumers have a much better opportunity to conduct their operations. There is for instance, no longer any serious shortage of coal among the consuming industries. It is difficult to see how there can be anything but an easier steel market in future. Of course this might not result in sellers going out actively after business. Seeing that they have such a large tonnage of unfilled contract business with their regular customers they are naturally more interested in this business being carried out than in their booking fresh contracts.

### Coke Supplies

Last week's Connellsville coke shipments were a trifle disappointing, seeing that they were 333,953 tons, against 334,584 tons the preceding week, representing a slight decrease, but the preceding week's shipments had represented a large gain, no preceding week in the year having shown as much as 300,000 tons shipped. It is estimated that shipments in the week just ending have been heavier, say 350,000 tons. It is still an acceptable estimate that the requirements of the furnaces depending upon Connellsville coke are about 375,000 tons weekly, so that at this rate the furnaces should soon be fully supplied, as shipping conditions are practically certain to improve more or less steadily. The by-product ovens are receiving very nearly full supplies of coal, so that altogether the blast furnaces are on the verge of full operation, say within a few weeks. It may be mentioned that frequently of late there has been 72-hour "foundry" coke offered in the market. It may not be altogether the best selection, but as long as it is offered to foundries it comes under the $7 set price, whereas if offered to furnaces it could only be at $6.

### Pig Iron Production

Official statistics just issued show the output of pig iron in the United States in 1917 to have been 38,647,397 gross tons, a decrease of 787,400 tons from the 39,434,797 tons produced in 1916, the record year. There was more furnace capacity available in 1917, on account of new construction, and the restriction in output was due almost wholly to shortage of coke. Capacity at present may be estimated at nearly if not quite 43,000,000 tons. Output in the first quarter of this year may be estimated at between 30,000,000 and 31,000,000 tons a year, but the rate now is much heavier than the rate the first nine or ten weeks of the year.

### Lake Superior Iron Ore Movement

Ore producers, lake vessel interests, the railroads and the blast furnaces, are all to co-operate closely in connection with the Lake Superior ore movement this year, the prime essential being to conserve railroad capacity and avoid railroad congestion. Last season the program was to get maximum efficiency from the lake fleet, but the actual experience was that of the railroads serving Lake Erie docks becoming congested, and the docks as well, whereby vessels frequently lost time waiting to be unloaded. The precise requirements of the blast furnaces will be compiled, and no more ore brought down than sufficient. The lake fleet is estimated to have a capacity to move 75,000,000 tons of ore, with no delays at any point, but prospects are it will hardly be called upon to move altogether as much as the 62,498,901 tons it moved last season, this figure excluding the 1,5,825 tons that was shipped from Key Harbor, on the Canadian side. There were 9,515,221 tons of ore on Lake Erie docks March 1, showing how ore accumulated, and how the railroads are behindhand in clearing the docks for the new lake season. The lake fleet has much more capacity than indicated by the movement last year, partly because there was time lost last year, from the late opening and from vessels waiting to be unloaded, partly because there has been more vessel construction than there has been tonnage lost, and partly, indeed largely, because channels have been dredged so that the draft of the largest vessels will be nearly one foot greater this year.

### Market Prospects

Increasing supplies of pig iron and increasing ability to ship finished steel, through the railroads getting in better shape, with continued absence of heavy commercial demand, apart from war requirements, seem bound to make an easier steel market in future. It is true Government requirements continue heavy, but they are running more to certain descriptions of material, leaving other forms of finished steel in relatively light request, and the steel industry can put no more than so much of its raw steel into each finished form. Quite possibly the mills have been indisposed to disclose their willingness to accept orders, by reason of the present price fixing operations in Washington, and when that is out of the way, as it must be before the end of this month, they may show more eagerness to secure business, even possibly to the extent of offering concessions from the set prices in the case of some commodities.

THE aim of belting manufacturers should be to secure the lightest weight consistent with strength, although it has long been thought by many power users that belt weight is an important factor of efficient service. This is entirely erroneous for a belt transmits its power by its surface contact with the face of the pulley, and if its co-efficient of friction can be maintained reasonably high, and elongation or stretch could be eliminated the thickness would be of small importance.

## UNCERTAINTY ABOUT NEXT MOVE MAKES MARKETING A HARD MATTER

Speaking to CANADIAN MACHINERY about the marketing of the product of Canadian factories, Mr. E. Barelman, president of the Gilson Engine Co., of Guelph, stated that there was an element of uncertainty being brought into the situation at present that was working against the men in his line of business. The Gilson people came to Canada ten years ago, and started in a very small way to make gas engines. At present they are making silos and their other lines. They have also investigated the tractor situation very thoroughly, and were prepared to go into this business, but the removal of the duty on these machines, and the refusal of the request for free material has changed their plans in this direction.

"The uncertainty that faces the manufacturers in the way of getting out their production is also facing them in the selling of their finished article. Here is a letter that we received this morning from a firm in Sarnia. We sent them a proposition to handle our engines on a commission basis, and this is the reply:

> "'We might say that your proposition looks attractive. At the present time, however, it looks very much as if the Canadian government would remove the duty from gas engines as well as a number of other farm supplies, which would make very strong competition from United States. Until something definite has been decided it will be impossible for us to advertise any engines.'"

"It doesn't take much figuring," continued Mr. Barelman, "to see where that sort of business is going to land us and the other manufacturers who will be up against the same problem. It's just the same thing with tractors. We have plans out to go into the business here. We are sure we can put a good machine on the market at a fair price. But we can't do it under the conditions that are now laid down by the Dominion government. The only alternative will be for the Canadian factories with an American connection to develop the latter. At the present time Canada is dependent on United States for her supply of tractors, and United States cannot supply the demand for these machines. I don't believe," concluded Mr. Barelman, "that the Canadian manufacturer realizes what he is up against in this particular line. To me it looks serious."

## THE STRENGTH OF AEROPLANE WINGS

IF the aviators who lost their lives in the early years of the flying machine's development could come back to life and gaze upon the great airplanes of this day they would first gasp in astonishment and then they would approve enthusiastically the construction which made it possible for sixty people to crowd upon one half of a huge bi-plane's wings without breaking them. For let it never be forgotten that some of the early martyrs who dropped to a terrible depth from great heights went to their doom because the builders of their machines had no conception of the structural strength required to buffet turbulent winds at high speed.

The wing section of a biplane is supported from a heavy wooden frame and not from the floor. The wing section is held only on one side and extends freely from that side into the air. Judging from their size, the wings are those of an enormous flying yacht. Althoughh the supporting surface could evidently sustain the weight of some 126 passengers, they have not, of course, that amount of lifting power. The crew of the vessel probably amounts to four. Hence the weight for 122 people is available for the boat body, rudders, engines, propellers and supplies something like over eight and one-half tons. Moreover, the human freight clearly does not overstrain the wings.

This example is an object lesson in reserve strength. The stoutest storm-sails of an old-fashioned sailing ship were never subjected to such strains as those which must be endured by that fabric of linen, wires and lattice-work of which the wings of a modern flying machine are composed. A sail needs strength to resist mere tearing alone. A flying machine's wings must in addition be so rigid that they will keep their shape in the worst hurricane. Only the pilot of an airplane knows how his wings are strained when he drops at a steep angle from a height of 5,000 feet in a swift downward glide for home. It must bend no more than if it were made of cast-iron. To this stiffness the modern airplane owes its superior stability.

## TANKS IN 1596

IN the recent exhibition of aircraft held in many great towns both in England and Scotland, full acknowledgment was given to the great genius of Leonardo da Vinci, as being the first to anticipate man's mastery of the air. Should the tanks also be on tour in the future, I [illegible] that one great Scotsman, John Napier, of Merchiston (inventor of logarithms), should be remembered as foreseeing and describing these mighty monsters. In a memorandum (dated 1596), which he calls his "secret inventions," he describes four inventions. They probably owed their existence in his fertile imagination to the rumors of war current at that time and were to be used in defence of his country should the Spanish Armada invade the coast of Scotland. I am only recalling one of them, in which the living presentiment of our modern tank is clearly foreshadowed. These are the words in which Napier describes it:

"A round chariot of mettle made of the proofs of dooble muskett. The use hereof serveth to break the array of the enemies battle, as also it serveth to destroy the environed enemie by continuall charge and shott through small hoalles. The enemie in the meantime being abased and altogether uncertaine what defence or pursuit to use against a moving mouth of mettle."

It is true Napier did not foresee the latest development in our "chariot of mettle," the moving mouth of the monster has been opened in our midst to-day, and opened to some good purpose, for it has been filled with that much-wanted supply of gold and silver on which the sinews of war so largely depend. But allowing for shortness of vision in this detail, we can still claim that the great magician of Merchiston was the man who foretold the coming of the tank.

## MAGNETIC SEPARATORS

THERE are very few instances to be found of greater waste in workshop management than in the usual disposal of the shop sweepings, metal turnings and borings, foundry sand, etc. In the old days many firms considered these materials as not worth troubling about, and many instances are known where large sums of money have been made by merchants buying this material, which was considered by the manufacturers as of little value, and after treating same disposing of it at a high profit. Competition has opened the eyes of many manfuacturers to the value there is in their waste material, and greater efforts are being made to recover the products. This is a necessity even in normal times, but under the existing conditions of life in this world, with the scarcity of metal, it is almost as great a necessity to recover the metals, and see that there is no waste of copper, brass, and gun-metal, etc., as it is to see that no waste takes place in coal, light, and even eatable things. The use of brass turnings and borings reclaimed from the scrap heaps of firms to an extent hitherto unknown has certainly eased the position as regards this metal, but it is up to every manufacturer in the world to look round the works and see what is being sold as scrap and to consider whether it would not be worth while putting down the necessary plant to treat the materials themselves, and so save the profit which would otherwise not be theirs. A practical instance of this occurred recently where a large works had a heap of about three tons of gun-metal turnings containing a very large percentage of iron. They were considered as useless and a dealer was asked to make an offer for them. He offered £5 per ton, but on a sample being passed over an efficient magnetic separator it was discovered that there was nearly 50 per cent. of good metal, and as the market price at that date was about £60 per ton it is obvious what a large sum the firm would have lost had they sold the three tons at £5 per ton. The saving made showed a handsome profit over the cost of an electric magnetic separator to treat just this o ne lot, and left them in a position to treat all future quantities and save the money they were otherwise losing in selling the material. This is by no· means an isolated instance, and is only given as an example to put works managers and manufacturers on the alert to see that no such instances occur in works under their control. In nearly all engineering works the practice in these days is to try and keep separate those shops where iron is being turned and those where metal is turned; but, however careful they may be, it is impossible to keep them separate, and there is always the danger of tools breaking and pieces falling into the metal, so that before the metal can be re-melted it is absolutely essential that the turnings should be passed over an electro-magnetic separator, which will remove the impurities and make a valuable marketable material. Further, there is often a waste of iron in foundry sand. Many firms make a practice of only riddling their sand and getting out the large pieces, but if they would go carefully over it with a horse-shoe magnet they would be very surprised at the quantity which is wasted, and they would soon cover the cost of putting down the plant.

ONE of the interesting problems of science which has been investigated is that of the time taken for a stone to fall to the centre of the earth. In a recent paper to Corrystes Rendus by M. Sauger this question has been carefully worked out. The problem has exercised the minds of many men; Mersenne estimated the time of fall to the earth's centre at six hours; Gassendi, twenty minutes. The latter value is the more accurate, says M. Sauger. If the earth's density is assumed to be throughout of its average value 5.53, then the time of fall works out at 1,234 seconds. The author investigated the problem, taking into account the variation of density with depth and derived a function from the ratio of the principal moments of inertia of the globe afforded by the precession of the equinoxes, and gives results in accord with experiments upon the intensity of gravity in mine shafts. With these assumptions the duration of fall is found to be 19 minutes 15 seconds.

AN interesting fact relating to the undeveloped state of French water powers is contained in a recent issue of *La Nature*. Over nine million horsepower is said to be available for 180 days in the year. Corresponding figures for other European countries show that France is especially favored in this respect, her water power resources being considerably larger than those of Norway, Sweden or Italy, or, in fact, of any other country. It is also interesting to note that although the German available water resources only amount to about one and a half million horsepower per annum, she has utilized 31 per cent. of them, whereas only 10 per cent. of French water power is yet developed.

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago. | 37 50 |
| Standard low phos., Philadelphia. | ..... |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 33 00 |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | ..... | ..... |
| Victoria | ..... | 50 00 |

## FINISHED IRON AND STEEL

| Per lb. to Large Buyers. | Cents |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 5 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 5 75 |
| Chequered floor plate, 3-16 in. | 12 20 |
| Chequered floor plate, ¼ in. | 12 00 |
| Staybolt iron | 8 50 |
| Bessemer rails, heavy, at mill | .... |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | *3 50 |
| F.O.B., Toronto Warehouse | |
| Steel bars | 5 50 |
| Small shapes | 5 75 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

## FREIGHT RATES

Pittsburgh to Following Points

| | Per 100 lbs. C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 38.1 | 50.5 |
| Halifax | 39.1 | 51.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

## METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $30 00 | $28 00 |
| Electro copper | 30 00 | 28 50 |
| Castings, copper | 29 00 | 28 00 |
| Tin | 98 00 | 99 00 |
| Spelter | 11 00 | 11 00 |
| Lead | 10 50 | 9 50 |
| Antimony | 18 00 | 17 00 |
| Aluminum | 55 00 | 52 00 |

Prices per 100 lbs.

## PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¼ to ½ | $10 00 | $10 00 |
| Heads | 10 30 | 10 25 |
| Tank plates, 3-16 in. | 10 10 | 10 10 |

## WROUGHT PIPE

Effective Feb. 5, 1918.

| Standard Buttweld | Per 100 feet Black | Galvanized |
|---|---|---|
| ⅛ in. | $ 6 00 | $ 8 00 |
| ¼ in. | 5 16 | 7 29 |
| ⅜ in. | 5 16 | 7 29 |
| ½ in. | 6 55 | 8 12 |
| ¾ in. | 8 28 | 10 41 |
| 1 in. | 12 24 | 15 39 |
| 1¼ in. | 16 56 | 20 82 |
| 1½ in. | 19 80 | 24 89 |
| 2 in. | 26 64 | 33 49 |
| 2½ in. | 42 72 | 53 53 |
| 3 in. | 55 85 | 70 00 |
| 3½ in. | 70 84 | 87 86 |
| 4 in. | 83 93 | 104 10 |

| Standard Lapweld | | |
|---|---|---|
| 2 in. | $ 29 60 | $ 36 08 |
| 2½ in. | 44 46 | 54 70 |
| 3 in. | 58 14 | 71 53 |
| 3½ in. | 72 68 | 90 62 |
| 4 in. | 86 11 | 107 37 |
| 4½ in. | 97 79 | 122 56 |
| 5 in. | 114 00 | 142 82 |
| 6 in. | 147 80 | 185 28 |
| 7 in. | 192 80 | 241 57 |
| 8 L in. | 202 50 | 253 75 |
| 8 in. | 233 30 | 292 32 |
| 9 in. | 279 50 | 350 18 |
| 10 L in. | 259 20 | 324 80 |
| 10 in. | 333 70 | 418 18 |

Prices—Ontario, Quebec and Maritime Provinces.

## WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

## OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 22 50 |
| Copper, heavy | 22 50 | 22 50 |
| Copper wire | 22 50 | 22 50 |
| No. 1 machine composition | 22 00 | 21 50 |
| New brass cuttings | 16 00 | 14 00 |
| Red brass turnings | 18 00 | 17 00 |
| Yellow brass turnings | 12 50 | 12 50 |
| Light brass | 10 00 | 9 50 |
| Medium brass | 12 00 | 12 00 |
| Heavy brass | 15 00 | 14 00 |
| Heavy melting steel | 24 00 | 21 00 |
| Steel turnings | 12 00 | 12 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 27 00 | 18 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 23 00 |
| No. 1 machine cast iron | 31 00 | 25 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 20 00 | 15 00 |
| Car wheels, iron | 26 00 | 25 00 |
| Steel axles | 38 00 | 35 00 |
| Mach. shop turn'gs | 9 00 | 8 50 |
| Cast borings | 12 00 | 12 00 |
| Stove plate | 19 00 | 19 00 |
| Scrap zinc | 6 50 | 6 50 |
| Heavy lead | 7 50 | 7 00 |
| Tea lead | 5 00 | 5 75 |
| Aluminum | 21 00 | 20 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, ⅜" and less | 10 |
| Carriage bolts, 7-16 and up | net |
| Coach and lag screws | 25 |
| Stove bolts | 55 |
| Plate washers | List plus 20 |
| Elevator bolts | 5 |
| Machine bolts, 7-16 and over | net |
| Machine bolts, ⅜ and less | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | 10 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | add 25 |
| Nuts, square blank | add $1 50 |
| Nuts, square, tapped | add 1 75 |
| Nuts, hex., blank | add 1 75 |
| Nuts, hex., tapped | add 2 00 |
| Copper rivets and burrs, list plus | 30 |
| Burrs only, list plus | 50 |
| Iron rivets and burrs | 15 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 37½ |
| Wood screws, O. & R., brass | 32½ |
| Wood screws, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

## MILLED PRODUCTS

| | Per Cent. |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil. Head Cap Screws | net |
| Flat But. Hd. Cap Screws | plus net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. & Semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2 in. | plus 10 |
| Studs | net |
| Taper pins | 40 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | list plus 20 |
| Collar screws | list plus 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | 65 |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add 7 00 |

## BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $47 50 |
| Open-hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.

F.O.B. Pittsburgh.

## NAILS AND SPIKES

| | | |
|---|---|---|
| Wire nails | $5 25 | $5 20 |
| Cut nails | 5 70 | 5 65 |
| Miscellaneous wire nails | | 60% |
| Spikes, ⅜ in. and larger | | $7 50 |
| Spikes, ¼ and 5-16 in. | | 8 00 |

## ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 41 |
| Plumbers' oakum, per lb. | 0 09 |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila rope | 0 33 |
| New Zealand hemp | 0 33 |
| Transmission rope, Manila | 0 45 |
| Cotton rope, ¼-in. and up | 0 47 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | net |

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | 0 47 |
| Solder, guaranteed | 0 50 |
| Babbitt metals | 18 to 70 |
| Soldering coppers, lb. | 0 53 |
| Lead wool, per lb. | 0 16 |
| Putty, 100-lb. drums | 4 75 |
| White lead, pure, cwt. | 16 05 |
| Red dry lead, 100-lb. kegs, per cwt. | 15 50 |
| Glue, English | 0 35 |
| Tarred slater's paper, roll | 0 95 |
| Gasoline, per gal., bulk | 0 31½ |
| Benzine, per gal., bulk | 0 30½ |
| Pure turpentine, single bbls., gal. | 0 73 |
| Linseed oil, raw, single bbls. | 1 95 |
| Linseed oil, boiled, single bbls. | 1 98 |
| Plaster of Paris, per bbl. | 2 50 |
| Sandpaper, B. & A. | list plus 20 |
| Emery cloth | list plus 20 |
| Sal Soda | 0 03½ |
| Sulphur, rolls | 0 05 |
| Sulphur, commercial | 0 04½ |
| Rosin "D," per lb. | 0 03 |
| Rosin "G," per lb. | 0 03½ |
| Borax crystal and granular | 0 12 |
| Wood alcohol, per gallon | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

### CARBON DRILLS AND REAMERS

| | Per Cent. |
|---|---|
| S.S. drills, wire sizes up to 52 | 40 |
| S.S. drills, wire sizes, No. 53 to 80 | 40 |
| Standard drills to 1½ in. | 40 |
| Standard drills, over 1½ in. | 40 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 |
| Bit stock | 40 |
| Ratchet drills | 15 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 40 |
| Sleeves | 40 |
| Taper pin reamers | net |
| Drills and countersinks | list plus 40 |
| Bridge reamers | 50 |
| Centre reamers | 10 |
| Chucking reamers | net |
| Hand reamers | 10 |

### COLD ROLLED SHAFTING

| | |
|---|---|
| At mill | list plus 40% |
| At warehouse | list plus 50% |

**Discounts off new list. Warehouse price at Montreal and Toronto**

### IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 8 00 | $ 8 25 |
| Sheets, black, No. 10 | 10 00 | 10 00 |
| Canada plates, dull, 52 sheets | 9 00 | 9 00 |
| Can. plates, all bright | 9 50 | 9 50 |
| Apollo brand, 10¾ oz. galvanized | | |
| Queen's Head, 28 B.W.G. | | |
| Fleur-de-Lis, 28 B.W.G. | | |
| Gorbal's Best, No. 28 | | |
| Colborne Crown, No. 28 | | |
| Premier, No. 28 U.S. | | 8 95 |
| Premier, 10¾ oz. | | 9 25 |
| Zinc sheets | 20 00 | 20 00 |

### PROOF COIL CHAIN

B

¼ in., $12.35; 5-16 in., $11.85; ⅜ in., $11.50; 7-16 in., $10.90; ½ in., $11.20; 9-16 in., $11.20; ⅝ in., $11.10; ¾ in., $11.00; ⅞ in., $10.90; 1 inch, $10.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $15.50; 3-16 in., $11.70; ¼ in., $8.40; 5-16 in., $7.40; ⅜ in., $6.35; 7-16 in., $6.35; ½ in., $6.35; ⅝ in., $6.35; ¾ in., $6.35.

**Prices per 100 lbs.**

### FILES AND RASPS.

| | Per cent |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 40 |
| Black Diamond | 40 |
| J. Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 37½ |
| Disston | 50 |
| Whitman & Barnes | 50 |

### BOILER TUBES.

| Size | Seamless | Lap welded |
|---|---|---|
| 1 in. | $36 00 | $ |
| 1¼ in. | 40 00 | |
| 1½ in. | 43 00 | 36 00 |
| 1¾ in. | 43 00 | 36 00 |
| 2 in. | 50 00 | 36 00 |
| 2¼ in. | 53 00 | 38 00 |
| 2½ in. | 55 00 | 42 00 |
| 3 in. | 64 00 | 50 00 |
| 3¼ in. | | 58 00 |
| 3½ in. | 77 00 | 60 00 |
| 4 in. | 90 00 | 75 00 |

Prices per 100 ft., Montreal and Toronto.

### OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | |
| Rovalite, per gal., bulk | 18 |
| Palacine | 21 |
| Machine oil, per gal. | 26½ |
| Black oil, per gal. | 15 |
| Cylinder oil, Capital | 45½ |
| Cylinder oil, Acme | 36½ |
| Standard cutting compound, per lb. | 0 06 |
| Lard oil, per gal. | $2 50 |
| Union thread cutting oil antiseptic | 88 |
| Acme cutting oil, antiseptic | 37½ |
| Imperial quenching oil | 39½ |
| Petroleum fuel oil | 13½ |

### BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30-5% |
| Standard | 40% |
| Cut leather lacing, No. 1 | 1 95 |
| Leather in sides | 1 75 |

### TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 06 |
| Emery glue | 15 to 20 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 35 |

**Prices Per Lb.**

### BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 38 |
| Brass sheets, 24 gauge and heavier, base | 0 43 |
| Brass tubing, seamless | 0 46 |
| Copper tubing, seamless | 0 48 |

### WASTE.

| White. | Cts. per lb. | | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 18½ |
| Peerless | 21 | X Empire | 17¼ |
| Grand | 19¾ | Ideal | 17¼ |
| Superior | 19¾ | X press | 16 |
| X L C R | 18½ | | |

**Colored.**

| | | | |
|---|---|---|---|
| Lion | 15 | Popular | 12 |
| Standard | 13½ | Keen | 10½ |
| No. 1 | 13½ | | |

**Wool Packing.**

| | | | |
|---|---|---|---|
| Arrow | 25 | Anvil | 15 |
| Axle | 20 | Anchor | 11 |

**Washed Wipers.**

| | | | |
|---|---|---|---|
| Select White | 11 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING.

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

### ANODES.

| | |
|---|---|
| Nickel | .50 to .54 |
| Cobalt | 1.75 to 2.00 |
| Copper | .44 to .46 |
| Tin | .49 to .56 |
| Zinc | .23 to .25 |

**Prices Per Lb.**

### COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | 42 50 | 43 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 46 00 | 44 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 48 00 | 48 00 |
| Copper sheet, planished, 16 oz. base | 57 00 | 45 00 |
| Braziers,' in sheets, 6x4 base | 45 00 | 44 00 |

### LEAD SHEETS.

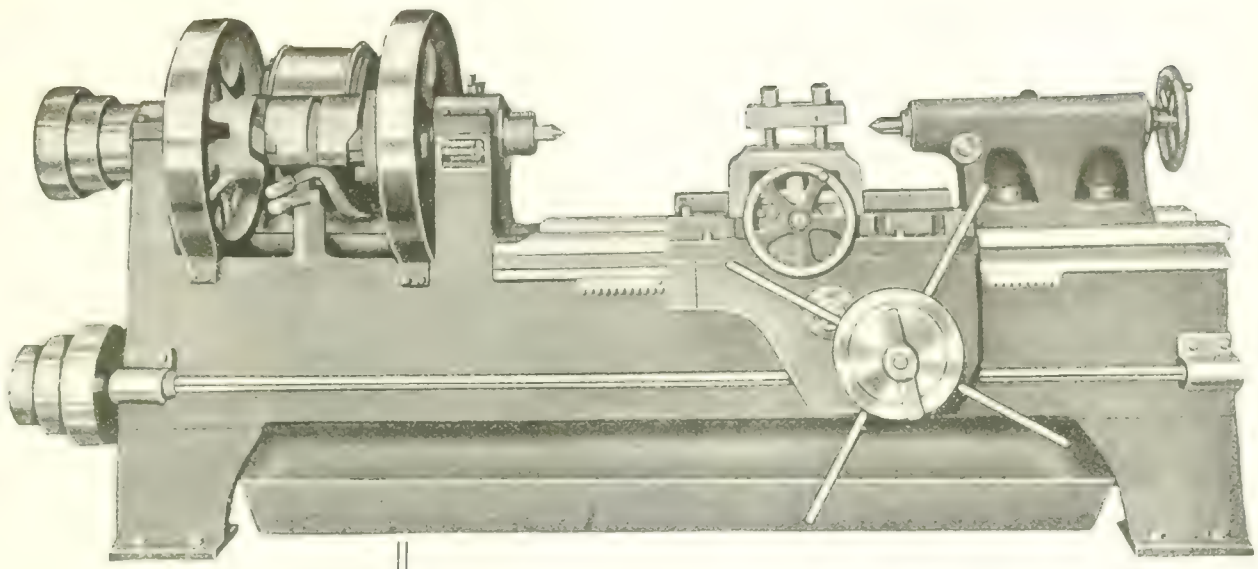
| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $13 25 | $13 25 |
| Sheets, 3½ lbs. sq. ft. | 13 25 | 13 25 |
| Sheets, 4 to 6 lbs. sq. ft. | 12 50 | 12 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS.

| | |
|---|---|
| Acid, boracic | $ .15 |
| Acid, hydrochloric | .05 |
| Acid, hydrofluoric | .14½ |
| Acid, nitric | .10 |
| Acid, sulphuric | .05 |
| Ammonia, aqua | .08 |
| Ammonium carbonate | .15 |
| Ammonium, chloride | .11 |
| Ammonium hydrosulphuret | .40 |
| Ammonium sulphate | .07 |
| Arsenic, white | .12 |
| Copper, carbonate, anhy | .35 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .70 |
| Iron perchloride | .20 |
| Lead acetate | .16 |
| Nickel ammonium sulphate | .12 |
| Nickel carbonate | .35 |
| Nickel sulphate | .15 |
| Potassium carbonate | .75 |
| Potassium sulphide (substitute) | .20 |
| Silver chloride (per oz.) | .65 |
| Silver nitrate (per oz.) | .55 |
| Sodium bisulphite | .10 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .41 |
| Sodium hydrate | .04 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | .14 |
| Tin chloride | .60 |
| Zinc chloride | .60 |
| Zinc sulphate | .09 |

**Prices per lb. unless otherwise stated.**



# Here are the Specifications

## (TURRET LATHE)

| | |
|---|---|
| Swings over bed | 20" |
| Bed—length | 9' 4" |
| width | 18" |
| Front bearing—length | 8½" |
| diameter | 10" |
| Drive pulley—width | 8" |
| diameter | 19" |
| Feeds | 1-16, 5-64, 3-32" |
| Turret, diameter | 18" |
| Height floor to centre | 40" |
| Weight | 7800 lbs. |

**Built both as Turning and Boring Lathe**

## Special Features:

Headstock integral with bed.
Broad flat ways
Long carriage
Large turret
Unbreakable apron

# THE "MONTREAL" LATHE

Designed and built specially to stand continuous operation and the abusive treatment given in boring and turning shells.

The success with which it has met this condition in shell plants throughout Canada fully justifies us in asserting that it is

## The Lathe with a Big Reputation

**Its production capabilities will astonish you.**

***Early Delivery - Write for Prices.***

**The A. R. Williams Machinery Co.**
**Limited**

**64 WEST FRONT ST. TORONTO, CAN.**

# INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

## ENGINEERING

Hull, Que.—[illegible] are calling for tenders for the steel work for a reach to step

Grand Mere, P.Q.—Erection of an extension to their plant to cost $150,000 is contemplated by the Laurentide Co., Ltd.

Montreal, P.Q.—[illegible] and [illegible] intend purchasing a 750 gallon per minute, 300-foot lift centrifugal pump. Consulting engineers, M. A. Sammett, McGill Building, Montreal.

## MUNICIPAL

**Melfort, Sask.**—The Town Council contemplates the purchase of Diesel oil engine.

**Strathroy, Ont.**—[illegible] system is to be extended by the purchase of a motor-driven turbine pump.

**Winnipeg, Man.**—The Board of Control is contemplating a municipal gas plant for the manufacture of gas for heating purposes from soft coal.

**Amherstburg, Ont.**—The Town Council contemplates the construction of a water main, to cost $20,000, in connection with the proposed Brunner-Mond water supply agreement.

**St. Catharines, Ont.**—The Fire, Light, and Gas Committee estimates amount to $24,000 exclusive of street lighting expenses. Estimates for the gas plant are being prepared. City engineer, W. P. Near.

**Kingston.**—At the meeting of the City Council it was decided to purchase engines to supplement the power supply for their street railway system. It was anticipated that a ten-minute service can now be given.

## BUILDING

**Ottawa, Ont.**—Votes for Ontario public buildings include: Galt drill hall, $8,000; Hamilton post office, $3,100; Kemptville public building, $1,200; Kingston R.M.C., covered drill hall, $7,500; Kingston R.M.C., enlargement of educational block, $150,000; Toronto postal station "A," $300,000; Toronto Junction buildings, improvements, repairs, $16,000.

## CONTRACTS

**Brantford, Ont.**—The Board of Works has awarded a contract for special castings to the Hartley Foundry Co.

**Ottawa, Ont.**—The National Iron Works, Ltd., Toronto, have the contract for pipe for water mains for the City Council. Cost, $18,600.

**Shawinigan Falls, P.Q.**—Church, Ross & Co., Montreal, have the general contract for $1,800,000 plant for the Ameri[illegible] of the Shawinigan Water and Power Co., formed to manufacture acetic acid.

**Montreal.**—Contracts for $22,000,000 for railway equipment for the Canadian Northern System have been let to the Canadian Car & Foundry Co. This includes more than two thousand cars of all kinds. It is expected that contracts for 150 locomotives will be awarded as follows:—One hundred to Montreal Locomotive Works and 50 to the Canadian Locomotive Works, Kingston, Ont.

## PERSONAL

**John Hole, Sr.**, who for the past two years has been assistant superintendent of construction for the Toronto Harbor Commission, is leaving the commission to enter private practice as a general engineer and contractor.

**Howard Taylor**, who for some years has been chief electrical and mechanical engineer of the Spanish River Pulp and Paper Co.'s plants, with headquarters at the Soo, has resigned to become consulting engineer with the Dayton-Wright Aeroplane Co., at Dayton, Ohio.

**Walter Baker Champ**, who for many years has been secretary-treasurer of the Hamilton Bridge Works Co., and who was last week elected managing director and secretary of the company, was born in Hamilton, March 23rd, 1874. His entire business career has been with the Hamilton Bridge Works Co., having joined that firm when he was 17 years old. He was appointed treasurer of the company when only 24 years of age and seven years later he was made secretary-treasurer. Mr. Champ has been a director of the company since 1910.

**H. B. Smith** was re-elected president of the Owen Sound Shipbuilding Co. on Friday, March 8. This was the time of the annual meeting, when a satisfactory year's work was reported. The officers: President, H. B. Smith, Owen Sound; vice-president, J. W. Norcross; second vice-president, R. M. Wolvin; secretary-treasurer, S. H. Lindsay; directors, Messrs. H. B. Smith, J. W. Norcross, R. M. Wolvin, H. W. Cowan, F. S. Isard, Capt. McDougall and H. Dyment.

**Sir Collingwood Schreiber**, one of the greatest figures in the Canadian railway world, passed away on March 23, at the age of 87, at Ottawa. The death took place at his home, "Elmsleigh," Argyle Avenue, where he had been ailing for some months. Although possessed of a magnificent constitution, his great age obviated his chances of recovery. He died in the presence of his wife, Lady Schreiber, and his two daughters, Mrs. Travers Lewis and Mrs. Lawrence Lambe, the sole survivors. For sixty years the late Sir Collingwood had been actively associated in the building and development of both publicly and privately owned railways in Canada. He had a tremendous share in the laying of transportation systems both east and west, and in the latter part of his career as Deputy Minister of Railways and Canals he helped to wisely administer lines directly under the Government, and subsequently superintended the construction of the Grand Trunk Pacific. For his splendid work in connection with the building of Government lines he was knighted in 1915.

## TENDERS

**Sifton, Man.**—Tenders for "Grading roads" and laying concrete pipe culverts will be received up to Tuesday, April 9th. Plans and specifications can be had on application to R. Hockin, secretary-treasurer, Oak Lake, Man.

**Listowel, Ont.**—Tenders, marked "Tender for High School," will be received until Tuesday, April 2nd, for building an addition and extensive improvements to the Listowel High School, including steam heat and ventilation, modern plumbing, hardwood floors, metal ceilings, etc. Address: W. E. Binning, secretary Board of Education, Listowel.

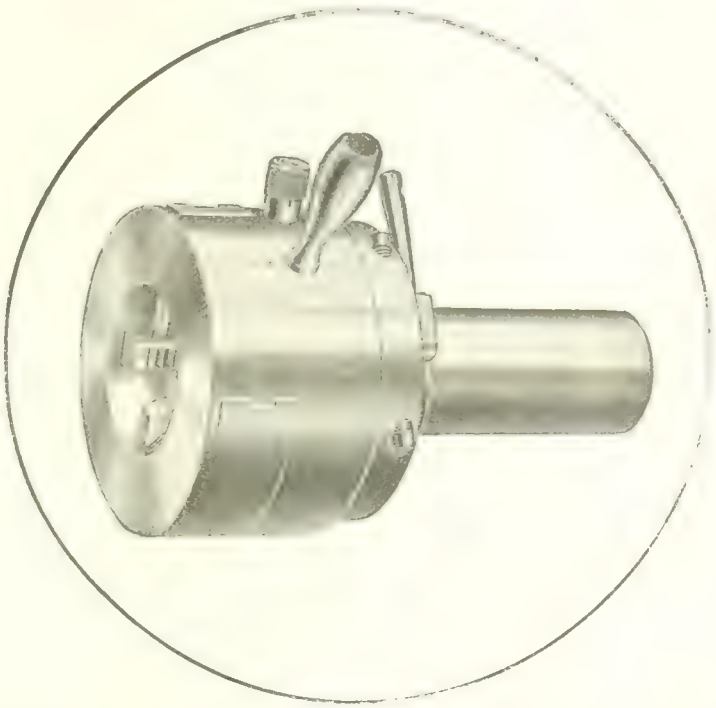
**Toronto, Ont.**—Tenders will be received by Frank Barber, engineer for the Municipal Corporation of the Township of York, up to Saturday, March 30, 1918, for the supply of the following:—450 12-inch cast iron pipes, 1,000 6-inch cast iron pipes, 200 cast iron specials, 112 hydrants, 15 12-inch gate valves, 100 6-inch gate valves. Further information may be obtained at the office of the engineer, 40 Jarvis Street, Toronto.

**Ottawa, Ont.**—Tenders will be received until Tuesday, April 2, 1918, for the construction of a Dominion Government Office Building, O'Connor Street, Ottawa, Ont. Plans and forms of contract can be seen and specifications and forms of tender obtained at the offices of the Chief Architect, Department of Public Works, Ottawa; the Overseer of Dominion Bldgs., Central Post Office, Montreal, and the Clerk of Works, Postal Station "F," Toronto, Ont.

**Toronto, Ont.**—Sealed tenders marked "Tender for steel bridges" will be received by the Toronto and Hamilton Highway Commission, 49 Wellington Street East, Toronto, Ontario, until noon on Tuesday, April 2, 1918, for the supply and erection complete and ready for traffic of bridges over Mimico Creek, Etobicoke Creek, Credit River (bridge and culvert), and Bronte Creek. Form of contract, general conditions, plans and specifications may be seen and obtained at the office of the chief engineer and also may be seen at the office of the city engineer, Hamilton, Ontario.

**Melbourne, Australia.**—Tenders for the following may be addressed to the Director of Navy Contracts, Navy Office,

# GEOMETRIC



**"Around the Geometric Die Head we draw a circle and claim that no other can touch it for quality and quantity production."**

*That is the claim of the Manufacturer.*

*This is the claim of the User:*

> "We purchased four sets 9 16 -18 chasers from you four months ago, and are pleased to state that the first set is still in use and doing perfect work, although it has been used almost daily since purchased, and threading better than a thousand pieces per day."

From 1,000 to 4,000 threaded pieces, according to work conditions, is the reputation of Geometric Die Heads. Unless you know what GEOMETRIC experience is, you have yet to learn what can be accomplished in the production of screw threads.

*We are ready to help you. Ask us about it.*

## THE GEOMETRIC TOOL COMPANY

NEW HAVEN, CONN., U.S.A.

*Canadian Agent*

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N. B.

*If any advertisement interests you, tear it out now, lest you forget, and mention it to the paper.*

Melbourne. Supply, delivery and erection at Garden Island of one 200 horse-power prime mover set of either semi-Diesel type or other heavy oil engine direct coupled to 2-65 K.W. 240 volt D.C. electric generating set. All accessories, tank and fittings to be supplied by tenders as per specification. Date of closing, June 7, 1918. Tender forms are open for inspection at the Department of Trade and Commerce, Ottawa. File No. 20,117.

**Ottawa, Ont.**—Tenders will be received until April 11, 1918, for the switchboards, panel boards and transformers required in the construction of the Parliament Buildings. All tenders to be based on the execution, completion, and delivery on the site, together with the furnishing of all material, tools, appliances, labor, etc., for the work as required and described by the plans and specifications for switchboards, panel boards and transformers. Plans and specifications and any other information required can be obtained at the office of the general contractor, P. Lyall & Sons Construction Co., Ottawa.

## TRADE GOSSIP

**Annual Meeting.**—The annual meeting of the Canada Machinery Co., Ltd., will be held at Galt on Wednesday, April 3.

**Open Montreal Branch.**—MacKinnon, Holmes & Co., Limited, of Sherbrooke, Que., have opened a sales office at 404 New Birks Building, Montreal, Que., Mr. W. J. Lochhead being in charge.

**Increased Wages.**—The 25,000 employees of the International Harvester Co., of Chicago, will receive an increase in pay amounting to approximately ten per cent. on April 1st, it was announced.

**Orders For Box Cars.**—Hamilton has secured a share of the $22,000,000 railroad equipment order placed by the Federal government. The local order is for one thousand 40-ton box cars, amounting to $2,750,000, and goes to the National Steel Car Co.

**Extension of Time.**—The C. N. R. is making application to Parliament for an extension of the time for the construction of a line from its authorized line between Port Arthur and Sudbury to a junction with the National Transcontinental east of Lake Nipigon.

**Organ Makers Moving.**—Messrs. Warren & Son, pipe organ manufacturers, of Toronto, are moving their plant and business to Woodstock. They have leased that part of the Hay Company building that was built by the late James Hay, especially for pipe organ building.

**Want Harbor Fixed.**—The municipalities of Brantford, Paris, Galt, Waterford, Preston, Kitchener and Simcoe are organizing to urge that the Government should improve Port Dover harbor at the lake end of the L. E. and N. line. They point out that at present the road carries 270,000 tons of coal, while the places it serves have a consuming capacity of 500,000 tons. Opposition is growing to the Grand Trunk retaining control of the Dover harbor, the contention being that it should be open under Government supervision.

**Industries Coming.**—New industries are going to Windsor and the border cities at the rate of one a month or better. Industrial Commissioner Sclanders reports to the council that since August 18 last, when he assumed his duties here, the following new firms have opened up: Standard Foundry and Supply Co., Tanlac Co., U. S. Playing Card Co., Liberty Motor Co., S. C. Johnson Co., Cadwell's Sand, Lime and Brick Co., Wayne County Fanning Mill Co., White Typewriter Rebuilding Co., Beaver Truck and Tractor Co., and N-Fuel Co.

**Blast Furnace To Reopen.**—According to F. S. Wiley, who returned to Port Arthur after a business visit to Ottawa, negotiations are now in progress and will be completed within a few days whereby the blast furnaces of the Atikokan Iron Company at Port Arthur will be in operation very shortly. It is understood that the Imperial Munitions Board will operate the furnaces and they will be worked to their full capacity for the manufacture of pig iron. The blast furnace in Port Arthur has been idle for about ten years. It was formerly operated by McKenzie and Mann interests.

**Dominion Public Works Appropriations.**—Public works votes chargeable to capital include an additional $1,500,000 to cover cost of construction of the new Parliament Building at Ottawa, and $1,000,000 for the new departmental building at Ottawa. Harbor and river votes under this head include $350,000 for improvements at Port Arthur and Fort William, $150,000 for improvements at Vancouver, and a similar expenditure of $166,000 on Victoria Harbor, B.C. The total vote for public buildings chargeable to capital is $2,620,000, as compared with $2,125,000 for the current fiscal year, a considerable increase. On the other hand, harbor and river votes chargeable to capital will decrease from $5,931,000 to $1,836,000.

**British Orders in Canada.**—British orders for munitions to the value of some $880,000,000 have been placed in Canada. In April, May, June and July last the amount of British orders ran as high as from forty-five to fifty million dollars a month. Since then there has been a diminution of orders owing to the growth of the munition industry in Great Britain, and also in some measure to the shipping situation. To-day, however, the Imperial Munitions Board is still expending about twenty-five million dollars a month in Canada on behalf of Great Britain. The largest type of shell now being produced is a 6-inch high explosive howitzer shell, and the manufacture of fuses has to a great extent been discontinued.

**Ottawa, Ont.**—Votes for Ontario harbor and river improvements chargeable to income include the following:—Bayfield, repairs to pier, $4,000; Cobourg, repairs to Langevin pier, $10,000; French River dams, repairs and maintenance, $3,000; Goderich, repairs to lumber dock, $3,000; harbors and rivers generally, repairs and improvements, $65,000; Kingston, maintenance and operation of combined roadway, wharf and bridges, $8,500; Port Bruce, repairs to pier, $2,100, Port Burwell, repairs to piers, $14,600; Port Colborne, repairs to breakwaters, $7,400; Port Hope, harbor improvements, $24,000; Port Stanley, harbor improvements, $77,000; Rondeau harbor, repairs to piers and placing riprap, $4,000; Saugeen River at Southampton, repairs to piers, $4,000.

**New Railway Co.**—The Montreal, Joliette, and Transcontinental Junction Railway Co. is applying for incorporation of a company under the name of "Montreal, Joliette and Transcontinental Junction Railway Company," with power to lay out, construct and operate a railroad from a point in or near the City of Montreal, in the Province of Quebec, in a northerly direction through the Counties of Hochelaga, L'Assomption and Montcalm to a point in or near the town of Joliette, in the County of Joliette, thence in a north or north-westerly direction to a point in or near the Village of St. Michel des Saints, in the County of Berthier, and thence by the most feasible route to a point on the National Transcontinental Railway, about 180 miles, and that the railway of the company be declared to be a work for the general advantage of Canada.

**Season Starts Late.**—Owing to the ice being heaviest in years the opening of navigation this season will be later than usual. Shipowners at Goderich, however, are busy getting the steamers in shape. Capt. Dan Cornett, of Owen Sound, has fifty men working on the steamer Sarnian, raising the masts, putting a new floor in the engine room, changing the wheel and making other improvements. The steamer Matthews, owned by the same company, is also undergoing extensive repairs. Both vessels will be fitted out with wireless apparatus before they sail. The barge Mary McLaughlin, which had some trouble in making the harbor last fall, may require considerable repairs, as she struck the breakwater after breaking away from the vessel towing her. A big rush of grain is expected at Goderich at the opening of the season. The first trip between Detroit and Toledo was made on the 21st by the steamer Wauketa. No ice was encountered on the trip.

**Will Need Supplies.**—United States trade agents in Serbia report as follows, and the information may be of value to Canadian manufacturers: — Household utensils, as well as the food which is to be cooked in them, will be much needed in Serbia as soon as that Serbian territory which is now in the hands of the enemy is recovered. Department of Commerce information is to the effect that in Serbia American manufacturers may anticipate a market for many articles. Tin plate for canning purposes will be wanted, as well as corn, wheat, flour, hard-tack, dried vegetables, lard, eating oil, canned meat, milk, coffee, tea, sugar, shoes, leather, clothes, cotton, wool, iron and steel bars, galvanized sheets, and tin plate. Here are a few of the things needed by Serbia: Tractors, plows, harrows, rollers, seeders, cultivators, mowers, reapers, scythes, com-

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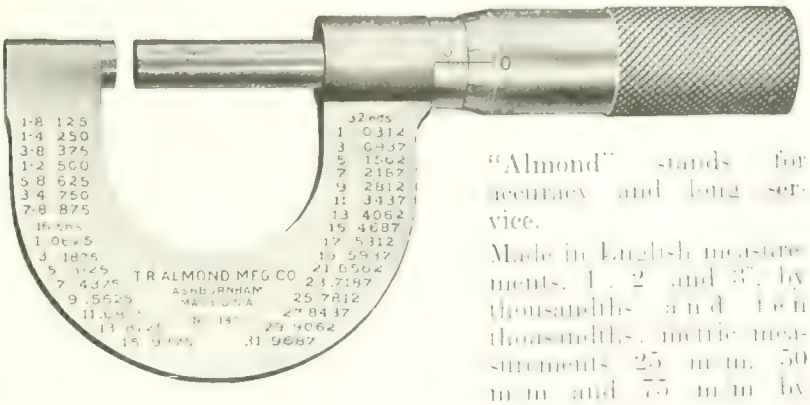


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**We are now supplying regularly Chilled Iron Drawing Dies and Chilled Iron Piercing Dies for making the forgings for 75 mm. shells.**

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## MARINE

**Charter Cancelled.**—In the Ontario "Gazette" notice is given this week of the cancellation of the charter of the Collingwood Shipbuilding Co. March 25 is fixed as the date of dissolution.

**Victoria.**—That 4,001 men are being employed in the shipyards of British Columbia controlled by the Imperial Munitions Board was a fact brought out at the afternoon session of the shipyard wage inquiry recently.

**Kingston.**—The Pyke Towing and Salvage Company shipped pumps and outfit to Trenton to raise the steamer "Rideau Queen," sunk in fifteen feet of water. As the boat lies partly on her side and in an eight-mile current, considerable difficulty is expected.

**Ottawa, Ont.**—Appropriations for public works chargeable to capital include $550,000 for Toronto harbor improvements. The sum to be voted is $450,000 less than was voted last year, and moreover includes a revote of $250,000, unexpended, of last year's appropriation.

**Port Wade.**—Capt. Howard Anderson, H. B. Short, of Digby; Joseph Gaskill, of Grand Manan, and Capt. John W. Snow, of Port Wade, are establishing a shipbuilding plant at Port Wade, just across the harbor from Digby, and will commence at once a three-mast schooner.

**Sault Ste. Marie.**—Ferry service between the two Soos was resumed on the 22nd by the ferry Algoma breaking through the icebound channel after an interruption of two months. Very little trouble was encountered, the trip being made in ten minutes, about the usual running time. Regular schedule trips will begin shortly.

**Vancouver, B.C.**—The British-American Shipbuilding Co. is negotiating for a site for a plant on the Kitsilano Indian Reserve. Plans provide for the laying of eight keels at once and a building programme of about $12,000,000. Dredging to cost $60,000 may be required. S. Mathieson, of Vancouver, is interested.

**Kingston, Ont.**—Just as soon as the harbor is cleared of ice the Kingston Shipbuilding Co., owned by the Canada Steamship Lines, will launch another trawler. Within a year the company has turned out four trawlers. They will be put into commission on the sea, the estimated cost of each being $75,000. The company has a big staff of men at work.

**Sandwich.**—Backed by the Border Chamber of Commerce, the Town Council will petition the Dominion Government to establish shipbuilding yards here. Local financiers are willing to help build a plant, providing the Government will guarantee orders for merchant ships for service between Canada and Great Britain. River front property between Hill and Brock Streets has already been leased.

**Annapolis Royal, N.S.**—The launching of the new three-mast schooner Hilda M. Stark, 172 feet long and 648 tons gross, at the local shipyard, was successfully accomplished at 11.35 March 4, having been unavoidably postponed from Tuesday on account of the storm. The laying of the keel for another three-mast schooner of about the same size will begin at once at this yard, and a larger four-mast vessel will be put in frame at the same time.

**Yarmouth, N.S.**—The old time shipbuilding property here, which in the years when Yarmouth became known the world over by her shipping was owned by the late Mr. James Jenkins, is once more to become a shipyard. A lease of the property immediately north of the old Jenkins homestead has been taken by a company now being promoted, and work preparatory to building will commence next week. Their first vessel will be a schooner of 300 tons, and Mr. Deveau expects to have the keel stretched by the first of April.

**Halifax, N.S.**—Capt. Lemedec, master of the Mont Blanc, with which the Imo collided in Halifax harbor on December 6 last, causing the explosion which wrecked a portion of the city, has left the province, so the Supreme Court of Nova Scotia was informed recently. L. A. Lovett, who appeared on behalf of Captain Lemedec, stated that following his discharge under the writ of habeas corpus, and not having been notified of any possible review of the case, he had left the city and the jurisdiction of the court.

**Windsor.**—Capt. Fred. J. Trotter, of Amherstburg, has been awarded the contract of raising the lightship Falken, which was sunk by the ice during the winter and is now lying off Scudder's dock at the north end of Pelee Island. The lightship was formerly a Norwegian whaling steamer. It remained at its station last fall so late that the ice prevented it making port at Amherstburg. Capt. Trotter, who is now assisting the crew of the lighthouse tender Aspen to recover gas buoys lost in the ice last winter, will leave for Pelee Island next week and make arrangements for raising the Falken.

**Owen Sound.** — Robert McMenemy, lighthouse keeper at Otter Head, has disappeared. McMenemy had been lightkeeper there for several years, being appointed from the Port Arthur district when the light was first placed there. He had carried on his work regularly and without accident until the close of navigation last fall; but after the lights had been ordered out he failed to report in as usual. Little was thought of it for a few days, as delays might have occurred; but when time passed with no news from him a party was sent out by the Sault Paper Co. from their camp at Pukosoi, a short distance from Otter Head, in search of the missing man. When the searchers reached Otter Head they found the lighthouse deserted; but a note had been left by McMenemy, which read:—

December 11, 1917. "Am leaving to-day. Am a very sick man, and do not expect to reach home alive." That was all. Since then no trace has been found of the light-keeper.

## RAILWAYS

**Ottawa, Ont.**—Railway votes include one million dollars for the construction of Hudson Bay Railway terminals. Government railway votes total $18,000,000, as compared with $31,000,000 last year.

**Ottawa, Ont.**—Railways and canals votes chargeable to income include, in addition to the I.C.R. and Hudson Bay Railway votes, $700,000 for the Quebec Bridge, $1,860,000 for the Welland Ship Canal, $500,000 for the Trent Canal, and $250,000 for the National Transcontinental Railway.

## INCORPORATIONS

**Arthur Balfour & Co., Ltd.**, have been incorporated to carry on the business of steel manufacturers, iron founders, etc. John L. Milner, of Toronto, is attorney.

**The Dillon Mfg. Co., Ltd.**, has been incorporated with a capital of $75,000. The incorporators are: R. B. Dillon, G. R. Dillon, W. G. Henderson, O. R. Durrant, and H. Rolston. They will deal in and make barn and stable fittings, etc. Head office, Oshawa.

**The Montreal-Kirkland Gold Mines, Ltd.**, has been incorporated to develop and deal in mines, mineral lands, etc., and refine ores. The provisional directors are: G. P. Cousins, S. Vineberg, and R. Stuart. The capital is one million dollars, and the head office is at Kirkland Lake.

**The Aetna Gold Mines, Ltd.**, has been incorporated to acquire, own, lease, prospect for, open, develop, etc., metals and minerals. The capital is placed at one million dollars, the incorporators being: S. S. Mills, D. W. Saunders, W. P. Torrance, E. G. Goodwin, P. Home, R. H. Wilson, and M. Walsh, all of Toronto.

**The United Inspecting and Testing Laboratories, Ltd.**, with head office in Toronto, and capital of $40,000, has been incorporated to inspect and test materials and engineering equipment and carry on engineering work. The provisional directors are: N. H. Manning, R. J. Marshall, L. S. Rogers, R. R. Deans, and L. S. O'Dell.

**Waltham Watch Co., Ltd.**—This firm has been incorporated by L. A. David, L. P. Crepeau, S. H. R. Bush, G. Whittaker, and J. P. Callahan, for the purpose of carrying on business, wholesale and retail, of the manufacture and dealers in watches, clocks, compasses, marine instruments, etc. The capital is named at $500,000, and the head offices of the company are located in Montreal.

**F. A. Fish Coal Co., Ltd.**, is the name taken by a firm incorporated by M. L. Gordon, C. McKay, W. B. Sturrup, T. S. H. Giles, and J. W. Bicknell, all of the City of Toronto, to purchase and acquire the assets and good-will of the business formerly carried on as the F. A. Fish Coal Co. The capital stock is placed at

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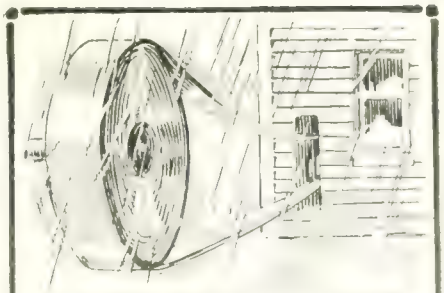

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Contracting and Repairing Machinists

*Quotations cheerfully submitted.*

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## Imports may be restricted from States

**American made luxuries may not be allowed into Canada—Business Must be prepared for Adjustments.**

"Relations with the United States are a vital factor in the business situation at the present time. The exchange problem has become one which is receiving the serious consideration of the Government."

Late reports from Ottawa indicate that in order to right our balance of trade, steps may be taken to curtail shipments of luxuries from the States into Canada.

### Canada's Dollar at a Discount

These important points are from the front page of THE FINANCIAL POST this week. In another important article on the same page the statement is made that a trade balance of 128 million dollars is a reasonable cause for the existing heavy discount on the Canadian Dollar in the United States. In both articles, and in many other important business articles in THE FINANCIAL POST this week, the inevitable need for far-reaching readjustments in business, and the paramount necessity for more production in the Dominion are emphasized. For the business man anxious to keep pace with and profit by the unusual and rapid developments now taking place THE FINANCIAL POST at $3.00 per year, is the right paper to read.

### Business News of the Week

In this week's issue of THE FINANCIAL POST you will find in addition to the important matters mentioned above, these other business news articles. All are written to give you the most and latest facts quickly and with the least effort in reading. These are merely a few of the news matters dealt with:

**Would Scrap Management of Toronto Rails**
**Big Profits for Canadian Car Co. This Year**
**C.P.R. Assets Pass Billion Dollar Mark**
**Farm Products Are on Higher Price Levels**
**Eastern Steel Made No Profit on Munitions**
**Developments re the Dominion Permanent**
**Supremacy of the Bank of Montreal Maintained**
**Bank Clearings Show Improvement**
**Bank Plans re Conscription Being Discussed**
**Edmonton Not Allowed to Recalculate Sinking Fund**
**Winnipeg Rails Showed Only 1 Per Cent. on Common**

The business man able to give an opinion from knowledge of the facts of these matters and many others of immediate business interest which are contained in this week's FINANCIAL POST would be recognized at once as an alert man of affairs. You can be that man every week in the year if you take the right step now by signing this order for THE FINANCIAL POST:

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$100,000, and the offices of the company are in Toronto.

**The Consolidated Equipment Co., Ltd.,** has been incorporated to carry on business as general merchants, importers, manufacturers, etc., for iron, steel, metals, rails, tools, machinery, locomotives, railway cars, trucks, wheels, etc., and to act as agents for the same. The capital stock is $25,000, and the incorporators are: H. Ewan, J. H. Dunlop, Montreal; H. B. Laduke, N. A. Collins, J. T. Barlow. The offices of the company are to be situated in Montreal.

## BOOK REVIEW

**The Darling Digest** is a 16-page monthly bulletin recently issued by Darling Bros., of Montreal. The first copy of this booklet, just off the press, is in keeping with the high standard of the other publications of this firm. The subject matter of this book is compiled in a very instructive yet interesting style, and the object is to give to the readers the gist of the Darling products in an interesting yet educational manner. The technical articles and data pertaining to their various lines of products have been prepared by experienced engineers, so that the readers are assured of reliable information respecting the operation of this firm's equipment. In addition to the "shop talk," the booklet contains a brief digest of many of the current events that adds to its educational value.

## CATALOGUES

The Vanadium-Alloy Steel Co. have issued their stock list of "Red Cut Superior" high speed steel, dated March 19.

**New Safety Switch Bulletin.**—Safety auto-lock switches are described and illustrated in some detail in special publication No. 1585-A, just issued by the Krantz Mfg. Co., Inc., of Brooklyn, N.Y. These switches are designed for use on circuits wherever the ordinary knife switch may be applied. They are especially designed for safety, it being absolutely impossible to touch the live parts regardless of the position of the switch or of the door. They are particularly adapted for use in steel mills, factories, mines and other similar locations where men are employed who have no practical knowledge of electricity.

**Electrical Heating Publication.**—Of interest to everybody connected with the heating of baking, drying, and japanning ovens is a reprint just issued by the Westinghouse Electric and Mfg. Co., of East Pittsburgh, Pa. This includes an article, "Electrically Heated Japanning Ovens," by C. F. Hirshfield, reprinted from the N.E.L.A. Bulletin, and "Heat Calculation for Baking and Drying Ovens." by W. S. Scott, reprinted from the "Electric Journal." Thus there are grouped under a single cover an article giving general considerations in favor of electrical heating for this purpose and an article giving the detailed method of calculation for the amount of heat required to raise the temperature of the work, of the supporting and carrying parts, such as trucks, and of the ventilating air. How

to compute the losses from the external surface of the oven and the heat required to raise the temperature of the oven walls, etc., are also given. This publication should be of much value to central station solicitors, who are endeavoring to interest their customers in the electrical heating of ovens, as well as to present and prospective users of such equipment. Copies will be furnished on application to any Westinghouse Electric branch office for Reprint 66.

## TRADE INQUIRIES

THE following trade inquiries have been received by the Department of Trade and Commerce. Further particulars may be obtained from the Inquiries Branch of the Department, Ottawa:

118. **Wire goods.**—A Liverpool firm asks for quotations on ton lots of wire nails, 1½-inch up to 6-inch. Prompt delivery desired.

120. **Hairpin wire.**—A firm of manufacturers in France wishes to secure supplies of wire for hairpins 11/10 thickness. They would like to have samples sent by parcel post, with particulars regarding prices per 1,000 kilogrammes.

121. **Barytes.**—A Liverpool firm of mine owners and paint manufacturers, who are large consumers of the above, makes inquiry for a Canadian source of supply. Finely ground barytes of good color desired.

122. **Antimony deposits.**—A Liverpool mines, agent inquires on behalf of a client for antimony mines or deposits to lease or purchase. State fullest details and terms to acquire.

123. **Kieselguhr.**—A Liverpool mines' agent would like to hear from holders of deposits of kieselguhr of a good white color.

125.—**Liquid carbonic gas.**—A firm in Kingstown, St. Vincent, is inquiring for manufacturers in Canada of liquid carbonic gas for use in making aerated waters.

126. **Cultivators.** — A Johannesburg (South Africa) firm is desirous of closing an agency arrangement with any Canadian concern prepared to manufacture the cultivator, particulars and illustrations of which may be seen on pages 400-401 of No. 737 issue of the "Weekly Bulletin." This firm is prepared to guarantee the sale of large quantities each year.

W. B. WOODHOUSE recently gave some interesting figures relating to the per capita consumption of coal in England and the United States. In the United States the production of coal per man was 660 tons, as against 250 tons in Great Britain; in the textile clothing trade, the annual value of the production per person employed in the United States was £484, as against £158; the primary cause for the difference was that American industry used approximately three times as much power as was used in England in corresponding trades. The solution of the problem was the more economical use of fuel and the cheapening of power supply, the one being a consequence of the other.


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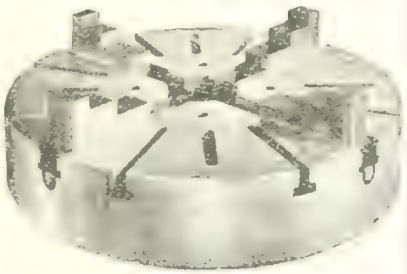

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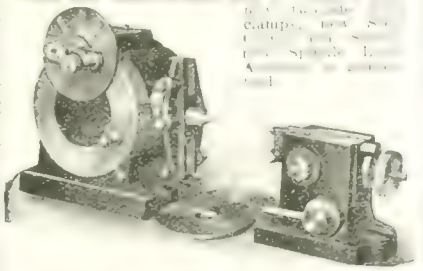

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First, understand what we mean by "good." Even an ordinary file may, for a time, do fast work on soft material. A file, to be what we term a *good* file, however, must do fast work on the hardest, the toughest material, and continue to do it long after the teeth of a common file would be worn smooth. A file made of

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is the only file able to retain sharp cutting teeth against hard metal.

Therefore only a crucible steel file meets our idea of a good file.

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MANUFACTURERS—WE CAN UNDERTAKE [illegible] any specialty—metal production [illegible] Write W. H. Sumbling Machinery Co., 7 St. Mary St., Toronto.

## FOR SALE

FOR SALE—ONE No. 52 NATIONAL ACME 4-spindle automatic screw machine, new, complete with chucks, forming and cut-off tool holders, threading attachment, etc. Box 380, Canadian Machinery. (c11m)

FOR SALE [illegible] LBS. 1,000,000 C.M. TRIPLE braid Wacco cable, 2,500 feet; 3,531 lbs., 500,000 C.M. triple braid Wacco Cable, 1,755 feet. Subject to immediate delivery and prior sale. [illegible] Canadian Machinery. (c12m)

FOR SALE [illegible] PLATING AND POLISHING [illegible] in first-class running order. To manufacturers now sending out their plating [illegible] is an opportunity to secure a high-class equipment at a low price. Must be sold and moved quick. Garland Stove & Foundry Co., Hamilton.

FOR SALE—MACHINERY—HEAVY BENDING brake, power punch, foot punch, folding machine, forming rolls, 35" exhaust fan, double spindle polishing lathes, upright drill, circular saw table, grindstone, two anvils, eight vises, and miscellaneous tools. Bargains for quick sales. Garland Stove & Foundry Co., Hamilton.

FOR SALE—BRASS SHEETS, 14 OZ., TINNED [illegible] 304 sheets 7½ x 14½" and 227 [illegible] Must be sold quick. No reasonable offer refused. Garland Stove & Foundry Co., Hamilton. (ctfm)

**FOR SALE**
**IMMEDIATE SHIPMENT**

Six (6) 600-ton vertical Shell Presses (for 6" shells) complete with pumps and accumulators. Have been used but eight months and are in good condition. Terms and price to interested parties.

United Engineering & Foundry Co.
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## METAL STAMPINGS

METAL STAMPINGS—THE HAMILTON Stamp and Stencil Works, Ltd., Hamilton, Ont. (c14m)

## WANTED

WANTED—FIRST-CLASS DETAIL DRAFTSman, structural and mechanical experience. Herbert Morris Crane & Hoist Co., Limited, Niagara Falls, Ontario. (c14m)

SHAPER, BACK-GEARED, DISC GRINDER and power saw fixture with metal top, hand or power. Must be all in good shape. Box 389, Canadian Machinery. (c14m)

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# CANADIAN MACHINERY

## AND MANUFACTURING NEWS

*A weekly newspaper devoted to the machinery and manufacturing interests.*

Vol. XIX. TORONTO, APRIL 4, 1918 No. 14


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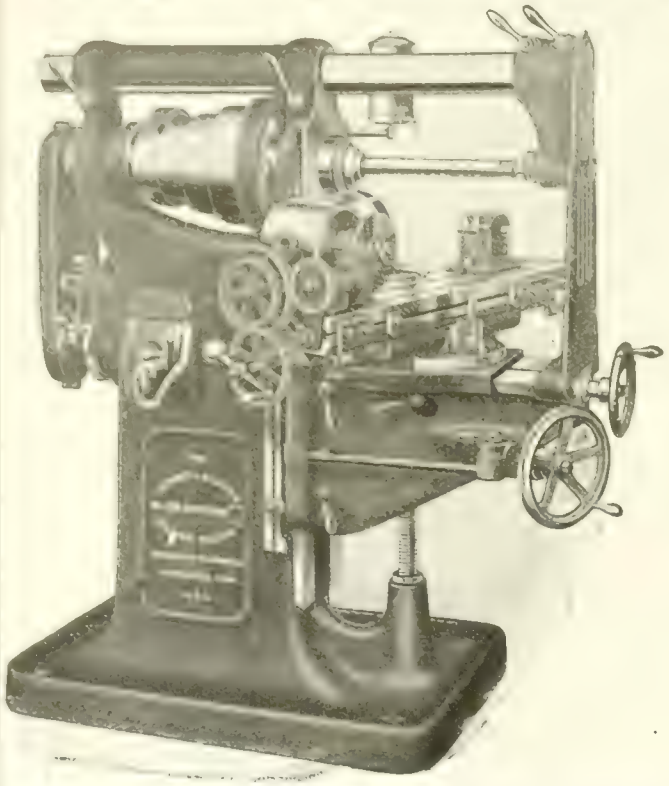

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# Dominion Steel Foundries, Ltd., Have Done Much Already to Solve After-War Problem

## When Munitions Orders Fell Off In Fall Of 1917 Move Was Made To Take Care Of Capacity Of Open-Hearth Furnaces — Developing A Line That Has Previously Been Imported

THE Dominion Foundries and Steel, Ltd., of Hamilton, have to a large extent anticipated their after-war problem. When the first break came in munitions orders in September of 1917 the officials began to investigate other lines to which their plant could be turned. They decided there was a good chance for the making of agricultural shapes, plow standards, etc., and at once turned to develop these and kindred lines. The business has now gone past the experimental stage. It has been a success, and as yet it is in its infancy.

### Growth of the Company

The company was organized in 1912 as the Dominion Steel Castings Co., C. W. Sherman being the organizer and chief executive of the new concern. In the following year, 1913, the new firm became amalgamated with the Hamilton Malleable Iron Co., and then took the name Dominion Steel Foundries. In 1916 the Hamilton Steel Wheel Co. came into existence, and the year following another amalgamation was completed, taking in all the above under the firm name Dominion Foundries and Steel, Ltd. At the present time it is the holding company for the above-named corporation, and will eventually become the operating company as well.

### The Officers

The officers of the Dominion Foundries and Steel, Ltd., are as follows:

President—C. W. Sherman.

Vice-President—W. J. Verity, Brantford.

Secretary—A. G. Wright.

Directors—C. W. Sherman, W. J. Verity, J. J. Harty, Kingston; S. A. Crone, New York; Robert Hobson, Hamilton; Paul J. Myler, Hamilton; W. E. Phin, Hamilton; E. H. Ambrose, Hamilton; F. A. Sherman, Hamilton; A. G. Wright, Hamilton.

### Rapid Development

Cold figures sometimes are quite effective in telling the story of growth and development. When work was started in Hamilton there were 100 men employed. To-day the firm has between 1,700 and 1,800 working in the various factories under its direction. When C. W. Sherman organized the Dominion Steel Castings, Ltd., in 1912 it was the intention to go into the manufacture of steel and malleable castings, but the malleable business was never developed, the main product being steel castings for locomotives and cars and special lines for railway equipment.

### Munitions Business

The company has had signal success in the development of the munitions industry, having been interested in various stages of the output. It was in April of 1915 that they turned out the first 4.5-inch shell blanks and their first shrapnel. Since then, up to September of 1917, the output has been large, rejections few in number, and results very satisfactory. In that time they machined shrapnel, 4.5, made shell blanks for 4.5, 60-lb., 6-inch, 8-inch and 9.2-inch; forged 6-inch, 8-inch, and 9.2-inch. The sole work now is on 6-inch shell blanks and forgings, which are being turned out at the rate of 100,000 per month.

TWO HIGH PLATE MILL AND ROPE TRANSMISSION

### Opened Plate Mill

The management could see that in time the munitions business would cease, and the next problem was to secure an outlet for their open-hearth capacity. Not long after the Dominion Foundries and Steel had their plate mill in operation the embargo was placed on the exportation of plate from United States. This gave the Hamilton mill a very favorable position early in its career. Other lines were affected by the embargo, and the Hamilton mill began the manufacture of plates for railway cars and automobile frames, as well as the agricultural lines. The initial installation consisted of one mill, the success of which was sufficient to justify the installation of duplicate equipment.

### Product

The product at present being turned out consists principally of agricultural steel for plow standards, land sides, shears and discs, etc. The plate rolled at this mill is also suitable for conversion into diaphragm plates and automobile frame steel, tire steel for farm tractors, etc. The steel is all of high grade quality and made to any analysis, as required for the different purposes for which it is to be used. The plates are rolled from No. 15 gauge to ¾-inch thick and any width up to 24-inch. The company was in a particularly favorable position to embark on a venture of this description, as the ingots from which the plates are rolled are cast in the foundry adjoining, which had been in operation for some years. The plate mill thus became a branch of the company's regular business and at the same time is indicative of the extended activities which have been undertaken in recent years. The company has embraced an opportunity of manufacturing a product not hitherto made in this country, but one for which there is an extensive demand. The management believe that they are in a position to supply the entire agricultural machinery trade in Canada with the product such as they are now manufacturing.

### Plant Layout

Construction of the mill building was commenced early in July last, and such good progress was made that the first shipment of plate was made on October 25 last, and it is interesting to note that the shipment in question was made to Tien-Tsin in China. The building is 168 feet by 197 feet and adjoins the company's main plant. The building is of steel construction and arranged in three open bays. The first bay contains the furnaces, the second the mills and ingot floors, while in the third

are located a number of steaming machines of different types. Tracks from the steel foundry run into the middle bay for delivering ingots to the floors near the furnaces, the ingots being handled inside by the means of a Shaw 10-ton, electrically operated, overhead travelling crane, having a span of 60 feet. Another crane of the same type

BATTERY OF OIL FIRED INGOT HEATING FURNACES IN PLATE MILL

operates over the third bay, serving the shearing machines and plate piles, also used for shipping finished plate, all of which is shipped from this bay by a railway switch running parallel with the building.

### Furnace Installation

The furnace installation consists of three ingot-heating furnaces, one combination pair and sheet furnace and a large annealing furnace. The ingot furnaces each have a hearth surface of 120 square feet and the annealing furnace has 500 square feet of hearth surface. All the furnaces are oil fired, the oil being delivered under pressure to the furnaces, where it is mixed at the nozzles with air at a pressure of 50 lbs. per square inch. The charge in the ingot furnaces ranges from 15,000 to 18,000 lbs. each. The heat varies according to the carbon content of the steel.

The annealing furnace has tracks on the hearth, upon which rests a set of cast iron balls carrying a cast iron cradle capable of holding 20 tons of sheets or plates. After being in the furnace for a time the sheets are then taken out and remain in the box about twenty-four hours and allowed to cool slowly. The combination pair furnace is really a sheet mill proposition, but can be used for the lighter gauges of plate. It is so constructed that the waste heat from the pair furnace passes over a brick arch, and is used again in the front or sheet heating end in connection with the annealing process. In the rear end the charging doors are at the side, whereas in the front furnace the doors are at the front. There is an overhead runway from the ingot furnaces to the mill to facilitate the handling of the ingots.

### Rolling Mill

The mill is a two high plate mill, the installation consisting of three stands of rolls and a cogging stand. The roughing rolls are 26 in. by 60 in. and the finishing rolls 26 inch by 38 inch and 26 inch by 32 inch respectively. The ingots are carried from the furnace to the roughing mills and broken down. The steel passes through the roughing rolls on to a large table known as a lifting table, which is operated by air pressure. The table rises, elevating the steel, which is then passed back over the top roll to be put through the mill again. This operation is repeated several times when the steel is transferred on an electric transfer buggy to the finishing mill, where the plate is given the proper gauge and surface. During the breaking down operation great care is taken to remove all scale which forms on the steel. The reduction in the roughing mill is provided for by a screw-down arrangement electrically driven and controlled by the operator, who has a dial in front showing the relative distance between the rolls. The mill is driven by an electric motor through a rope drive.

### Mill Transmission Details

The mill is operated by a Bullock electric motor through a rope drive of the American type, supplied by Dodge Mfg. Co., Toronto. The motor is a 500 h.p., 2,200 volt A.C. machine, operating on Hydro power and of specially strong construction for mill work. The motor is situated in a room adjacent to the transmission, and to the left of the mill. This drive is an interesting sample of rope transmission. It is an endless rope of Manila, 2,800 feet long and 1¾ in. diameter. The rope feeds from the under side of the extreme left-hand groove in the smaller sheave round the idler and back to the top of the sheave on the opposite side, then across to the big sheave. Each sheave has 28 grooves. The motor and smaller sheave run at 380 revs. per min., the big sheave at 120 revs. per min., and the mill rolls at 32 revs. per min., the gears in the mill line providing for the necessary reduction in speed.

### Shearing Machinery

The plates after passing through the finishing mill are placed on a cooling bed. They are then carried to the hot shears and cut into lengths. This machine is a Long & Alstatter, motor-driven gate shear, having 60-inch knives and capable of shearing stock up to 1 inch by 20 inch cold. The plates after being cut to length are sheared into blanks and into various shapes into machines equipped with specially designed knives. There is also installed a gate shear for trimming light gauge stock. This machine has 126-inch knives, and was built by the United Engineering Co., Pittsburgh. Shearing for agricultural stock requires skilled labor and special knives to suit the work.

### Pickle Department

The pickle department is located in a separate building, which is situated so as to allow immediate loading of the steel in railroad cars for shipment as soon as the pickling process is completed.

TRIMMING SHEARS HOT SHEARS AND STOCK PILES

The pickling house is equipped with a 2-ton overhead electrically-driven crane and industrial tracks, etc. No agricultural steel is pickled, but all automobile frame steel is treated, the process con-

sisting of thoroughly cleaning in a sulphuric acid bath 7 per cent. solution, and afterwards covering the steel with a coat of lime to prevent rusting. The company pays particular attention to the quality of steel used in the manufacture of the finished product, and has been successful in producing a fine quality steel, particularly suitable for the purpose for which it is required. The quality of the steel is claimed to be better for its purpose than any manufactured on this continent. T. L. Crossen, who is superintendent of the plate mill, has been in charge since its inauguration. Mr. Crossen has been engaged in plate mill work for a number of years, and came from Pittsburgh to take charge of this plant.

SHEARS FOR AGRICULTURAL STEEL, ALSO SHOWING STOCK PILES

### SHIPBUILDING CO-OPERATION

About forty representatives of the steel shipbuilding industry on the Great Lakes, with leaders of labor, were in conference at Ottawa on March 27 with members of the Government regarding the shipbuilding program which is being entered upon. There had been some prospect of disagreement on wages, but at the conference all parties expressed a willingness to amicably co-operate in carrying out a plan which is recognized as vital to the allies, while at the same time being a source of great industrial prosperity to the Dominion.

At the conference the Government was represented by the Prime Minister, Hon. C. C. Ballantyne, Hon. T. W. Crothers and Hon. G. D. Robertson. Sir Robert Borden, in his address, pointed out the great need of shipbuilding to aid in overcoming the allied shortage, and appealed alike to employers and employees to amicably co-operate, so that the product could be turned out with the utmost speed.

Hon. C. C. Ballantyne, after concurring in what the Premier had said as to the need of ships, stated that the Government policy was not for the war alone, but contemplated a permanent national industry in shipbuilding. Canada, he said, proposed to be self-contained as regards her marine requirements. Mr. Ballantyne referred to the contract concluded with the Dominion Iron & Steel Co. for the construction of a plate rolling mill as a great advance step. The contract called for 250,000 tons of steel plates, and extended over a period of five years. The guaranteed minimum was 50,000 tons a year, but 75,000 might be taken. The estimated cost of the mill was $5,000,000, and a year would be required before the plates could be turned out.

The minister stated that it was the policy of the Government to order ships at a fixed price per ton, and it was therefore very necessary to ship-owners to know the rate they would have to pay, particularly as 60 per cent. of the cost was labor.

He urged strongly that a scale of wages be fixed for at least one year. He further pointed out that the present capacity of the yards was 250,000 tons.

P. M. Draper, Secretary of the Dominion Trades and Labor Congress, speaking for organized labor, fully realized the natural necessity of shipbuilding, and spoke hopefully of employees and employers agreeing, while Mr. Smith, head of the Collingwood Shipbuilding Company, expressed similar sentiments.

There is little question that any prospective difficulty will be obviated.

### FIRMS WITH FOREIGN TRADE SEEK VETERANS

THE rehabilitation of many returned soldiers in the Canadian forces has started with a struggle with the English language. The vocational training department of the Military Hospitals Commission, to whom the Government has entrusted the business of making verterans fit again for civil life, has scores of men enrolled in English classes in the military convalescent hospitals.

French, Swedes, Italians, and Norwegians who enlisted in the army of their adopted country when the war broke out are returning unfit for further military service, and the Government is giving them every opportunity to become equipped for success in the future.

#### English the First Necessity

It is commonly known that many foreigners who migrate to Canada are condemned to common labor by their lack of a knowledge of the language. Abilities which would enable them to become very useful factors in business are lost to them because of their handicap, and they are eager to embrace the opportunity which is being afforded them during their days of convalescence.

In the west where foreigners are to be found in large numbers, men who have learned English will find places in the business world easily. The appreciation of the work which the commission is doing in this line was evidenced recently in Saskatoon when a very perturbed manager of a big firm phoned to the hospital to see if they had a man who could translate some Norwegian mail for him.

The school was ready with the man.

### U. S. AUTHORITIES URGE CO-OPERATION BETWEEN WOOD SHIPBUILDERS

THE possibilities of increasing output from shipyards engaged in construction for the Emergency Fleet Corporation have been subject to investigation recently, with the result that efforts are being made to secure closer co-operation amongst builders along the lines of methods of construction, plant and storage equipment, etc.

According to a recent statement by Mr. James O. Heyworth, manager of the division of wood ship construction, some yards can work 300 to 400 men per ship at the time when the peak of construction of the ship is ready for them; other yards can work rarely more than 160 to 200 men per ship; even some of the old shipbuilders believe 100 to 125 men per ship is the limit for good construction.

#### Can Rely on Drawings

It must be remembered that in the Ferris standard type the plans are so accurate that much of the woodwork can be done with safety by sawing to the exact dimensions. For your information there are yards where the old shipbuilder was doubtful whether he dared saw to the exact size, leaving from 1 to 3 inches that could be hand reduced after the timber was in place, taking this precaution to be sure that the alignment of the ship would come out right. Experience shows that the plans and drawings can be relied upon.

We have records of yards where they have put as high as 500 men on a ship to advantage. In one yard this has recently caught up previous delay by over two months. We have numerous yards where 300 to 400 men are worked to advantage on one ship. Other shipbuilders that I have personally talked to were fearful of

The shipbuilders in each district should [illegible] association and meet at least once in every two weeks; remember that a week from now is equal to one month in ordinary times. The district supervisor should meet with this association; the meeting should be formal and carried on in a business-like manner, straight to the point, viz.: To illustrate by photographs and drawings, or papers, or brief talks, the advantages certain yards are obtaining by their methods and equipment and general handling of construction. The minutes of these meetings should be immediately put in proper form and distributed among the shipbuilders of the district, as well as a copy to the home office.

### Must Speed Up Production

This is no time to work on the old basis for wood construction. The country needs ships more than anything else. We must have them. Production must be speeded up.

It is logical that a general comparison can be made where so many yards are at work, and it is also logical that many of the yards are being operated along better lines of production than other yards. It is your duty and obligation to the soldiers abroad to take the utmost advantage of this fact and act accordingly.

The district [illegible] engineers, [illegible] for the purpose of arriving at how the yards are doing at best. Co-operation with these engineers will help, but real co-operation between the shipbuilders of each district, worked out in a proper manner, can double our production in the next six months.

## URGE DEVELOPMENT OF HOME FUELS

FOR the purpose of studying Canada's fuel situation from every angle, an important body of civil engineers drawn from all parts of the Dominion met in session in the Physics Building of the University of Toronto, on March 26 and 27. The Canadian Society of Civil Engineers devoted two days of the convention to an exchange of views upon means of making Canada independent of the United States in regard to fuel. The first day's programme took account of the necessity for extra immediate production and systematic conservation of coal in order to tide the country over the next year or two of war scarcity, but it covered more particularly the problem in its larger sense. Full emphasis was placed in the various addresses upon the imperative need of developing Canada's fuel resources so that in the future when the supply in the United States falls short, the industrial life of the Dominion will not suffer. Increased production of bituminous coal in the Western and Maritime provinces and of peat fuel in Ontario, together with radical economies in the use of coal, were proposed.

## MARKET FOR ASBESTOS MANUFACTURES IN ENGLAND

J. E. RAY, Canadian Trade Commissioner at Birmingham, England, has the following to say in regard to the market for asbestos products in that district: At the present time there is a brisk demand for manufactures of asbestos in the Birmingham district, but according to replies to specifications recently cabled by this office to Canada, the obstacle to the transaction of business is dearth of shipping space. However, if it is impossible to ship under the circumstances, efforts should be made to ascertain the requirements of the British market in preparation for after-war trade. As is well known, the production of raw asbestos in Canada has increased rapidly during recent years, but manufactures of the same have made but tardy progress. Some twelve months ago a range of German samples of manufactured asbestos was forwarded to the Department of Trade and Commerce. An excellent trade in these commodities was transacted by Germany with the United Kingdom prior to 1914. Firms interested can be introduced to importers in Birmingham, with whom preliminaries might be discussed in preparation for future trade.

## DEVELOPMENT OF AIRPLANE GUN AMMUNITION

CONDITIONS under which airplane fighting has been developed show that a continuous process of evolution has taken place conjointly between protective and destructive equipment. As the war progressed, the more vital parts of the airplane were protected with light armour, so that it became necessary to introduce armour-piercing bullets similarly.

As the gasoline tanks were particularly susceptible to incendiary explosion, it was necessary to procure a bullet containing an inflammable substance, ignited upon discharge, which would carry the spark or flame into the tank upon piercing it.

### Tracer Bullet Introduced

As the target, the enemy airplane, was within fighting range for only brief moments at a time, and as there were no means of determining the fire effect as on land, a tracer bullet containing a bright-burning composition, which would indicate the path of the bullet in daylight as well as in darkness, and thereby allow the aim of the machine gun to be corrected, was introduced. The composition is set on fire upon discharge and the bullet flies through the air as a bright spark plainly visible to the machine-gun operator.

All of these cartridges are of the small rifle calibers—caliber .30 or thereabout. The 3/10 of an inch diameter and short length of this bullet left little space therein for the armor-piercing element or for the tracer or incendiary composition. Nevertheless, combinations of armor piercing and tracer and armor piercing and incendiary bullets have been made.

### Meet Tests Fully

At the outbreak of the war, further information was promptly gathered from the allies and this subject was studied by those responsible for this work in the United States. Of course, on account of the difficulties of the problem, none of the special bullets possessed by any country is entirely satisfactory or what might be termed "perfect" in operation.

The bullets developed by the United States Ordnance Department have been tested on land and from airplanes to see if there is any difference in their performance when fired from a quickly moving airplane in the upper atmosphere and when fired on land.

These tests indicate that the United States has developed a class of special cartridges with a performance fully equal to that attained abroad.

## RESEARCHES ON TIN AND TUNGSTEN

THE *Board of Trade Journal*, London, England, says that one of the most attractive fields for investigation being opened by the exigencies of the war is that which pertains to the winning of tin and tungsten. Recently some successful experiments have been made with a view to increasing the recovery of tin. No systematic researches, however, have been undertaken beyond those designed to improve the appliances now in use; and, having regard to this fact, the Privy Council Committee for Scientific and Industrial Research has expressed the hope that a research association might be established in order that the series of investigations already undertaken might be continued with fresh vigor on a larger scale.

One of the difficulties in the way hitherto has been the want of adequate funds for sustained investigation and experimental trials. But the Ministry of Munitions, represented by the department for the development of mineral resources, is now venturing on a strong effort to make progress possible, and is suggesting that those interested in the tin and tungsten mines of Cornwall and Devon should co-operate in the establishment of a research association, and contribute to a central fund devoted to a study of the many-sided aspects of the problem. In this way adequate means might be provided annually for two or three years; and with such a fund, supplemented if necessary by a grant from the Committee of the Privy Council, experimental researches upon scientific principles could be conducted.

## NEW ZEALAND IMPORTS OF METAL MANUFACTURERS

PERTINENT remarks regarding business conditions and methods feature the report on 1916 trade of the Dominion of New Zealand submitted by R. W. Daltan, British Trade Commissioner. The losses sustained by British manufacturers, the reasons for such and means to be employed for recovery are of particular value to present and prospective exporters in this country.

The following table shows the total imports in this class, together with the shares of the countries named:—

| | Competitive. | |
|---|---|---|
| Countries. | 1915. | 1916. |
| United Kingdom | £1,8[illegible] | £1,799,901 |
| Australia | 63,065 | 97,434 |
| Canada | 111,953 | 165,042 |
| United States | 44[illegible] | 486,134 |
| Japan | 891 | 11,970 |
| Germany | 5,42[illegible] | 28,803 |
| Other countries | 4,1[illegible] | |
| Totals | £[illegible] | £2,589,784 |

There were no non-competitive imports during these years.

The following table shows the proportion of the total of the imports from each of the countries named in each of the two years:

| | 1915 | 1916 |
|---|---|---|
| Countries | % | % |
| United Kingdom | 76.7 | 69.5 |
| Australia | 2.6 | 3.7 |
| Canada | 4.6 | 6.4 |
| United States | 14.3 | 18.8 |
| Japan | 0.0 | 0.5 |
| Germany | 0.2[illegible] | 1.1 |
| Other countries | 1.6[illegible] | |
| Totals | 100.0 | 100.0 |

As was only to be anticipated, British manufacturers have lost ground in the trades covered by this class. A good deal of this loss is due to dealers having to purchase the products of other countries against their will, but there are a few lines in which the goods which have been supplied are capable of holding their own on their merits even in normal times. It will, therefore, require the display of energy and adaptability if our manufacturers are not to lose, permanently, trade in this market which they formerly held.

### Bolts and Nuts and Wire Goods

In bolts and nuts, the imports from the United Kingdom decreased from 27,391 cwts. to 24,282 cwts., while the imports from the United States increased from 1,761 cwts. to 3,831 cwts. American bolts and nuts are very much cheaper than British, but, allowing for difference in price, the British article is recognized to be a much superior article which would usually be preferred.

Imports of brass plate and sheet from the United Kingdom showed a large increase, while imports from the United States declined. Germany's share of the trade in metallic capsules has passed to the United Kingdom. In fencing staples, American trade increased, and there was also a considerable increase in imports from Canada. Dealers complain that the reason why this trade is largely in the hands of American firms is that British firms refuse to make the pattern which the market requires; but Canada has now begun to make this pattern, and is getting a good share of the trade. There were no imports of barbed fencing wire from the United Kingdom in the last year, and America supplied about 80 per cent of the trade. In ordinary fencing wire, the United States supplied the greater part of the trade, but the imports from Canada increased.

The whole of the fencing position in New Zealand demands consideration from firms in the United Kingdom. There are very few hedges such as are known in the United Kingdom, the common method of fencing being by wire. The American firms cater for the cheaper trade. There is no comparison, of course, in the qualities of the wire supplied from the two countries, and where first cost is to be considered only in relation to durability the British wire will always be used. But where land is continually being brought in and quickly changing hands, the cheaper method of fencing will often be employed, because first cost is often the main consideration. There is, consequently, a certain demand for the cheaper wire which our firms do not apaprently attempt to cater for. With the development of the dairying industry and the tendency to closer settlement, apart from the continual breaking of new land, the demand for fencing materials of all kinds is bound to be very great, and it would be worth the while of United Kingdom firms to study the position.

### Hardware and Hollow-ware

In hardware, hollow-ware and ironmongery, not otherwise enumerated, there were considerable increases in the imports from Canada, Australia, Sweden, Japan, and the United States. Probably the most notable line in which developments have taken place is enamelware. The difficulty in obtaining supplies from the United Kingdom has enabled other countries to develop this trade. The enamelware which has come from Japan has been of very poor quality, and much below sample on which orders were taken. Dealers generally are very much dissatisfied, and unless a great alteration takes place it is not likely that this trade will continue. The Canadian, American, and Swedish lines have been very satisfactory, though prices in many cases are high, but latterly supplies from Sweden have stopped.

The greater part of the growth in imports from the United States is probably due to increased trade from that country in files, screws, etc. America has been supplying good selling lines in pliers, such as formerly came from Germany, and has also entered the trade in sheep's ear markers, a line in which it is impossible to get satisfactory deliveries from the United Kingdom.

I consider that the United Kingdom trade in general hardware lines is not is not what it ought to be. The manufacturers are too much inclined to satisfy themselves with making a good article and leaving the article to sell itself.

The Americans may have an inferior article, but they make it look like a good one, and they consider the best way of making it appeal to the buyer. The average buyer has little idea of intrinsic value, and from my experience of New Zealand I am sure that, with the exception of certain recognized brands, the buyer will very frequently buy an American, rather than a British article, so far as hardware is concerned, for no reason than that it looks better value. In addition, the dealer finds himself almost obliged to push the American article to the disadvantage of the British if he is to make a good show in his store, and to make a good profit in his business. The articles which he receives from America look attractive on his shelves or in his window, while he is also supplied with plenty of showcards and advertising matter. Everybody who thinks knows, of course, that the buyers pay for all this, but few actually think of it.

If the manufacturer will consider that everybody believes that the British article is the best, but that it is the American article to which the attention of the customer is more often drawn, he will begin to find out what is the root trouble in our overseas hardware business. I am driven to the conclusion, after careful consideration, that many of the firms in the United Kingdom in this trade have not sufficiently realized what must be done to secure successful "selling," and that it is this shortcoming in their selling organization, almost solely, which is building up foreign trade in these lines.

It will probably be said that the figures of trade prove that the position of the United Kingdom trade is satisfactory and that, therefore, the methods must be. As a matter of fact they do no such thing in this trade at any rate, for the returns merely show that, in spite of defects, the quality of the goods which United Kingdom firms have to offer is the saving factor. More trade could be done here if their methods were improved. I could not rightly refrain from calling attention to this matter in the interests of British trade, as the weakness is so obvious to any one who travels through the country, and one cannot go into any hardware store without finding proof of it.

### Galvanized and Corrugated Sheet

Imports of galvanized and corrugated sheet, for which the demand is very great, showed a large decrease. Prices have risen to an extraordinary extent, and it is extremely difficult to find even small lots on the market at present. Imports from the United States increased from 8,072 cwts. to 10,579 cwts., but it would seem almost certain that when supplies are again available the trade will revert to the United Kingdom.

### Wrought Iron Tube

Canada has done a very large business since the war in wrought iron tube 6 inches and under in internal diameter. In 1915 very large quantities of this tube were placed on the market at low

[illegible] by the agent of a Toronto firm, and, in fact, for a time, dealers were [illegible] The imports from Canada in 1916 were only about half of those in [illegible] and the imports from the United Kingdom also fell considerably. I am informed that the Canadian lube is good value and will probably hold its own after the war.

### Lighting Equipment

The German trade in oil lamps has apparently passed into American hands, the trade from the United Kingdom having gradually declined since the war, while that of the United States has shown a considerable increase. There seems to be no reason why United Kingdom firms should not secure more of this trade, which includes both inside lamps and hand lanterns. It is absolutely essential, however, to keep to the patterns which the market calls for and this United Kingdom firms do not appear to do. The imports of gas mantles from the United Kingdom showed a large increase. The United States supplied 1,685 electricity meters as compared with 191 in 1915.

### Nails and Tacks

There has been a considerable increase in the imports of small nails and tacks from the United States. The American tack would seem to have a better finish than that from the United Kingdom, and it is packed in small cartons for retail trade, a fact which is said to help sales. These packets can be retailed at 1d. and are neatly packed three dozen in a box which can be shown on the counter. In wire nails, Canada is taking the place formerly held by the United States. This trade is apparently purely a question of price; with the assistance of the preferential tariff, Canadian firms can underquote American, while British prices are as a rule too high.

The United States supplies the majority of the spraying pumps which are imported, but there is a locally manufactured article which is selling well. This, of course, refers to pumps which are known as bucket pumps and knapsack pumps for handwork. The large pump, petrol driven, which is used in the large orchards in the commercial fruit-growing districts, is an American article. It is horse-drawn, and with a motor of 1½ horse-power with 600 revolutions per minute, costs about £120. British manufacturers do not apparently cater for the trade in the motor-driven pump, though they do supply some of the hand pumps.

### Stoves and Ranges

The trade in oil stoves is largely in the hands of American and Swedish firms. The American stove is sold by the oil companies as a means of cultivating a demand for their oils. The prices, which are fixed by the oil companies, are very low. Imports of gas stoves, which are solely from the United Kingdom, showed a marked increase. The trade in other stoves and ranges also increased, but the majority of these are now supplied by local manufacturers.

### Tinsmiths' Furniture and Fittings

Tinplates have been very difficult to secure, and the imports from the United States have increased in consequence. In tinsmiths' furniture and fittings there has been a large increase in imports from Australia—the majority of these imports probably consisted of fittings for articles used in dairy factories.

### Axes and Saws

The remarks which have been made above in reference to general hardware lines apply to some extent to the trade in tools, but in this trade there is an added difficulty in that the tools which are obtained from the United Kingdom are not always suitable to conditions in the country. This refers chiefly to such articles as axes and saws. In the former the United Kingdom trade is practically non-existent, one or two firms have made an attempt to meet the bushmen's requirements, but for some reason they have not been very successful. United Kingdom firms interested in these have had their attention drawn to the position in regard to these articles, and I do not propose to consider the matter further than to say that New Zealand is still without a British axe of an entirely satisfactory character. As regards saws, I believe that saws to compete with the American special saws are now to be had in the United Kingdom, but they have apparently not been offered with any energy in the Dominion. In spades and shovels, the British article has displaced the American, but I understand that an American long-handled shovel made to a well-known British design is now being offered on the market at $7.50 per dozen, f.o.b. American port, which is lower than the corresponding British price.

So far as other articles in this class are concerned there is little of interest to record. The market is very well stocked, if not overstocked, with goods, and it is practically certain that imports in the present year will show a falling off. Building is practically at a standstill and public works are being reduced to a minimum. In addition, the working of the Military Service Act is resulting in the stoppage of any work on farms or elsewhere that is not absolutely essential. Wholesalers are, consequently, anticipating quiet trade and are indisposed to place orders. This, of course, relates to goods which can be bought; there is a great scarcity of some goods of the heavier classes, of which delivery cannot be secured under present conditions of trade.

## FOREIGN TRADE OF CANADA

(Comparison 1915, 1916, 1917)

### IMPORTATIONS

Month of December

| | 1915 | 1916 | 1917 |
|---|---|---|---|
| Dutiable Goods | $24,805,899 | $38,177,116 | $36,363,034 |
| Free Goods | 20,884,822 | 29,723,418 | 25,271,628 |
| Total | 45,690,721 | 67,900,534 | 61,634,662 |
| Coin and Bullion | 9,429,288 | 611,512 | 657,769 |
| Grand Total | 55,120,009 | 68,512,046 | 62,292,431 |
| Duty Collected | 9,242,125 | 12,085,082 | 10,860,805 |

Nine Months Ending December

| 1915 | 1916 | 1917 |
|---|---|---|
| $197,950,486 | $330,791,068 | $426,719,371 |
| 145,972,837 | 271,850,406 | 335,662,916 |
| 343,923,323 | 602,641,474 | 762,382,287 |
| 19,902,003 | 22,994,423 | 10,247,976 |
| 363,825,326 | 625,635,897 | 772,630,263 |
| 71,305,304 | 106,378,729 | 125,796,836 |

### EXPORTATIONS

Month of December

| | 1915 | | 1916 | | 1917 | |
|---|---|---|---|---|---|---|
| | Domestic | Foreign | Domestic | Foreign | Domestic | Foreign |
| The Mine | $ 5,632,984 | $ 207,652 | $ 8,457,039 | $ 42,446 | $ 5,026,041 | $ 152,423 |
| The Fisheries | 2,067,132 | 8,429 | 2,630,149 | 106,449 | 3,016,059 | 65,357 |
| The Forest | 3,553,083 | 2,764 | 4,262,423 | 9,409 | 3,836,909 | 6,147 |
| Animals and Their Products | 9,430,534 | 330,383 | 12,882,235 | 768,867 | 11,433,910 | 336,543 |
| Agricultural Products | 19,389,763 | 36,303 | 47,213,553 | 804,833 | 91,216,447 | 259,232 |
| Manufactures | 21,810,697 | 673,545 | 54,261,266 | 664,372 | 33,635,790 | 1,367,510 |
| Miscellaneous | 287,209 | 164,125 | 330,509 | 100,405 | 246,763 | 287,917 |
| Total Merchandise | 92,171,402 | 1,423,201 | 130,037,174 | 2,496,831 | 148,411,919 | 2,475,129 |
| Coin and Bullion | 20 | 101,322 | 5,000 | 142,143 | 265 | 125,920 |
| Grand Total Exports | 92,171,422 | 1,524,523 | 130,042,174 | 2,638,974 | 148,412,184 | 2,601,049 |

### EXPORTATIONS

(Nine Months ending December)

| | 1915 | | 1916 | | 1917 | |
|---|---|---|---|---|---|---|
| | Domestic | Foreign | Domestic | Foreign | Domestic | Foreign |
| The Mine | $49,034,177 | $7,265,059 | $ 63,725,560 | $ 202,715 | $ 55,498,616 | $ 702,985 |
| The Fisheries | 16,103,698 | 85,945 | 18,075,556 | 171,412 | 21,510,180 | 340,518 |
| The Forest | 12,184,929 | 384,089 | 46,138,448 | 304,987 | 42,512,114 | 51,103 |
| Animals and Their Products | 78,559,429 | 2,193,963 | 93,586,906 | 3,916,500 | 136,353,322 | 4,857,670 |
| Agricultural Products | 202,506,936 | 17,111,054 | 317,451,445 | 5,130,017 | 475,338,003 | 9,179,195 |
| Manufactures | 119,399,269 | 5,752,596 | 317,841,414 | 6,163,671 | 522,963,430 | 18,420,270 |
| Miscellaneous | 3,745,610 | 1,183,089 | 4,810,484 | 1,135,660 | 3,509,235 | 1,793,083 |
| Total Merchandise | 511,534,048 | 33,975,795 | 861,629,813 | 17,024,962 | 1,257,684,900 | 35,344,824 |
| Coin and Bullion | 115 | 103,151,019 | 76,382 | 195,970,726 | 237,933 | 2,503,051 |
| Grand Total Exports | 511,543,163 | 137,126,814 | 861,706,195 | 212,995,688 | 1,257,922,833 | 37,847,875 |

# Role of Chrome Vanadium: Its Position Among Alloy Steels *

By F. J. Griffiths**

*Simple heat treatment, wide range of permissible temperatures and the possibility of producing almost any desired physical properties to suit different classes of application have caused chrome-vanadium steel to be the object of much investigation and research. The writer discusses the properties, processes and applications of this steel.*

CHROME-VANADIUM steel holds the position virtually at the head of the commercial alloy steels and owes this prestige to the extremely wide range of physical qualities which are capable of being developed from this metal by proper methods of heat treatment. Like all alloy steels it is, as its earlier name signifies, a special steel, meaning not only that it is designed for special purposes, but also, that its preparation for the particular work it is called upon to perform must be carried out along certain lines calculated to yield in the final result, those qualities which shall represent 100 per cent. efficiency in the final product. Many specifications to-day allow a variation of 1 or 2 per cent. in the elongation, and restrict also the ultimate strength and yield point to extremely narrow limits. Examination of these specifications alone would serve to show the wide range of qualities of [illegible] delicate accuracy with which by proper management it may be put into condition to perform its highest functions.

### Its Composition and Structure

Chrome vanadium combines in such a manner with iron that the separate constituents of the final alloy produced cannot be distinguished, regardless of the methods selected to separate them. Whether we adopt mechanical means or use the microscope under large magnification the result is the same. This phenomenon indicates a quite strong combination between the alloying elements and defines the combination unmistakably.

Until recently little investigation has been ventured to ascertain the definite properties of chrome vanadium, and the [illegible] imparted by this [illegible] element were relatively unknown except to a favorite few who, through their own research work, acquired intimate knowledge of the characteristics bestowed upon iron by the addition of this alloy.

Chrome vanadium alloys with iron in all proportions and affects the properties to a marked degree, depending upon the percentage of chrome vanadium present. The qualities which become inherent are influenced also more or less proportionately by the amount of carbon contained. In this respect chrome-vanadium steel is a special steel in another sense of the word and cannot be judged by the same standard as the old carbon steels.

The point of view of the examiner of the old commercial steel is always that of the actual condition in which the metal exists as he sees it before him, and governed by the amount of carbon present. But this point of view has altered grad[illegible] the carbon range permissible to obtain specific characteristics has become narrowed. The presence of chrome vanadium in steel intensifies the effect of the carbon in all the best qualities, which it is capable of producing alone.

The property of soundness of the casting and ingots produced by the use of chrome vanadium induces freedom from occluded gases and greatly increases the desirable physical qualities of the forgings subsequently made from this steel, such as strength, ductility and resilience. These desirable properties are amply proved not only from the results obtained from tests, but also from the more vital trial of actual use.

### Value of Special Steels

According to the old view and judging from the results of tests chrome vanadium steel, as rolled or annealed [illegible] appear to be a worthless product. It may have, as in examples to be given later, a percentage of elongation, reduction of area, elastic limit, and ultimate [illegible] corresponding to simple carbon steel. Stress is laid on this particularly, because there is still a large and unreasonable prejudice in certain quarters against the use of steels which have to be put in special condition, or more plainly, heat treated, before they are capable of doing their best work. Of course, as we all know, this feeling is largely giving way before the splendid performance which steels of this character are giving in service, and given sufficient time the special steels themselves will demonstrate the unsoundness of this objection based largely upon the limitations of the older simple carbon steels.

In order to make this more definite the subjoined tests, which are in no sense exceptional, are offered. They have been selected almost at random from records for the purpose of illustration. They cover briefly four classes of chrome vanadium steel, as follows:

A steel with a composition of about 0.1 per cent of carbon, 0.95 per cent. of chromium and 0.14 per cent of vanadium.

A steel of 0.42 to 0.49 per cent. of carbon, approximately 1.10 per cent. of chromium, and [illegible] per cent. of vanadium.

High carbon chrome-vanadium steel of a composition of 0.98 per cent. of carbon and 1.06 per cent. of chromium and 0.12 per cent. of vanadium, and

Low-carbon chrome-vanadium steel of an analysis suitable for most strucutral purposes, namely, carbon, 0.24 per cent.; manganese, 0.69 per cent.; chrome, 1.10 per cent., and vanadium, 0.15 per cent. It is to be regretted that while we are engaged on extensive tests of the third class of material mentioned, our experimental data are not at present available for use here. However, the extreme softness and ductility of this steel in the annealed condition may be noted from the one example given. This result is rather surprising in view of the high-carbon content present. Table I gives results of tests on these steels.

An examination of these results, which are concerned only with the simplest quenching and drawing treatments, shows the versatility of chrome-vanadium steel. One comment, however, based upon a practical consideration and not upon theory, may well be made here. Test results such as these just presented are valuable only in so far as they are recognized for what they are. They represent, it is true, what it is possible to do with the metal when it is in the finished state, but they do not necessarily represent what the qualities of the metal in the final product will be, if the heat treatment is carried on under exactly the same conditions as those which obtain in the tests. When it comes to question of heat treatment of the final product, the conditions must of necessity be altered somewhat, and the treatment of each class of articles then becomes a special problem. This should not be considered in the light of admission on the part of the steel manufacturer; it should be rather conceded as the principle by which he is most willing to work.

One of the principal effects produced in steel by the addition of chrome vanadium, is to raise the temperature at which the carbides dissolve in the iron, and the temperature at which they are precipitated out of solution. This elevation of the solution temperature is quite noticeable, the carbon content affecting this temperature but slightly. When chrome is added to steel it raises the critical points on heating above the corresponding carbon-steel temperatures, but on cooling, the critical point is considerably depressed, roughly in proportion to the maximum temperature from which the steel is cooled. The higher the maximum temperature reached the lower the critical range will be on cooling. This fact serves to show the slowness with which the structural changes occur in this alloy and the additional time required for the transformation to be effected completely.

It is unnecessary to point out the practical utility in commercial practice of working with a steel, in which this slow rate of transformation can be taken advantage of by the use of higher temperatures without resulting injury to the product, and also by the fact that the steel can stand exposure at these higher temperatures without the attendant harmful effects characteristic of other steels subjected to the same conditions. In fact, chrome vanadium seems to attain its greatest combination of desirable qualities at higher treatment temperatures than would be expected from the location of its critical range, due principally to the greater length of time necessary to effect the [illegible]

*Abstract of paper read before American Society for Testing Materials.

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uniform and homogeneous solid solution. other commercial alloy steels, although excellent in many respects, have very narrow limits of annealing and hardening temperatures, and therefore require unusual care in their treatment, a slight deviation from the correct temperatures resulting unsatisfactorily.

found by experience that a temperature of 775 deg. C., which is suitable for hardening a case-hardening steel and still retain desirable toughness of the core, can also be employed for hardening oil-treated parts.

The lower-carbon chrome-vanadium steels are apparently pearlitic in nature and, as such, possess the increased strength and hardness resulting from the

TABLE 1.—PHYSICAL PROPERTIES OF STEELS OF VARIOUS CHEMICAL COMPOSITIONS.

| Limit, | | | Reduction of area, % | Brinell Hardness Number | Drawing Temperature, deg. Cent | Remarks |
|---|---|---|---|---|---|---|
| | | 0.31 Per Cent Carbon Chrome-Vanadium Steel | | | | |
| | 255,000 | 6.5 | 26.0 | 444 | 200 | Heated to 850° C. |
| | 232,000 | 10.5 | 49.0 | 444 | 260 | Cooled to 800° C., |
| 178,000 | 193,000 | 11.0 | 50.0 | 444 | 370 | quenched in water. |
| 170,000 | 179,000 | 11.5 | 55.0 | 387 | 430 | Reheated to 850° |
| | 166,000 | 15.0 | 58.0 | 364 | 485 | C. for 20 min., |
| | 160,000 | 16.0 | 59.0 | 351 | 540 | and cooled in air. |
| | 146,000 | 17.0 | 60.5 | 340 | 595 | |
| 225,000 | 234,000 | 6.0 | 14.0 | 321 | 200 | Heated to 850° C. |
| 212,000 | 223,000 | 7.5 | 16.0 | 321 | 260 | Cooled to 800° C., |
| | 212,000 | 8.5 | 41.0 | 321 | 320 | quenched in oil. |
| | 175,000 | 11.5 | 52.0 | 321 | 430 | Reheated to 850° |
| | 159,000 | 13.0 | 55.0 | 303 | 485 | C. for 20 min., |
| 141,000 | 151,000 | 15.0 | 60.0 | 286 | 545 | and cooled in air. |
| 130,000 | 141,000 | 16.5 | 62.0 | 269 | 595 | |
| | | 0.42 to 0.49 Per Cent. Carbon Chrome-Vanadium Steel. | | | | |
| 100,000 | 120,000 | 22.0 | 62.0 | 260 | 700 | Heated to 875° C. |
| 116,000 | | 19.0 | 58.0 | 286 | 656 | Cooled to 825° C. |
| | 170,000 | 15.0 | 45.0 | 387 | 650 | quenched in oil. |
| | | 12.0 | 40.0 | 418 | 580 | Reheated to 875° |
| | | | | | | C. for 20 min. |
| | | | | | | and cooled in air. |
| 167,000 | 179,000 | 12.0 | 35.0 | 418 | 540 | Heated to 900° C. |
| 182,000 | 188,000 | 11.0 | 32.0 | 444 | 485 | Cooled to 825° C. |
| 202,000 | 216,000 | 10.0 | 31.0 | 477 | 430 | quenched in oil. |
| 220,000 | 228,000 | 9.5 | 30.0 | 555 | 375 | Reheated to 900° |
| | | | | | | C. for 20 min. |
| | | | | | | and cooled in air. |
| | 142,000 | 16.0 | 55.0 | 321 | | As rolled |
| | 136,000 | 19.0 | 60.0 | 321 | | As rolled |
| | | High-Carbon High-Chrome Steel | | | | |
| 43,200 | 92,450 | 32.0 | 64.0 | 170 | | Annealed. |
| | | Low-Carbon Chrome-Vanadium Steel | | | | |
| | 209,000 | 12.0 | 51.0 | 444 | 200 | Heated to 850° C. |
| 197,000 | 206,000 | 11.1 | 53.0 | 444 | 260 | Cooled very slowly |
| 182,000 | 198,000 | 10.0 | 53.0 | 444 | 320 | to 800° C., quench'd |
| 166,000 | 179,000 | 13.0 | 57.0 | 402 | 375 | in water. Reheated |
| 161,000 | 169,000 | 15.0 | 58.0 | 387 | 430 | to 850° C. for 20 |
| | 157,000 | 16.0 | 59.0 | 364 | 485 | min., and cooled in |
| 144,000 | 155,000 | 18.0 | 60.0 | 340 | 540 | air. |
| 130,000 | 142,000 | 20.0 | 63.0 | 332 | 595 | |
| 158,000 | 162,000 | 16.0 | 57.0 | 364 | 450 | Heated to 850° C. |
| 142,000 | 150,000 | 15.0 | 61.0 | 340 | 485 | Cooled very slowly |
| 135,000 | 146,000 | 16.0 | 62.0 | 321 | 540 | to 800° C., quench'd |
| 128,000 | 139,000 | 19.0 | 64.0 | 302 | 607 | in water. Reheated |
| | | | | | | to 850° C. for 20 |
| | | | | | | min., and cooled in |
| | | | | | | air. |

A single quenching and drawing treatment, as we have seen from the tests, is sufficient for general purposes to effect complete refinement and hardening of chrome-vanadium steel. This characteristic of simplicity in treatment obviously insures a high-grade product under ordinary commercial conditions, and when compared with the double and triple heat treatments required for the refinement of other alloy steels, the economy presented is obvious. These properties, possessed only by the chrome-vanadium alloy, characterize this steel as a material universally applicable for any commercial requirement. They also simplify the treating instructions necessary to successfully handle alloy steel of this chemical composition. One heat-treating specification is adaptable for any carbon analysis, whether the steel is destined for case-hardening purposes or for oil-treating for gears and cones, etc. It has been

effect of the special elements, in producing a ferrite of superior strength, subsequently resulting in a more dense and improved pearlite. With the increase in the carbon and alloy contents, this steel becomes more or less cementitic, and it is probably this quality which demands the use of higher temperatures than usual in treatment in order to produce complete absorption of its component parts.

The quality of chrome-vanadium steel often described as "tough-hardness," is one of its especially desirable properties, and is due probably to the somewhat finer and denser structure of the microscopic constituents, and to their more uniform distribution. This effect is obtained not only through the actual influence of the chromium and vanadium as component parts of the alloy, but also to the influence of the combination of both of these elements in producing in the molten metal a condition of purity and freedom from gases, and, therefore, subsequently forming a metal which, at the time when the structural changes occur, is in the best possible condition for these changes to take place, that is, in the highest form in which the alloy composition renders it possible.

### Adaptability of Chrome-Vanadium Steel

From conclusive tests, chrome-vanadium steel can be described as a universal steel. With the carbon present in variable amounts, almost any physical property desired can be secured. It is adaptable for casehardening where the carbon should not exceed 0.20 per cent, that is, for axle shafts, etc., where nominal strength is essential; for oil-treated gears and vanadium springs, where great resilience and resistance to repeated shock is required; for dies, where surface hardness and toughness must both be present; for drills, etc., where wear-resisting qualities and lack of potential brittleness is necessary; for cones and raceways of bearings, which must possess a glass-hard surface, accompanied with proportionate toughness to prevent checking and cracking under the stresses imposed.

The adaptability of chrome-vanadium steel is general, and where strength and hardness and resistance to fatigue properties are the prerequisite, there is a chrome-vanadium steel for the purpose. When the steel is case-hardened, a glass-hard surface and tough fibrous core is easily obtained. These properties are obtained without complex treatment, consisting of simple quenching, with reheating and quenching. For other heat-treated parts, a simple heating, quenching and drawing give a steel, relatively so tough and strong that it is unlike any other hardening alloy steel. Chrome-vanadium steel is a universal alloy steel and stands forth unmistakably as the master alloy.

TABLE 2.—RESULTS OF TESTS ON CHROME-VANADIUM STEELS OF A LARGE AUTOMOBILE MAKER

| Specimen No. | Elastic Limit, lb. per sq. in. | Tensile Strength, lb. per sq. in. | Elongation in 2 in. Per Cent. | Reduction of Area Per Cent. | Brinell Hardness No. |
|---|---|---|---|---|---|
| | 162820 | 172850 | 14 | 49.7 | 418 |
| | 160130 | 172090 | 14 | 49.5 | 418 |
| | 160840 | 173090 | 15 | 49.9 | 387 |
| | 159720 | 171630 | 14.5 | 46.9 | 377 |
| | 154180 | 164760 | 14 | 52.4 | 364 |
| | 151000 | 162240 | 14 | 55.7 | 364 |
| | 154570 | 165160 | 15 | 52.3 | 364 |
| | 150920 | 162590 | 15 | 54.0 | 351 |
| | 146790 | 162790 | 15 | 55.6 | 340 |
| | 146700 | 158960 | 15 | 55.7 | 340 |
| | 146080 | 157790 | 15.5 | 55.3 | 321 |
| | 148620 | 158090 | 15.5 | 55.8 | 321 |

Table 2 gives results of tests made by a large automobile manufacturer using chrome-vanadium steel for principal parts. The tests given represent those made from 0.30 to 0.40 per cent. carbon chrome-vanadium steel used for axle shafts, and demonstrate results that are secured from routine practice. The uniform strength exhibited supplies incontestable testimony of the dependable qualities inherent in this analysis steel when treated in commercial quantites.

## ELECTRICAL PORCELAIN

THE problem of securing desirable electrical and mechanical properties in the manufacture of porcelain used in the electrical industries is one beset with many difficulties and, while the products of some companies stand very high tests and seem in every way ideal insulators, the products of some other companies are well-nigh worthless.

Those who know the cause for this variation in quality do not seem to be inclined to distribute the information, but in general a porcelain mass will be the more resistant, the higher the proportion of kaolin and felspar also the finer the grain of kaolin used the higher will be the maturing point of the porcelain produced.

### Composition

According to a paper by Arthur S. Watts appearing in the transactions of the American Ceramic Society the leading materials used in porcelain manufacturing are certain kinds of kaolin, which are very slightly plastic, quartz and felspar. Ordinary felspar displays basic properties in the fire, uniting with the silica to form silicates. Therefore the kaolin content must be in a definite ratio to the quartz and felspar for the production of desired insulating qualities.

Too much quartz makes the body too little plastic, thus making it difficult to work, and after burning the ware shows impressions and some warping due to the tendency of the clay substance to contract. Too high a content of felspar makes the body soft and liquid and increases the tendency to crack. A body low in felspar does not produce sufficient vitrification and hence decreases its insulating efficiency.

A porcelain body may shrink 15 to 18 per cent. and it is very important that the exact degree of shrinkage be known. No crazing or shivering is allowable in the glaze used on ware for electrical materials. If the glaze is too infusible the ware is likely to be dull, and if too fusible it is likely to be covered with blisters. Investigation has proven the condemnation of glazes containing metallic oxides to be unfair. Metallic oxides when used in glazes combine with silica forming silicates.

The plain bell used for low potentials and which is also practical and satisfactory for alternating currents up to 1,000 volts, does not meet the requirements of modern high voltage transmission lines. Up to tensions of 3,000 volts the ordinary double bell 75 mm. wide and 100 mm. high suffices, but above this voltage the question of further improvement arises.

At first insulators were glazed and burned, resting on the bottom edge of the bell, but the roughness of this edge seemed to cause the collection of drops of water and to prevent this, the insulator is now glazed all over, the glaze removed from the head and the insulator burned; the insulator is by this means made much more resistant and need not be so thick. The weight of porcelain used in the insulator is not of the greatest importance, but rather the quality of the porcelain and the kind of glaze.

### Manufacturing Methods

In Europe, insulators are made by all five of the clay working processes, viz., turning, pressing, jollying, casting and dry pressing. The writer stated that he was familiar with all these processes except casting, but was not prepared to pass judgment on the superiority of any given process of working, as of course the product and its shape and size would greatly influence the method chosen. Dr. Seger, in his work, shows very conclusively that a semi-dry process in which the material to be pressed contains the highest percentage of water permissible for good pressing, gives the densest and strongest bodies. The turning of large insulators is done similarly to all clay turning, the product being made mouth up and the top finished when the ware is sufficiently dry to permit of its being inverted. For making threads, threaded tube like steel tops, or automatic boring apparatus is used.

Pressing is done in moulds. Clay is placed in the mould in a lump and by means of a plunger its exterior is forced to assume the shape of the inside of the mould while the plunger shapes the interior.

Dry pressing produces more exact shapes than any other method. The moulds used are of steel and are very expensive. The body must be in such shape that it will not stick to the mould. To obtain it in this condition some factories use the following process.

The clay, after drying and being thoroughly pulverized, is placed in wet cement or plaster boxes and allowed to absorb 10 per cent. to 20 per cent. moisture. The mass is then sieved thoroughly. Ten kilograms of the body will contain about 1 to 2 litres of water. Of course this proportion must be maintained exactly in order to insure a uniform shrinkage.

The moulds are sometimes complicated and are often composed of insertions. Ware is threaded by means of a screw inserted in the bottom before the clay is introduced and which is screwed out rapidly by means of a crank. The tendency is to make insulators without threads as [illegible] trouble and loss in manufacture.

Porcelain which is not perfectly vitrified does not possess any great insulating efficiency even when perfectly dry.

### Essential Properties

Essential properties of an insulator are: That it possess first of all a high efficiency as a nonconductor, that it stand without snapping any reasonable strain put upon it and that it withstand blows of missiles, etc., without breaking. Electrical, abrasion and tensile tests are made to show these properties [illegible] tested.

From a study of the electrical resistance tests it has been found that every specimen standing a superior test has a high silica and moderately low alumina content.

In series showing the effect of alumina content no great difference is shown in ability of specimens to resist abrasion. Much the same statement would apply to series showing results of varying of silica, medium high silica specimens seem to chip worse than extremely high silica specimens, while the low silica specimens show a lack of ability to resist abrasion.

The conclusion reached is that a moderately high silica and alumina content will bring a good strong porcelain but that not over 1 per cent. alumina and 6 per cent. silica should be used.

Shrinkage tests showed that there are three factors that may cause a variation. (1) The amount of clay substance introduced; (2) the variation in the kind of flux used; (3) the amount of silica present. Hence shrinkage may be varied to suit almost any case.

In closing it may be said that an ideal porcelain for electrical purposes may mature at any point between [illegible] cone 12.

The bodies of high resistance porcelain in use in the United States employ potash almost exclusively as a flux, although some few may contain a small quantity of lime. The formation of small cavities in the porcelain weakens it remarkably in resisting strains. Porcelain must be thoroughly vitrified so that moisture cannot penetrate it.

## REVERSING GEARS FOR TURBINES

ENGINEERS are aware of the great disadvantage that the steam turbine labors under in view of the fact that it cannot be reversed. It must not be assumed that the production of a reversible turbine is from the nature of the case impossible, for the introduction of gearing in connection with marine turbines not only suggests a means whereby a single turbine may be utilized for driving the vessel either ahead or astern, it suggests also the possibility of designing a turbine capable of developing a large power, and capable of being driven in either direction. At present, however, the reduction gear sems to point to the simplest method of attaining the end in view, and already we have heard of reversible reduction gears wherein a small pinion wheel, which runs idle when the vessel is being driven ahead, is lifted into mesh between the pinion wheel on the turbine shaft and the gear wheel on the propellor shaft, with the result that the latter runs in the opposite direction. Whilst the controlling mechanism for such a device will have to be capable of exerting large forces, especially with units of large power, and while other mechanical difficulties readily present themselves, it certainly would appear as if in the development of this idea we may eventually solve the problem of the reversing of the propellor when the vessel is turbine-driven until such time as the reversible turbine is itself forthcoming.

# PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

## GRIPPING AND DRIVING METHODS FOR LATHE WORK. V.

By F. Scriber

WHENEVER a long part which is to be [illegible] it is a good plan to use the tailstock center of the lathe for supporting the work, thereby decreasing the liability of the part being thrown out of alignment under the stress of the cut.

An example where this has been done is shown by Fig. 34; here the end that is to be machined has an arbor driven into it, this arbor is placed in the tailstock center in the manner shown. The arbor is indicated at A. The groove is to be machined, end faced and the flange is to be turned, these being indicated at B. The work in this instance is driven by the spindle nose fixture in which the work is supported. In handling lathe work on a face plate there is considerable tendency for it to sag or where the work is not running in balance there is apt to be quite a little pound on the spindle. In order to support the face plate under these conditions a fixture [illegible] shown in Fig. 35 may

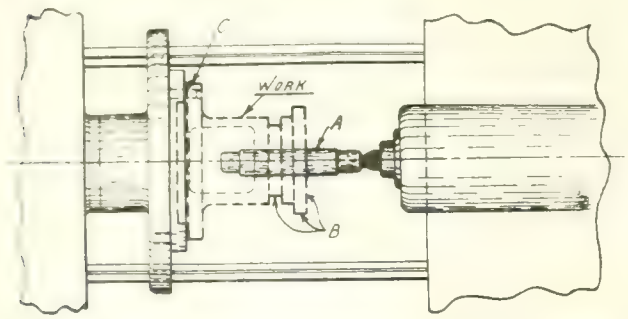



FIG. 34. SUPPORTING WORK ON FACE PLATE WITH ARBOR

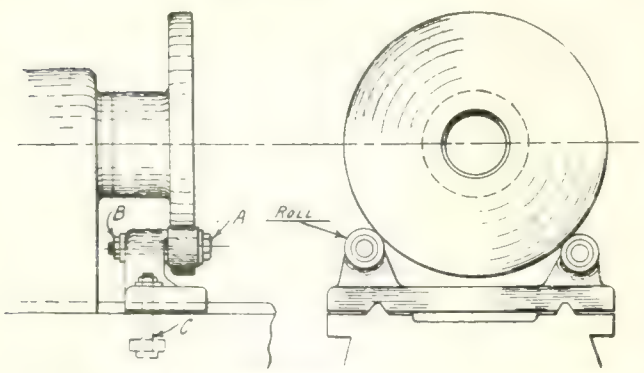



FIG. 35. ROLLS ON ECCENTRIC STUDS FOR SUPPORTING FACE PLATE.

be used; this consists of two rolls in contact with the outer surfaces of the face plate. These rolls are mounted on studs A, which are eccentric, by means of this eccentricity the studs may be turned thereby bringing the rolls into firm contact with the face plate, this feature may also be used to take up the wear on the rolls or the face plate. When properly adjusted the studs are clamped in position by means of the nut and washer B. The studs are mounted in a cast iron bracket which is in turn held to the ways of the lathe by the bolt and strap C in the usual manner.

In one of the illustrations shown in a former section of this article a method was shown for piloting a boring bar, the pilot bushing in that instance being held in the spindle nose. As it is not always practicable to use this method, Fig. 36 illustrates an example of a pilot bushing mounted in a bracket A, where the reamer or boring bar passes through the piloting bushing before entering the work, this method being similar to most jig reaming and boring practice.

### Safety Guard

When a chuck or spindle nose fixture is revolving there is always some danger of the operator being caught by revolving set screws or jaws, and to somewhat annul this danger guards similar to that shown in Fig. 37 are frequently used. The one to the left of illustration shows a sheet metal guard mounted on a chuck; this presents a smooth revolving surface, while the guard to the right shows a sheet metal guard attached to the side of the lathe. This expands over the chuck. The manner of using this is obvious from the illustration and of course various modifications of these methods are in vogue, many of them being made to swing out of the way while the operator is putting the work in the lathe although there is no necessity for this in a good many instances.

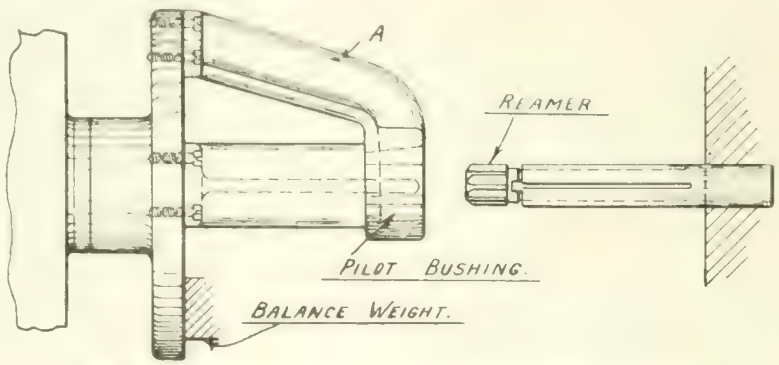


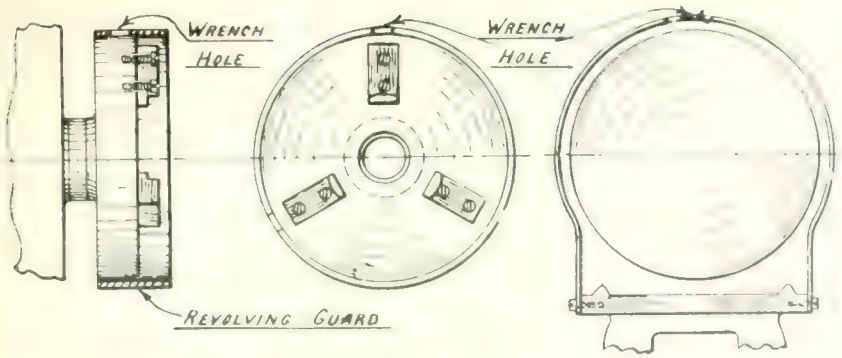

FIG. 36. FACE PLATE EQUIPPED WITH PILOTING BRACKET

An example of gripping work in chuck jaws at one end while holding the work in a back rest at the other is shown by Fig. 38, the back rest used is the ordinary three-jawed rest furnished with the lathe and the manner of using is apparent from the illustration.

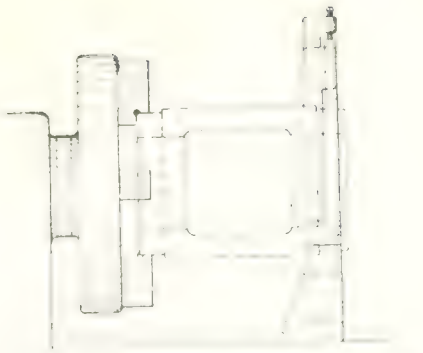
Fig. 39 illustrates a face plate which has an adjustable slide in it. The purpose of this feature is to provide some means of boring a hole eccentric with the outside of a piece, boring two or more holes which are in line or other similar operation, as after one hole has been bored the slide with the work mounted thereon may be moved over to the next hole. A vernier scale is sometimes provided with these face plates for convenience in setting the slide over.

### Arbors

A group of arbors for various purposes are shown in Figs. 40 and 41, these differing from the general run of arbors inasmuch as they are carried in the spindle nose. The first of these in the upper view of Fig. 40 is a plain tapered arbor. The work A is driven tight upon to force the work off the arbor. A pin wrench is used with this nut, while the arbor itself drives into the spindle nose and is driven by means of the key C. In the lower view of Fig. 40 an arbor carried in a spindle nose fixture is shown, the fixture D is made of cast iron and the work which has a tapered hole in it is carried on the stud E, the stud must be removed from the spindle nose fixture while the work is slipped through it, and by putting the stud back in place the work is securely clamped between the tapered part of the stud and the hardened ring F. The stud is tightened by means of the squared end G, and any tendency of the work to slip under the cut only makes the stud bind tighter as the thread is right-handed. The opera-



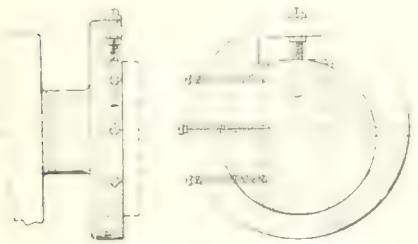

TWO CHUCK GUARDS



RIPPING IN CHUCK AND BACK REST

tions on this piece are turning the outside, squaring the end and cutting the recess in the face.

Referring to the upper view of Fig. 41 we have an arbor which is carried in the spindle nose in the same manner as the one described in the upper view of Fig.



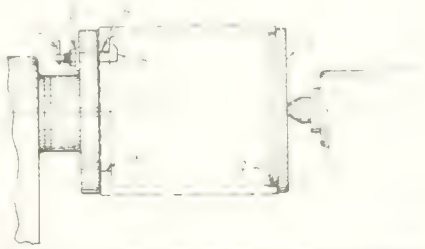
FACE PLATE WITH ADJUSTABLE SLIDE.

40. This arbor A is made to fit two diameters and the work is slipped on the surface B and C, while the driving of the work is obtained by tightening up the stud D; this stud is tapered inside at the end, and as the arbor has three splits cut in it the stud causes it to expand and grip the work.

The lower view of Fig. 41 shows a screw arbor and the arbor proper E has a pilot, this being the end F which is supported by means of a bushing in the tailstock of the lathe or chucking machine. A ring H is held to the flange of the spindle by means of four screws H, and on the spindle nose a sleeve J is mounted. This sleeve has a flange K, the object of this is that sleeve may be screwed back on the spindle nose until the flange comes in contact with the ring at L; in this position the work is screwed against the sleeve, thereby locating it in its proper position lengthwise on the arbor. By the machining of the part it is of course wedged on the arbor and to release it the sleeve J is turned by means of a spanner wrench in the holes M. This moves the sleeve out of contact with the work, after which the work can be readily screwed off the arbor.

When the work has been removed the sleeve is returned to the aforementioned position in contact at L. This makes it obvious that each piece will be located in the same position, which is an important item in securing duplicate work where threads are to be cut or cross-slide tools are to be used in connection with work mounted on an arbor.

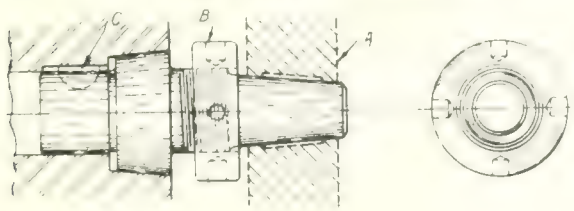
three hook bolts B clamp the work. When putting the work on the fixture these hook bolts are turned out of the way by means of the pins C, and when the work is put in position the pin is also used to turn the bolt so the hooked surface will come in the correct position for



HOOK BOLT FEATURE LEAVES OUTSIDE DIAMETER CLEAR

clamping, tightening of the hook bolt is accomplished by the nut and washer D. In the end of the work nearest the tailstock a disc E is placed, thus permitting the tail-stock center to be used as a support. It is evident that the operation on this piece at this time consists of turning the outside, the inside surface at F and G having been machined in a previous operation and the ends have also been faced.

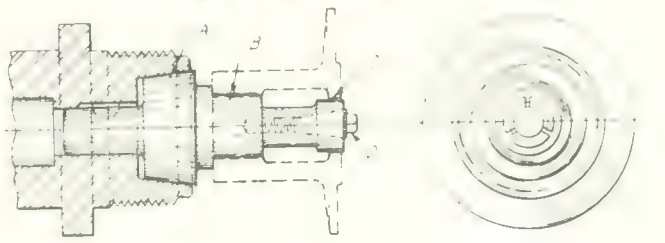
Taper Arbor Held in Spindle Nose



Arbor for Thin Tapered Work.

FIG. 10 TWO TYPES OF SPECIAL ARBORS

Arbor with Expanding Grip



Driving Arbor with Screw Center Rest

FIG. 11 TWO TYPES OF CHUCKING LATHE ARBORS

### The Use of Hook Bolts

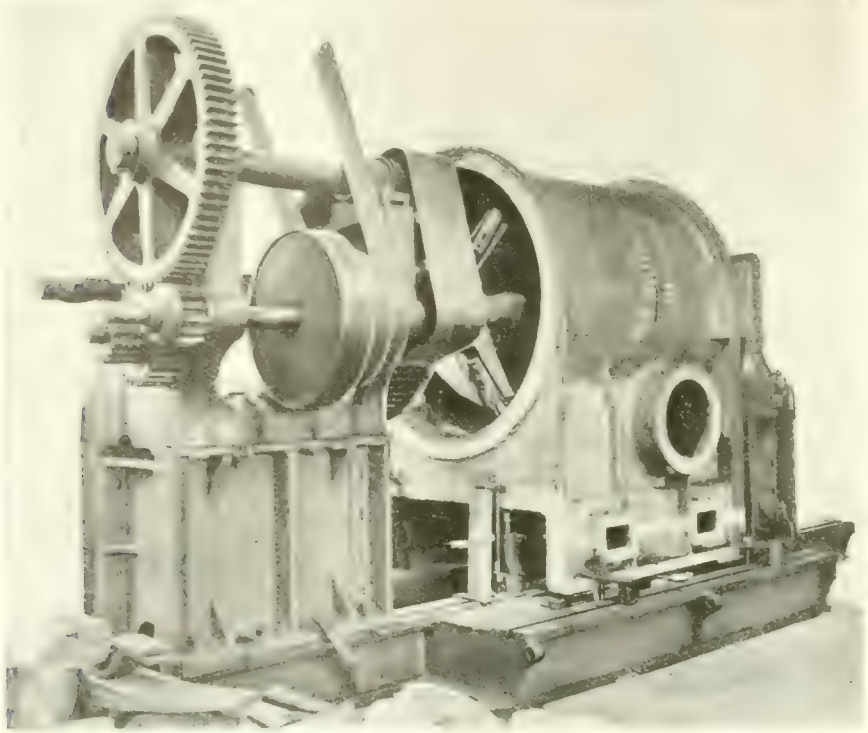
In Fig. 42 a large casting mounted on a face plate and driven by means of hook bolts is shown. The fixture used is simply turned to fit the work at A and

## CYLINDER BORING MACHINE

By A. E. Menzies.

THE [illegible] which have been tackled by the war are as varied in character as they are legion in number. Our machine shops are, perhaps, the largest gainers from the lecture halls of necessity.

The shop where the accompanying illustration was taken was for some time engaged in the manufacture of high explosive shells. As the work handled became that [illegible] repairs the



CYLINDER BORING MACHINE MADE FROM CAR WHEEL LATHE

staff had to commence at the grass roots. When the shell contracts were completed and the shipping shortage was realised the management decided to get back to their own line and accepted a contract to turn out tramp steamers. As they decided to build their own engines fresh problems were presented to the machine shop for solution.

### A New Lease of Life

The first set of cylinders were bored out on a bull lathe; out like every other tool in the shop, this machine had more work than it could handle. The subject of the illustration, a car wheel lathe, built long, long ago by Wm. Collier & Co., Ltd., of Salford, Manchester, had been lying by resting and was shortly to be sent to the foundry when the ma- [illegible] The photo is what he saw.

[illegible] bed cast iron packing blocks about 3 ft. high were made and the head and tail stocks packed up on them. The shaft, gear and pinion on top of the front head were added, the pinion meshing with the gear built into the face plate. An 8-in. boring bar secured to the [illegible] running in bearing placed where the tail stock spindle used to be carries the traveling boring head. The head is driven by a key and travelled by a screw driven by a star wheel. The head used for boring the 62-in. dia. cylinder shown in the illustration has three arms, each arm carrying a tool. Setting up the work is not a difficult job as the bed affords ample surface to block and wedge from. The bar, of course, is used to set up by.

Besides being used for boring cylinders this machine has successfully faced up the ends of a large cylindrical condenser shell. It also came in extremely handy for boring out the recess for the main bearings in the bedplates of engines which the firm is building.

## A CHART FOR FINDING THE LENGTH OF COILED PIPE, ETC.

By N. G. Near.

WITH the aid of the acompanying chart it is a simple matter to determine the length of a coil of rope, the length of a pipe so familiar to the plumber, the length of a coil of rope, the length of a coil of wire, or a coil of almost anything as a matter of fact. This chart, however, was made primarily for pipe. The size limits of this chart, it will be noted, range from 4 to 30 inches in diameter (column A) and from one to 60 turns (column C). This limits the charts to a bit over 400 feet.

To use the chart, measure the "average" diameter of the coils as indicated by the sketch on the chart itself. That is, measure from the "mid-point" of one side to the mid-point of the other side in inches. Then count the number of coils. Then connect the diameter (column A) with the number of turns (column C) and the intersection with column B immediately gives the total length in feet.

For example. What is the approximate length in feet where the diameter is 15 inches and the number of turns is 20?

Connect the 15 (column A) with the 20 (column C), as indicated by means of the dotted line drawn across the chart and the intersection with column B immediately shows the length of the coil of lead pipe or whatever else it might be as very close to 79 feet.

It is evident that it is much quicker to use this chart than to unroll the pipe and measure it, or even to compute it, knowing that to compute one must divide the diameter in inches by 12 and multiply by 3.1416 and then by the number of turns in arriving at the result. Besides, this method is just as accurate anyway because of the judgment that must be used in measuring the diameter.

This method is much quicker and eas-

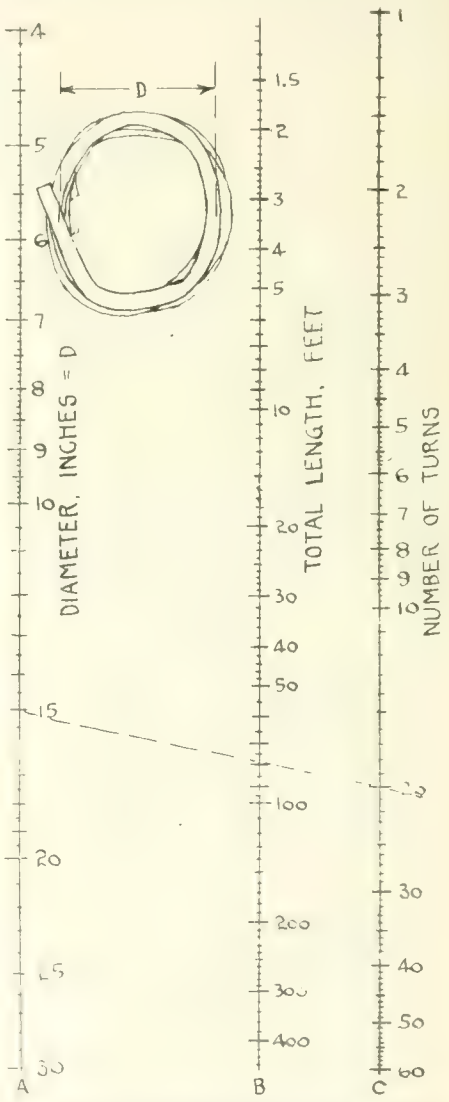


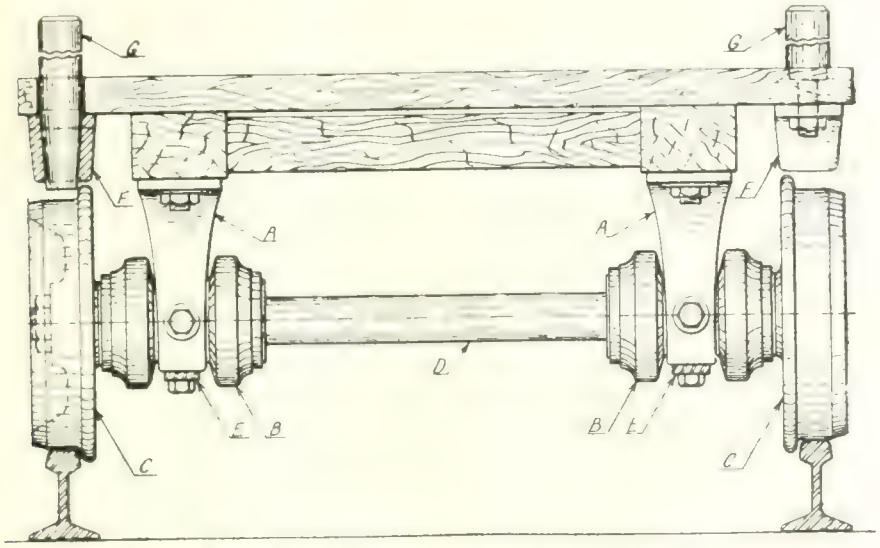

CHART FOR DETERMINING THE LENGTH OF COILED PIPE, ETC.

ier than to unroll a long coil and measure it with infinite care and then roll it up again. The method is not "absolutely accurate" but for most rough purposes it will do very well indeed. If it is desired to determine the "exact" length within an inch or even a foot (provided the coils are large) there is no surer method than unrolling and measuring in the longhand way. But if the answer is wanted only approximately, why do it the hard way?

## TRUCK WITH DISCARDED LINE-SHAFT BEARINGS

By J. H. R.

WHILE in a large shipyard recently the writer observed a factory truck of a very serviceable character, the shaft bearings for the truck axle being constructed from a number of line shaft double ball bearings that had become inefficient for their initial purpose owing to continual service. Their adaptation to truck service entailed a duty that in some respects exceeded that of the line shaft, but the factor of the high speed was eliminated, and consequently the partly worn bearings were given a new lease of life. The truck was used for transporting materials such as steel plates, bars and shapes to and from the various departments, and its construction offered minimum resistance to the propelling efforts of the workmen.




TRUCK MADE FROM DISCARDED LINE SHAFT BEARINGS

The frames are made of suitable planks and timbers and the bearing brackets A are bolted to the under side of the main side stringers. The bearings B are fitted into the slot in the bracket and locked in position by the bolts shown. The truck wheels are secured to the ends of the axle D; this particular truck being operated on the standard gauge track throughout the plant. Other trucks of a similar nature are provided with plain wheels for general purpose work on the concrete floors of the shop. To increase the rigidity of the supporting brackets, tie-bars E are secured to the lower portion of the bracket A and the ends extend at an angle of about 45 degrees to the main stringers of the top platform. Underneath the top planking of this platform several brackets F are placed to support the wooden pins G that are used to prevent the material from sliding off the truck.

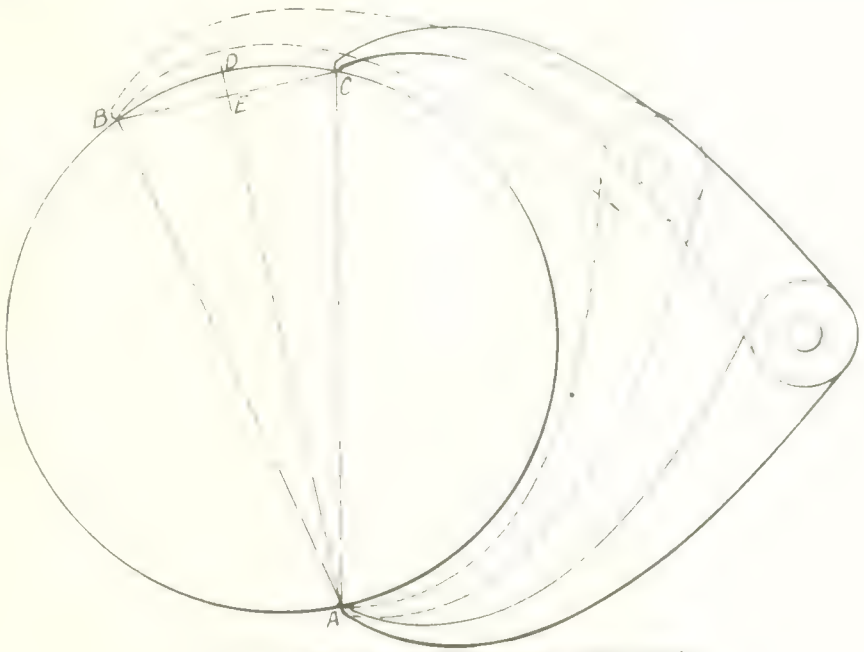
## SETTING LATHE TOOLS

By R. M.

JUDGMENT in the setting of lathe tools to remove a certain amount of stock is a trait that is only attained after considerable experience on the part of the operator. As a guide to the tool adjustment when turning work, the accompanying sketch may be of some assistance for young mechanics. Supose the finished diameter of a shaft is to be 15 inches and the calipers are set to this dimension. With one point of the calipers bearing at A, the other point is placed against the opposite side of the work at the points B and C respectively, as indicated by the full and dotted lines. Suppose that the chord, or the length B-C equals 6 inches and it is required to find the set-in of the cutting tool to remove the surplus stock. It is first necessary to calculate the distance A-D.

The length E-A can be found from the formula $E\text{-}A = \sqrt{(A\text{-}B)^2 - (B\text{-}E)^2} = \sqrt{15^2\ 3^2} = 14.7$ inches. The height of the chord D-E can be found by proportion, thus, D-E : E-C = E-C : E-A or $(E\text{-}C)^2 = D\text{-}E \cdot E\text{-}A$. Therefore $D\text{-}E = \frac{(E\text{-}C)^2}{E\text{-}A}$

$\frac{3 \cdot 3}{14.7} = .612$ inch. Then the complete diameter equals 14.7 + .612 = 15.312 inches, and the advance of the tool to remove the .312 inch of material would be .312 ÷ 2 = .156 inch.




ILLUSTRATING THE SETTING OF LATHE TOOL

## PICKLING SHIP STEEL

By D. D. Street

THE preparing or "pickling" of ship steel is becoming more common. Whatever compounds may be used for coating steel, it is very necessary that the mill scale should be thoroughly cleaned from the plates and the bars beforehand. The British Admiralty specify the removal of scale by immersing the steel in a bath of dilute hydrochloric acid, which contains one part of acid to nineteen of water. After remaining in some time the steel is taken out, hosed with fresh water and scrubbed with steel brooms. The material is then coated with linseed oil and allowed to stand in the weather for some days. In merchant work this has usually been considered an unnecessary expense, the usual practice being to put the material together without removing the mill scale and allow it to rust up. This rusting process is going on whilst the ship is on the stocks and until she is ready for painting. The rust and scale is then scraped off and the paint applied. The underwater portion of the ship is not painted before the launch, and the sea-water accelerates the rusting up with the result that when the vessel is placed in dry dock a very good surface can be obtained for the application of the anti-corrosive paint.

There are three principal methods of cleaning forgings, namely, pickling, tumbling and sand-blasting. The pickling is much better than sand-blasting. In the former method all surfaces are cleaned thoroughly from oxides or foreign substances which are detrimental to the machining operation, whilst in the tumbling and sand-blasting fine sand is hammered into the surface. This has a big effect in the machining operations.

the cost of machining being three or four times as great with a forging cleaned by [illegible] as it is a pickled forging. In addition, drop-forgings that have small holes or indentations are not properly cleaned except by pickling. It has been found out that the additional cost of pickling is more than effective and is offset by the saving in the cost of machining.

It is not uncommon to find nowadays merchant shipowners specifying that the steel used in their ships should be pickled. It is well-known that the rusting process is not absolutely effective, and the extra expense in the pickling is probably easily saved in the less amount of corrosion occurring and consequent smaller upkeep cost for renewal of steel. At the present time there is another strong argument in favor of pickling. Ships are rushed through very quickly, and if possible, dry docking near or on completion is dispensed with. This means that the bottom of the vessel has to be properly painted before leavin the stocks, and it is very doubtful if the rusting-up process has gone far enough to ensure a good application of paint. In such cases, therefore, it is better to be on the safe side and pickle the steel before erection.

## BRITISH SHIPBUILDING ACTIVITY

NEVER has there been greater activity in the shipbuilding yards of GGreat Britain than exists at present. On the four principal shipbuilding rivers of the British Isles every available foot of adjoining land has a ship more or less in construction on it. Nearby engine works are turning out motive power for the vessels at a tremendous rate. Shipbuilders of various sorts—men, women, boys, girls—are all working at top speed. Great Britain has two great objects in all this activity. The first is to help to beat the German U-boat destructiveness and the second is to recoup her greatly theatened prestige as the first maritime nation of the world.

Nowhere is the growing importance of the United States and Japan as maritime powers after the war so seriously taken as in the British Isles, and when the time comes for readjustment on the seas the latter is evidently intending to reassume their maritime precedence, and the British navy, which has been kept intact during the war, will enable authority to be given to these demands. It is well known in America that British builders are rushing out countless destroyers, cruisers and other naval ships, which must for the present remain as "mysteries." Standardization of construction has been adopted in the shipbuilding yards to the greatest possible extent. All parts of hulls, engines—in fact everything—are standard and may be used where first needed. Hitherto thirty-five sizes of steel sections were used in the construction of merchant vessels, but standardization process has reduced the number to eight. Before the war Germany was the only real competitor on the sea and now there are two friendly may be, but nevertheless competitors—Japan and the United States.

## ANNUAL CONVENTION OF FOUNDRYMEN'S SOCIETIES

MILWAUKEE, one of the leading foundry centers of the United States, has been selected as the 1918 meeting place for the annual conventions of the American Foundrymen's Association and the American Institute of Metals. Concurrent with these gatherings will be held the exhibition of foundry equipment and supplies, machine tools and accessories. On Monday, Oct. 7, the deliberations of the two foundrymen's technical societies will be opened with a joint session, and at the same time the visitors will be given their first opportunity to inspect the displays. The convention and the exhibition will continue throughout the week.

The meetings of the American Foundrymen's Association and the exhibition will be held in the Auditorium, where ample display space will be afforded and a sufficient number of large meeting rooms are available for the joint sessions which will be scheduled for three days of the week. This commodious building will be the center of all the foundrymen's activities, and here the headquarters will be established for both organizations.

The Auditorium is one of the largest and most complete structures of its kind in the world. Machinery hall, where the operating exhibits will be assembled, has a floor area of 54,000 square feet, and the arena, where the still exhibits will be located, has a floor space of 22,500 square feet. If necessary, the stage, 50 x 68 feet, also may be used for exhibition purposes. Two large meeting halls are located on the first and second floors respectively, and are separated by wide corridors from the exhibition areas, thereby insuring freedom from noise. Milwaukee also has ample hotel facilities to provide accommodations for the 3,000 to 3,500 visitors who attend these affairs.

Milwaukee is one of the largest foundry centers of the United States, and provision will be made for plant visitation in the week. Within the confines of the municipal limits of the city are located about 80 gray iron, steel, malleable iron and brass foundries, and including North and South Milwaukee and West Allis, the total is in excess of 90. Racine, Wis., only a short distance from Milwaukee, is the center of approximately 20 foundries. Milwaukee also is one of the leading steel casting districts of the world. It has approximately 20 steel foundries, a number of which recently have installed small open-hearth and electric furnaces. According to the 1914 statistics the value of iron, steel and heavy machinery of Milwaukee exceeded that of any other of its industries with a total of $34,300,585, and it is estimated that last year this totalled more than $50,000,000.

The committee of the American Foundrymen's Association empowered to decide upon the time and place of the 1918 convention and exhibition, which met in Milwaukee several days last week, consisted of the following: Benj. D. Fuller, president, Westinghouse Electric & Manufacturing Co., Cleveland; C. E. Hoyt, exhibition manager, Chicago; H. R. Atwater, Cleveland, Osborn Mfg. Co., Cleveland; S. T. Johnston, S. Obermayer Co., Chicago; V. E. Minich, Sand Mixing Machine Co., New York, and A. O. Backert, secretary-treasurer, Cleveland.

## FRENCH DISCOVER NEW LIGHT WEIGHT METAL

IT is said that the French government is manufacturing helmets from an alloy discovered by a Mr. De Montby, which contains from 92 to 97 per cent. of aluminum. It is suitable for use in the manufacture of air craft and military equipment. According to "Engineering," it is silver-white, has a specific gravity of 2.82, and a melting point of 1,382 deg. Fahr. Its tensile strength in castings is given as 30,000 lb. per square inch, and in rods and sheets up to 64,000 lbs.; heat treated, its tensile strength is given as over 70,000 lb. per square inch. It is claimed that it may be sand cast, die cast with or without pressure, hot and cold forged, annealed, drawn, rolled, stamped, hardened by temper, polished, electroplated, and soldered. It withstands the action of all acids except hydrochloric.

## B.C. GOVERNMENT TO INVESTIGATE IRON ORE DEPOSITS

AN intimation that the B.C. Government will probably amend the Mineral Survey and Development Act so as to enable the mines department to drill and test several iron ore properties without penalizing the owners with the double cost which the act provides, was given by Hon. William Sloan, Minister of Mines.

Hon. Mr. Sloan is to select the outside engineer to report on the project to establish a thermo-electric smelter and plate mill at Vancouver and expects to make his decision within a few days The minister stated that the B. C. Electric Railway Co. has joined with the Aetna Steel Co. and the provincial government in pledging the cost of the engineer's investigation on which the government will consider lending assistance to start a steel industry on Burrard Inlet.

"The government is alive to the great possibilities which a steel industry may bring to the province in settling a permanent steel shipbuilding industry on the coast and in developing the lighter manufacturing industries," stated Hon. Mr. Sloan, who added that as a further step in developing an iron and steel industry the government is contemplating an amendment of the Mineral Survey Act.

The first test of shrapnel was made in England 112 years ago, when a committee of British army men reported favorably on the invention of a fellow officer, Henry Shrapnel. Shrapnel was first employed in warfare in 1806 and fully demonstrated its explosive usefulness.

# Corrosion of Iron and Steel, and Its Prevention-II.*

By Abe Winters

*Perhaps the most patent feature of modern existence on this planet is the unceasing fight to contrast between the immense metallic plant and manufactures of mankind on the one hand, and the loss of finished metal due to corrosion. Sometimes almost more pressingly noticeable are the stoppages of vital services of all kind[illegible] which are likely to occur, while the latter is unpreventable certainty that [illegible]*

IT is generally recognized that the corrosion of a metal or alloy is intimately connected with the formation of local electrolytic couples at the surface in contact with the solution or the atmosphere. The process of corrosion is always initially one of chemical solution, the dependence of which on electrolytic conditions is well established. A highly purified specimen of zinc is almost inactive towards acids, whilst commercial zinc, containing lead, is rapidly attacked, the action of the liquid beginning in the immediate neighborhood of the lead particles. This is one of a large class of similar facts, the bearing of which on the question of corrosion is often overlooked.

### Physical Condition and its Effects

Laboratory tests of long duration or rapid tests involving the use on the one hand of active chemical corroding agents, or on the other of an applied electromotive force, are usually of an unsatisfactory character. A number of metals or alloys, arranged in order of their resistance to acid solutions, will present a very different order when exposed to technical conditions such as contact with city air or sea water.

The heterogeneity which gives rise to the formation of local couples may be of two kinds, chemical or physical. A pure metal is of necessity chemically homogeneous in the sense that it is made up of only one kind of atoms, but it may be physically heterogeneous. A metal which has been "cold worked" or deformed at a temperature below that at which complete recrystallization takes place, contains, as demonstrated by Dr. Beilby, films of amorphous material between the separate crystal grains.

The amorphous metal is more electropositive than the crystalline, as is shown by measuring the difference of potential between two specimens of the same metal in the cold-worked and annealed states respectively. Consequently cold-rolled metals almost always corrode in such a way that greater chemical action takes place along certain lines than along others, such lines following the direction of the rolling. This effect is not to be confused with the striation observed on the surface of rolled plates due to the inclusion of impurities.

### Effect of Cold Rolling

There are two reasons for the greater corrodibility of cold rolled than of annealed metals; the more electro-positive character of the former and their greater heterogeneity. Against this must be set the fact that some metals are commonly porous in the cast or annealed state, and that the closing of the surface pores by cold rolling may increase the resistance to corrosion, in some cases more than compensating in this way for the electrochemical difference. This applies mainly to atmospheric corrosion; in contact with liquids the electrochemical differences assert themselves more strongly.

Local cold-working greatly accelerates corrosion. The severely cold-worked condition which prevails around a punched hole is always the spot at which corrosion first appears if opportunity offers.

Besides the physical condition of the metal, that of the product of corrosion has to be taken into account. When iron rusts, the product is porous and bulky. It affords a ready passage to the corroding liquids or vapors, whilst at the same time, being strongly electro-negative to iron, the ferric oxide furnishes innumerable local couples which accelerate corrosion. On the other hand the layer of oxide formed on aluminum under normal conditions is extremely tough and coherent, and prevents further corrosion when a certain small thickness has been reached. Where corrosion is more rapid the coating may be porous.

In moist, tropical climates aluminum corrodes more rapidly, and the coating, although apparently continuous, may be minutely porous. Aluminum drinking vessels in hot climates acquire a foul taste, doubtless owing to the absorptive [illegible] oxide.

### Different Kinds of Corrosion

The term corrosion is used somewhat widely, but generally speaking may be taken to indicate the solution or oxidation of the pure metal or its constituents. There are three principal types, and these are not to be regarded as isolated or independant, rather are they extreme cases of an almost infinite variety of reactions, dependent upon the composition of the metal and the nature of the corroding influence. Type one, solution in acids, need not occupy our attention at this time.

Type two, graphitization. This is the form of corrosion to which cast iron is particularly liable, the mass becoming so soft as to be readily cut with a steel knife. The metallic portion is more or less completely oxidized, mainly to ferrous oxide, some of which has frequently been washed away, the remainder collecting within the pores of the now isolated mass of graphite.

Type three, formation of rust.—The most usual form of corrosion is that in which the iron is oxidized more or less completely to brown, hydrated ferric oxide, which remains *in situ* and is popularly known as rust. When relatively pure iron is suspended in tap water the ensuing rust consists almost entirely of hydrated ferric oxide, and there is usually no pitting. If on the other hand the metal is allowed to become alternately wet and dry, both ferric and ferrous oxides are produced, the proportion of the former varying enormously according to circumstances. In this case pitting is frequent.

When iron is only partially immersed in water the corrosion just at the surface of the latter is particularly severe, and the resulting mass of rust is usually high in ferrous oxide. Complete immersion of the iron in concentrated solutions of nitrates of the alkali metals may be made to yield a deep green oxide, while a dilute solution of oxalic acid develops a beautiful lemon-yellow form of rust. Dilute phosphate solutions may yield a white rust, whilst alkaline iodides can be made to yield black rust.

### Influence of Composition Upon the Corrosion of Steel

Rusting occurs in all known steels to some extent when submitted to test with an appropriate medium. Ordinary rusting is slightly retarded by the presence of 3 per cent. tungsten in the steel, while in salt water the corrosion is increased. Vanadium has practically no effect on the corrodibility of steel. Chromium decreases the tendency to rust with steels of varying carbon content.

Nickel decreases corrosion when at least 3 per cent. nickel is present except in rare cases where the percentage of carbon present evidently exerts an influence favoring corrosion. Manganese steels are very irregular in their behaviour, generally speaking manganese causes increased corrosion of steel when the latter is suspended in water.

Changing the crystalline structure of steel by annealing, hardening, and burning causes the amount of corrosion to vary. In electrolytic corrosion this amount of corrosion per ampere hour of the hardened steel is considerably less than that of annealed or burned steel.

Recent experiments indicate that electrolytic corrosion produced by the flow of a current of moderate density from an external source produces results on the metal which are similar to those produced by corrosion under ordinary conditions.

In many, if not all cases, the character and rapidity of ordinary corrosion of iron and steel depend upon their physical and chemical properties, and the galvanic action due to differences in potential between different parts of the metal.

*No. 1 appeared Feb. 28.

### The Effect of Strain

The application of stress to metals [illegible] chemical activity, this increase being especially marked after the elastic limit is reached. In cast iron and steel, in their many processes of manufacture, there are many irregular zones of density and purity, each of which has its own potential. Between all of these differently charged bodies a current of electricity is set up, the circuit being completed through the electrolyte.

This electric current flowing from the metal to the electrolyte will cause corrosion of the metal, which may be general over the surface of it, or be localized in spots, according to the composition of the metal, which is affected by local disturbances such as welds, strains, annealing, burning, and hardening, or the presence of foreign substances. Some peculiar cases of corrosion can be explained by ascertaining if the metal has been subjected to some of these influences, that otherwise would be classed as mysterious.

Hardened steel being necessarily under a highly strained condition should show greater corrodibility than annealed or burned steel. If it does not, it is owing to the fact that the high tension between the particles holds them in place until they are severely corroded away.

Metals which do not change their physical characteristics when strained apparently do not materially change in corrodibility as the result of strain, though the very softest iron does harden slightly when strained and its corrodibility is slightly affected by strain.

## NAPHTHALENE AS MOTOR FUEL

By L. E.

THE effect of the compulsory search for a substitute for petrol has been highly beneficial, as it has stimulated experiment and test in directions which would otherwise have been neglected under normal conditions, and research has revealed that coal provides an excellent hydrocarbon which can be utilized as fuel for the internal combustion engine: benzol. But this product is indispensable for war purposes, so it was promptly ruled out of court. Yet benzol is but one of the many hydro-carbons derived from coal, although it is admittedly the most acceptable substitute for petrol, as a fuel for the explosion motor. But coal possesses other constituents of a similar character, although somewhat heavier, and amongst these must be mentioned naphthalene, a substance which, while not popularly known under its technical name, is familiar enough.

Naphthalene is a crystal. In its crude condition it might also be compared to dirty, finely-powdered snow, being relatively light and fine in its consistency. In this condition it contains a certain proportion of creosote oil, which imparts an oleaginous character to the substance, but which can be driven out by subjecting the powder to a violent centrifugal or whizzing action, and can be further cleaned or rectified by washing with an acid. But naphthalene is the bugbear of the gas engineer, and of the householder, who depends upon coal gas for illumination. With a slight drop in temperature it condenses in the form of snow and becomes an obstruction in the pipe. A very small quantity suffices to impede the natural passage of the gas, and recourse to the force pump or a liquid solvent are the sole effective palliatives. Apart from its conversion into dyes and carbon blocks and moth balls, naphthalene is of little use except possibly for the preparation of firelighters, to which latter purpose about 50% of the total yield is devoted.

In pre-war days crude naphthalene commanded about $20 per ton, and although the current price is from $25 to $35, its reclamation cannot be described as profitable. The annual yield in the aggregate from the gas and tar works of the British Isles is equivalent to about 10,000,000 gallons. Yet naphthalene is closely allied to the more appreciated hydro-carbon, benzol, and it belongs to the same series. The chemical symbol for benzol is $C_6 H_6$, that for napthalene is $C_{10} H_8$, and this close relationship was responsible for the doping practice which had a certain vogue during the early days of benzol as a motor spirit. This fact was also responsible for another line of action amongst certain French and German investigators. They advocated the possibilities of the compound as a fuel for internal-combustion engines, and carried out experiments to support their assertions, but they never achieved distinct success. The general practice was the dissolving of the naphthalene in a lighter hydrocarbon such as petrol or benzol. These two liquid fuels will readily absorb a certain portion of napthalene, the quantity varying from 20 to 40 per cent. But the experiment did not prove successful in practice.

### Success in Sight

Other inventors, confident of their ability to use napthalene as a straight fuel, confined their efforts to achieving success in this direction, but other difficulties arose, and success was not forthcoming. But to-day it seems as though success is within a measurable distance of turning this elusive by-product of coal into a commercial motor fuel, and that without recourse to doping or other expedients.

Some five years ago two English experimenters, Mr. J. H. Willis, and Lieut. G. G. Wilson, attacked the problem. Their investigations elicited one important fact and they resolved to continue their researches from point where text books left off. These had settled that the melting point of the hydro-carbon was 79.8 degrees C., and the laboratory experiments were conducted on methodical lines from this point, and these proved conclusively that it was necessary to raise the temperature to about 133 deg. C., in order so highly to change a small volume of air into naphthalene vapour that sufficient would be present in a form suitable for an explosive mixture with a large proportion of air subsequently introduced. It was also found that the explosive mixture was formed when composed of 12 parts of air to 1 of naphthalene vapour.

A special form of vaporizer had to be devised and subsequently the vaporizer, carburetter and fuel tank were combined. With the experimental installation, starting up is conducted on petrol. After running for about ten minutes by which time the naphthalene has been melted and raised to 275 deg. F., the petrol is shut off and the napthalene vapour switched on.

The engine can be started on the naphthalene, which will retain its liquid form for an appreciable period. The results achieved are so striking that the fact is established that it is possible for an internal-combustion engine to be run exclusively on this new fuel.

## LOSS OF MAGNETIC QUALITIES AS A GUIDE IN THE HEAT TREATMENT OF STEEL

It is contended that to rely on pyrometrical observations in determining the all-important critical point in the heat treatment of steel is hazardous, because so many factors have to be considered in this method. First, unwarranted credence has to be placed on the permanent accuracy of the pyrometer, regardless of the natural deterioration of the thermo elements which are subjected to the temperature. Secondly, the element has to be borne in mind of the period of time necessary in order that the steel may assume its critical temperature. Thirdly, the personal factor then appears in determining whether the steel has assumed this temperature. It is a well-known fact that steel in the process of heating loses its magnetic properties when it is brought to its critical point. Taking advantage of this phenomenon, there has been invented an ingenious device which serves to indicate the critical point in the heat treatment of steel. Through the medium of magnetic coils contact is made with the steel in the furnace, while a magnetic indicator is placed in the circuit, which meter immediately indicates whether the steel has reached its critical point. The surface of the steel in time becomes non-magnetic, or, in other words, up to the critical point this is indicated on the meter by the approach of the needle towards the red line indicative of the critical point. As the heat penetrates the steel, and the interior is brought to the critical point, the needle of the indicator continues to approach the desired mark. This device does not measure what the critical point temperature is, and, though interesting, this knowledge is not relevant.

COLLISIONS and derailments caused but 3.9 per cent. of the total injuries received on the railroad systems of the United States during 1916. Negligence of passengers, employees, trespassers and others caused 30.1 per cent., while 66 per cent. of the total was in nowise connected with the operation of trains, but covered accidents, mostly trivial, in shops around stations, etc.

# Some Considerations Regarding Modern Plant Organization-III

By M. H. Potter

*The factors have entered into the successful manufacturing business to become more dependent to an ever-increasing degree. Location, type of building, transportation facilities, staff organization and plant equipment are features which require to be considered both singly and as a whole in relation to the particular product to be undertaken. A clear and concise [illegible] is necessary [illegible]*

COST accounting is a branch of general accounting and is the right arm of factory organization. It may be understood as providing for efficient records of the receipt and distribution of manufacturing materials, inventories of stores of materials, detailed accounting for expenditure for labor, productive and non-productive, a scientific treatment of manufacturing expense or establishment charges, processes and machines, the determining of the cost of operating machines, the rate to be charged for the work done by them, and the assembling of all these charges to show the cost of production of a unit, lot or process.

The cost of a product may be briefly defined as the outlay in money for materials, labor and all other expenditures which are necessary to turn out the finished article.

### Objects

The prime objects of all systems of factory organization and cost accounting are:

1. To secure the highest attainable efficiency of manufacturing departments.
2. To know the cost of manufacturing.
3. To ascertain whether or not a business undertaking is profitable, and
4. To provide a means of determining the basis upon which it is advantageous to all.

### Essentials of Proper Cost-Keeping

One of the first essentials in the keeping of manufacturing costs is an efficient accounting system, providing for a thorough classification of expenditure, subdivision of which may be as minute as practical requirements demand, to ascertain exactly the character and the amount of the expenses of operation and maintenance of the manufacturing plant. In designing an accounting system for a manufacturing concern the setting forth of the results of manufacturing and trading, the treatment of manufacturing costs, the classification of income and expenditure, the detail necessary and the general arrangement of the system, all are matters for consideration. No one business will be found to be exactly like another in its organization or in its business methods. According to the character of the manufacturing will it call for good judgment and perhaps some ingenuity in arriving at what will prove to be best suited to its peculiar requirements. For this reason it is very desirable that careful study of existing conditions should precede the introduction of a system of accounts for a manufacturing business already established.

Manufacturers have hesitated to adopt methods of which they had but little knowledge, believing that the introduction of a cost system would mean the superseding of all the accounts previously kept and the substituting therefor of a system of accounts containing much detail and both difficult and expensive to operate.

This may in part be attributed to the large number of manufacturers who have seen the industries they now control develop from small and unpretentious efforts to supply the demands of a limited community with their particular manufacture, to industries which, in many instances, are now of great importance. It is not to be wondered at that the conditions under which such tremendous strides were made should be considered equal to the requirements of the future, yet their continued success may depend upon an accurate knowledge of manufacturing costs.

### Adoption of a Cost System

The manufacturer may reasonably ask how much disturbance will be caused his operations by the introduction of a cost system. A workshop in which the production is not the result of complex operations presents a less difficult task than one comprising numerous departments with varied operations. A time limit should never be allowed to be a factor in the introduction of a cost system. The work of introduction is largely educative and it may take a number of months before results are obtained which may be considered satisfactory. Employees as a rule are not appreciative of systems whereby manufacturing costs may be obtained. Even in the office there may be objections to new methods, for nothing tries out and tests a clerical staff like the operation of a costing system, but with a reasonable knowledge of the principles underlying its operation it becomes a pleasurable study of interesting problems, an ever-widening field of investigation and an acquiring of valuable knowledge.

The introduction of a cost system will be materially affected also by the attitude of the executive head. The best cost system ever designed can have its working seriously impaired, if not negatived, in failing to receive the active, and more the determined, support of the manager. Weakness, indifference, or carelessness in shop administration will from the very first be brought to light by a cost system, and if the factory manager is a party to such faults, that is, if he allows shop evils to continue, which the new system will displace if carried out, and if he does not lend his assistance and authority towards that end all the time, then he must not complain if the successful working of the cost system is thereby materially retarded.

### Analysis of Costs

One of the most delicate problems which has engaged the attention of modern accountants is that of the proper division of costs, and experts are by no means agreed as to the exact classification of some items. A careful analysis of the problem of producing or manufacturing costs will reveal three elements as follows:

1. Material costs.
2. Labor costs.
3. Operating expenses.

(1) Material costs.—The organization necessary to obtain accurate material costs should begin in the purchasing department, for if the records of purchase and receipt of manufacturing materials are efficient it is reasonable to expect that the same orderly methods will follow in the distribution of materials to be used in manufacturing. The advantages of improved methods more than offset any extra clerical or other labor occasioned by them and where the manufacturing operations are on a large scale they are indispensable.

(2) Labor costs.—Labor may be divided into two classes—productive and non-productive. Productive labor can be definitely identified as belonging to a particular piece of work. Non-productive includes all labor not contributing directly to production, but necessary in that operation and maintenance of the shop or factory. For the purposes of obtaining labor costs the fact of labor being skilled or unskilled does not indicate to which class it belongs, although it is to be expected that skilled labor, in the sense in which this term is used will be productive.

The term "labor cost" is used to describe the cost of productive labor charged in the cost accounts to work in progress of manufacture. The tendency of this cost to increase, caused by organized effort to obtain increased remuneration for shorter working time, or from other causes, makes accurate cost absolutely necessary if the selling price is to be regulated to afford a satisfactory return to the manufacturer.

### Wage Systems

The systems of labor renumeration in general use are a rate per hour of time worked, and the ordinary piece-work system, whereby the workman is paid for the work he has done at rate per piece or equivalent thereto. These have been

output, thereby reducing the manufacturing cost while affording increased

This increase is effected by offering a the time adopted as the minimum time in which such work can be completed. The premium offered is practically sharing with the workman the value of the time saved in production. In doing this a saving in expenditure for wages is effected and allowing for extra strain on machinery and the expense caused thereby there is a further saving in the manufacturing expense.

### Time Records

Methods of obtaining labor costs are determined largely by the character of the manufacturing operations. It is to be kept in mind that the making of the records of the time chargeable to work in progress should not mean the loss of time of skilled workmen, nor does it mean the workmen doing that which it may not be convenient or practical for them to do.

The fact that the workman is the original source of information concerning the charging of his time does not imply that he be required to make the charge. The daily time-card is essential for use by the workman, and apart from his ability or his willingness to use it, and the economy of his doing so, it may be questioned if he is rendering the best value when actually making records, which a clerk by training and occupation is better qualified to do, and at what may

Therefore the methods it is intended to put in operation should be carefully reviewed. In some industries it is practical for workmen to furnish records of time worked and the nature of the work they are engaged upon permits this to be done without its being burdensome, of productive time. When the same class of manufacture continues from week to week, descriptive time cards, with divisions of time and names of the operations thereon only require to be punched as these operations are completed to show the time occupied on each. And in instances, repeating here what has been said of the of materials, the writing required should be reduced to a minimum.

Well-designed forms do much to assist in the making of shop records. Nothing which can be printed should be written, exceed what is actually needed. Simplicity of detail, if not another way of describing efficiency of operation, is at least very near to it. Under conditions which make it difficult for the workman to furnish records of time worked, recourse must be had to the time clerks, whose duties may also include the writing up of the pay-rolls and the entering of the labor costs of the various departments

### Analysis of Pay-Roll

Where workmen are engaged from week to week on continuous operations, or production of a similar character, an analysis of the weekly pay-roll may be made to obtain labor costs. The analysis must however, be based on absolute knowledge furnished by daily time-slips or cards, a foreman's daily report, or by a time clerk.

It is also practical and desirable in many instances that the arrangement of the cost accounts provide for the showing separately of different descriptions of labor or the labor of particular departments through which the work has passed in different stages of production.

### Operating Expenses

The operating expenses however are everywhere continuous, and therefore are a perpetual cause of concern to the alert factory manager. It not infrequently happens that, with a growing feeling of being unable to locate where the increased cost of manufacturing occurs, these items which can be indentified and valued are made the subject of closest scrutiny, with the result, possibly, that less valuable materials are used and wages are reduced. But the system in use may not provide for the accurate ascertainment of the overhead expenses so that manufacturing goes on with the same uncertainty of its character and amount. The conditions have not been improved, for if a cost system means anything it means ascertaining all the elements of the cost so that unnecessary features thereof may be eliminated while maintaining or improving the quality of the product.

Indefinite knowledge of the operating expense exists in many industries. To determine its character and amount accurately is of primary importance .

### Various Terms Used

A variety of terms are used to denote this feature of manufacturing expense such as shop charges, factory expense, on cost, and overhead expense. A sharp distinction should be made in every system of accounting for manufacturing concerns between manufacturing, selling and general or administrative expenses. The first two classes of expense are chargeable to manufacturing and trading respectively, and the third class of expense is chargeable against the profit from operating and trading.

In some instances a proportion of the expense charged to administration may be considered a fair charge to manufacturing. Such a contingency arises when an executive officer, and remunerated as such, with his devotes a large proportion of his time to the manufacturing operations. The expense in respect of rents, taxes and insurance can by a proper system of accounts be determined and apportioned monthly. It is necessary, perhaps to state that expenditure in this connection is intended to mean expense incurred without regard to the fact of whether the actual disbursements have been made for such items or not.

The next article in continuation of this subject will deal with the distribution of expenses on the machine, space, power costs and the idle time. The installation and working of a modern cost system will be described in detail.

## THE PASSING OF GERMAN INDUSTRIES

By C. T.

ACCORDING to authoritative information which has filtered through from Germany, with much weight behind it, there is much of interest in the condition of Germany's engineering and allied industries. The manufacture of an innumerable list of machine tools is being slighted and thus other industries are gradually going by the board. The manufacture of rails and railway equipment is below requirements so the magnificent net of German railways is going into a state of magnificent ill repair. The fabrication of shrapnel has replaced the fanufacture of lace and machines and loms. The fabrication of submarine parts has replaced the manufacture of locomotives, typewriters and sewing machines. The fabrication of shells and cannon has cut down the manufacture of agricultural implements. All the strength of the factory and forge is being sucked into the never-satisfied munitions business, the tentacles of which, furthermore, are continually drawing away the life-blood of other varied industries.

The steel industry has become a thorough-going war industry, one feature of which is the continued manufacture of imperatively needed staples. This industry has been so terribly pushed by the primary demands of the gigantic war business of the Central Empires and Turkey that it has not been found possible to produce sufficient rails and rolling stock for the railways, important as are these battle nerves of Germany in her efficient game of war. The Krupp people have established branch furnaces and forges in all parts of the country, likely with the idea of minimizing enemy opportunity for crippling the shell and cannon production. Furnaces have been operated for the Krupp works in France, Belgium and Asia Minor. Asia Minor is being developed into a metal treasure-trove for Germany and many millions of marks have been, and are being expended in the building up of mining properties there.

There is no longer a scarcity of metals in Germany. Copper is plentiful. Nickel mines in Anatolia are yielding considerable outputs. Serbia, Rumania, and Anatolia are now furnishing large supplies of copper.

Before the conquest of Serbia the metal outlook in Germany was dark and dreary. They stripped the roofs of large buildings and factories of their copper and conducted a painful house to house survey of the copper and nickel stores of the Empire. Ornaments, kitchen utensils, heirlooms, statues and bells, all went into the munition melting pots; and the kitchenware, at least, was replaced by coarse pottery.

The whole metal industry of Germany is concentrated on war, on the output of shells, bullets, armor plate, cannon, submarine parts. Every other business interest of the Empire is subservient to the demands of this industry. It is maintaining an atmosphere of hopeless hectic rush, and its activity and prosperity are surely ruining the country.

# EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

## THE WORST OF THE MACHINISTS TRADE

By D. A. Middleton

"THE worst of the machinist's trade is that it is so dirty." That remark is frequently dropped by doting parents and by youths who are making up their minds. And yet those same people will delve into the grease and grime of an automobile—the dirtiest kind of work—and, because they are not paid for it, will claim they like it. As a matter of fact, machinist's work is only relatively dirty, and only in special branches such as mentioned above is it necessary to get plastered from head to foot. It is noticeable that the best mechanics are the cleanest ones—they don't wipe their hands on their face, they have enough gumption enough not to lean on every machine they operate, and they keep their tools and work clean. Also it is noticeable that they are doing more or better work than their associates of the black face and greasy clothes.

That does not mean that there is not oil and dirt and discoloration in the shop, far from it, but one does not have to wallow in it to work there. A good man in a repair shop, which is apt to be the dirtiest branch of the business, cleans off a greasy part before he goes to work, he carries a small piece of waste in his pocket, and by its use cleans the smudges from his hands and the excess from the work and his tools as he goes along. No man can do good work when every time he picks up a part he leaves a sixty-fourth of dirt on it, dirt that mysteriously gets tracked on other parts nowhere near just as honey finds its way to the handle of one's knife.

The dirt of the machine ship is clean dirt anyway, and it all comes off in the wash. Would any machinist swap jobs with a plumber who has to straighten out a clogged sewer system, with an employee of a flour or cement mill, with workers in many lines that use waste materials and animal products? There are no odors of the business for a machinist to carry home, and if he chooses he may ride home on the car side by side a dry goods' clerk, looking fully as neat as the latter and conscious of a worth to his country not approached by the so-called genteel worker.

A visit to a fertilizer plant convinced the writer that a machinist's trade is usually plied amid most favorable surroundings. Their boiler feed pump did not work and I was sent on the job. The only spot visible that wasn't grease and slime and smell was the soft coal pile alongside the boiler. A fresh fire had just been put in and I chose this spot to unroll overall's and jacket and put them on. Outside in the yard, upstairs in the kettle room, everywhere, were carcasses in various stages of undress, dissection and decay. Well. I took the pump apart, re-packed it, and made adjustments and started it up. It worked finely, but no water. The suction pipe ran out underground to a pool fifty feet away. I ascertained that the pipe was not stopped up. Of course, the only other thing the matter would be a leaky suction and I wanted the line taken up. To this the management would not consent so I hurried to the coal pile to undress and get away.

The shop looked good after that and the soiled hands became clean and sanitary in my eyes. And I had to wear my best clothes for a few days while the others were airing way down in the back yard. Oh, yes, they finally came to it and took up the pipe line and discovered a split length which had made the pump failure.

## MACHINE EFFICIENCY COMPARISON

By J. H. R.

A MACHINE is no stronger that its weakest part. The evolution of tool steel for metal cutting purposes has necessitated a relative change in the design of the machine upon which it is to be used. The efficiency of high speed steel can only be determined when the limit of its usefulness is a comparatively well-established factor, and to do this it is essential that the machine be so constructed as to meet the maximum requirements of the cutting steel. The adoption of high speed steel resulted in greater cutting speeds and very often heavier cuts than generally practised with the carbon steel tools. Frequently, however, the forcing of a tool has demonstrated the advisability of exercising particular care in the manipulation of a machine before striving to obtain the limit of the tool capacity. The maximum cutting tool efficiency cannot be determined from machines that have not been designed for the heavy duty work accomplished on the more modern types of machine tools.

Invariably tools working under similar conditions will be operated at practically the same cost and efficiency. However, apart from the variable ability of the respective operators, no two machines can be expected to be operated under exactly identical conditions, therefore production can only be considered on a basis of machine efficiency when every component part of a machine is in complete accord with the qualities of the cutting tool. The end desired is the finished work, the means by which this is attained is the machine and the tools. Before the appearance of the high speed steels the weak point was invariably the cutting tools, the machine being generally capable of meeting the limit of possibilities of the carbon steel tools. However, when the quality of the tools was increased, as exemplified in the high speed steels, it was only a short time before the machine builders triumphed over the new development, until now the laurels are about equally divided. Some of the old machines are still doing good service but occasionally conditions will arise to show that in some particular instances they are not suitably adapted for extreme tests of heavy duty work.

A case in point was that of a small lathe that had been doing very good work of a certain description. Some shafts were wanted in a hurry, however, and, as the lathe ordinarily used for this job was heavily employed, the foreman prepared the light machine for the work. The larger lathe was accustomed to take heavier cuts at reasonably high speed, so the foreman thought the same would apply on the smaller lathe. Work was commenced, and the first shaft finished satisfactorily, but when the cut was about half finished on the second shaft the fireworks started; when the case was diagnosed it was found that several small gears in the apron would require dentist's treatment. As a matter of fact two new gears were necessary, and repairs required on two others, necessitating a shut down of the machine for several days. It is thus obvious that when striving to determine the efficiency of a machine it is essential that every consideration be given to the machine mechanism when forcing the cutting tools to a possible limit.

## CONVICTED CHEMISTRY

By R. M.

NOTHING appears to provide greater stimulus to the development and promotion of industrial and chemical science than the prosecution of a war, and this becomes additionally emphasized when the operations are on the tremendous scale of present world activities. For nearly sixty years scientific research and learning have been supported and encouraged, and institutions for its advancement have been in receipt of liberal financial endowments. In many instances community and government funds have been lavishly supplied for educational and experimental purposes. In the hope of attaining to a higher civilization men have been protesting and striving to eliminate the dominating feature of brute force that has periodically or spasmodically been manifest in the warring actions of the human race. Blinded in the belief that university investigations and scientific research have been of a constructive character and in many respects they have—we are to-day confronted with the appalling results of the advancements of so-called civilization.

Burns has said that "man's inhumanity

sent day, particularly in relation to the sible by the "advancements" of science, counts the mourners by the millions. To-day the nations of the earth stand horror-stricken before the evidence of brutalities practised by the various belligerents. The art of destruction has ne scientific but odious weapons of torture, decimation and death are exemplifications of what can be achieved through a misdirected utilization of scientific learning.

In the promotion of modern civilization (so called), crimes are being committed that makes the days of savagery look like play in comparison. Poison gases, air-bombs and liquid fire are among the many achievements that vie with each other for the destruction of mankind, not as individuals but as entire battalions. Chemistry, a name that should be the key to set humanity free, stands before the bar of history convicted of the most revolting crimes that have ever been perpetrated from the very

The destructive power of chemistry has created more blind men, has ruined the health of greater numbers, has maimed and destroyed the vitality of more human beings during the past three years than the curative powers of the said science can hope to prevent or safeguard during the next generation. Mars himself must surely be shocked by the perfection with which war is carried on at the present time. Instead of chemistry concentrating her efforts for the uplift of the human race the past three years has apparently demonstrated that in place of a guardian over the welfare of men she has become a trainer for this ghastly monster that threatens to completely destroy the equilibrium of the peace of the world. The present devastation should serve as a serious lesson for the development of the future, so that in some measure redemption may be possible for the loathsome acts that have resulted from chemical and other scientific achievements. This redemption can only be realized when the students of chemistry recognize their obligations to their fellows and utilize their knowledge and ability for the construction of a better and higher civilization than that which dominates the world at the present time.

## THE INDUSTRIAL SLACKER

By R. H.

MORE titles and honors have probably been conferred during the past three years than in any other similar period of the world's history. War is invariably a productive factor for heroic achievement. Honors are generally associated with recognized acts of bravery in the face of extreme danger. Titles, on the other hand, are usually bestowed for faithful service to a specific cause or purpose. A title or phrase, however, that reflects upon the character of the party upon whom it is conferred, is that of the odium "slacker." While this expression is primarily intended for those young men of military age that are practically free from domestic or business responsibilities and who have refrained from joining the colors, the implication is none the less applicable to many of those who at the present time are engaged in essential industrial activities.

Conscientious objection is a term often used by men to obtain exemption from military service, but few of these men show any compunction about accepting a job in a munition plant making shells at from $6 to $8 per day. Conscience, however, is a very pliable characteristic and can generally be moulded to suit the varying conditions in which we often find ourselves. Circumstances like the present demand that every man should conscientiously analyse his individual faults and failings so as to put himself right respecting his own responsibilities and his obligations to those of his countrymen who have accepted the challenge to give their lives, if necessary, for the cause of right and justice. If it is not permitted for us to take up the more arduous duties of the soldier and we find ourselves in a position where our efforts are devoted to the production of materials for the comfort and protection of these men, it behooves us to adapt ourselves to the situation so that in no sense can the term slacker be rightfully applied.

A notable feature in connection with the making of munitions is the progressive method of production. The routing of a shell during the machining operations has become one of the efficiency factors in the manufacturing problem. The successful solution, however, was often a matter of considerable concern to the various plant executives owing to the many difficulties contingent to maximum output and the vagaries of the human element. During the period of greatest activity, when the man problem was of much importance, the "floating" of machine operators caused considerable inconvenience. The high wages that were paid to the operators at that particular time was one of the chief reasons for the indifference of many employees. Taking a day off was a frequent occurrence for many men who were receiving double, or possibly treble, what they had ever done before. These men failed to realize that their absence often meant the temporary disorganization of the work in the shop as it was seldom possible to have certain machines idle when working to capacity.

During a visit to a large plant last summer the writer was told by the superintendent that during a certain race meet at a track about a quarter of a mile from the factory in the outskirts of a large city, that he was greatly handicapped by the men leaving at noon to attend the races, often as many as 5 to 10 per cent. of the men being present. The isolation of the plant and the inability to get new men to locate made it difficult to reproach the workmen for their neglect and indifference. Thus it is that the term slacker, apart from the meaning that it generally implies, can be very readily and rightly applied to many who are priding themselves on "doing their bit" in the manufacture of munitions and other essentials, but who in reality are only working for the abnormal remuneration made possible through abnormal conditions.

## INCREASING THE SAFETY FACTOR

By R. Hamilton

IN adopting safety methods in the factory it is good policy to solicit the assistance of the workmen in devising ways and means whereby the danger of accident may be minimized. Invariably, when a safety measure is adopted in a plant it is done so without previous consultation with the workman whom it is supposed to benefit. The disposition of the man is the prime factor in the success of any innovation, and in order to assure the greatest efficiency for a safety appliance or regulation it is well to impress upon the workmen the advisability of its use before applying the device to the machine upon which it is to be used. If it is seen that their co-operation is desired the workmen will adapt themselves more readily to methods that are evolved for their protection.

An effective device must be acceptable to the worker otherwise antagonism will follow its installation, and the result is liable to prove unsatisfactory owing to the initial prejudices engendered in the mind of the workman. Employees should be encouraged at all times to study the problem of the prevention of accidents, and induced to take an active interest in developing methods for their own and others' safety in the performance of their duties.

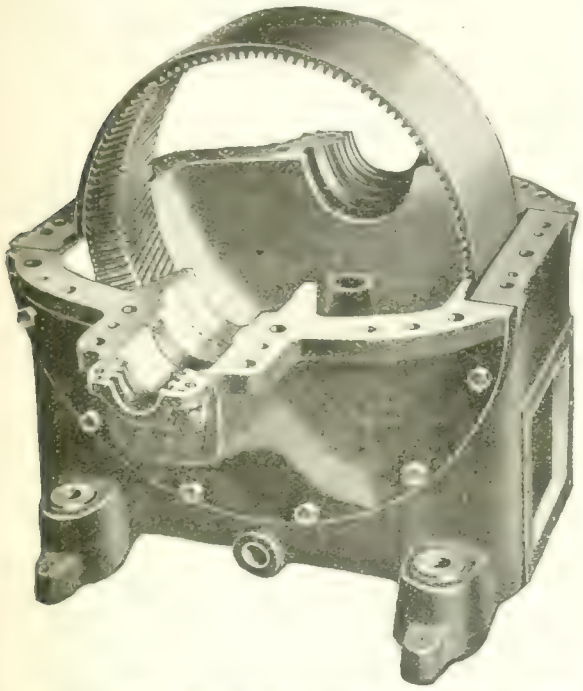
## OPENING FOR SMALL ELECTRIC PLANTS IN JAMAICA

CHARLES L. LATHAM, U. S. Consul at Kingston, Jamaica, B.W.I., reports that there is a good opening in Jamaica for small electric plants furnishing light for isolated country houses and power for doing the ordinary operations on the farm, such as grinding, pumping water, making butter, etc. Owing to the lack of development of water power here, electric current is available only in the larger centres, and there is a good demand throughout the island for individual plants at a moderate price. There is one outfit on the market at present which retails at about $400, and is capable of carrying 20 to 30 18-candle power lights at 32 volts.

The outfit should consist of a kerosene engine and a dynamo mounted on the same shaft, preferably, and a bank of storage batteries. The operation should be as simple and as nearly automatic as possible. Only oil-burning engines should be considered, as gasoline is altogether too expensive at the present time. Attention should be given to the method of packing and shipping so that the outfit can be set up by an ordinary mechanic.

## SPEED REDUCTION GEAR

RECENT developments in the use of prime movers having high rotational speeds have necessitated the employment, in many cases, of some form of speed reduction gear. The difficulties surrounding this application of gearing are well known. High peripheral speeds, proper lubrication, floor space occupied and lack of convenience and general adaptability combine to form a problem trying the designers' ingenuity.



LOWER HALF OF CASING, SHOWING INTERNAL GEAR IN POSITION

A new form of speed reduction gear has recently been developed by the Pool Engineering Co., of Baltimore, the design being such that it may be used for either step up or step down service.

The high efficiency of the gear has been shown in a recent test where the gear gave an efficiency of 98.5 per cent. as an average of five readings.

The torque of a direct current motor was measured by means of a Prony brake at a certain number of armature amperes, volts and field amperes, the speed also being measured. The motor was then coupled to the gear and the Prony brake attached to the gear. The load was then adjusted to give the same electrical readings and the torque then [illegible] to the first multiplied by [illegible]

Efficiency = T / 6.666

The totally enclosed feature makes it impossible for the workman to get his fingers or clothing caught in any rotating part or gear. This feature also makes for low maintenance cost and permits its use in wet, dirty, dusty or gritty places.

### Low Maintenance Cost

After installation there is little or no maintenance expense attached to the operation of this gear. The only attention needed is to see that an adequate supply of oil is in the reservoir. This may be contrasted with a belt or chain drive where constant attention is needed due to the stretching of belts or the wear of chains and sprockets.

Owing to the self-contained nature of this gear the cost of installation is very slight. It is only necessary to provide a firm foundation and to insure that the alignment of the gear and the driving and driven unit is perfect. When mounted in accordance with sound engineering practice this reduction gear is practically noiseless and works without vibration.

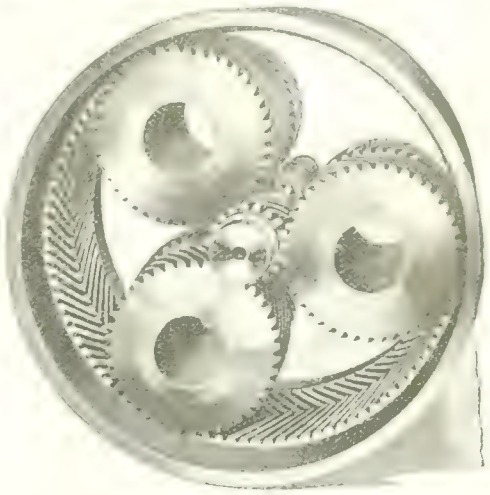
The casing is horizontally split, so that by the removal of the casing bolts the tops may be removed for inspection without disturbing the gears or shafting in any way.

As the high speed and low speed shafts are in axial alignment and all tooth pressures are balanced there is no tendency to deflect the shafts and produce unequal stresses on the bearings. The bearings merely have to support the weight of the rotating members. In the case of motors connected to chains or belts there is always considerable side pull on the bearings, this causing wear and often heating.

The high and low speed shafts are each independently supported by the casing. The low speed shaft is supported at each end by heavy duty S.K.F. ball bearings. One end of the high speed shaft is supported in a babbitt split bearing and the other end in a bronze bushing inside the cage, which forms a part of the low speed member. The pinion is cut integral with the high speed shaft and is allowed to float and [illegible] between the intermediate gears.

### Three Line Tooth Contact

Another advantage of the construction adopted is that there are three lines of tooth contact as compared to the one line of contact of the ordinary herringbone and pinion. This results in a lower [illegible]



GEAR MEMBERS

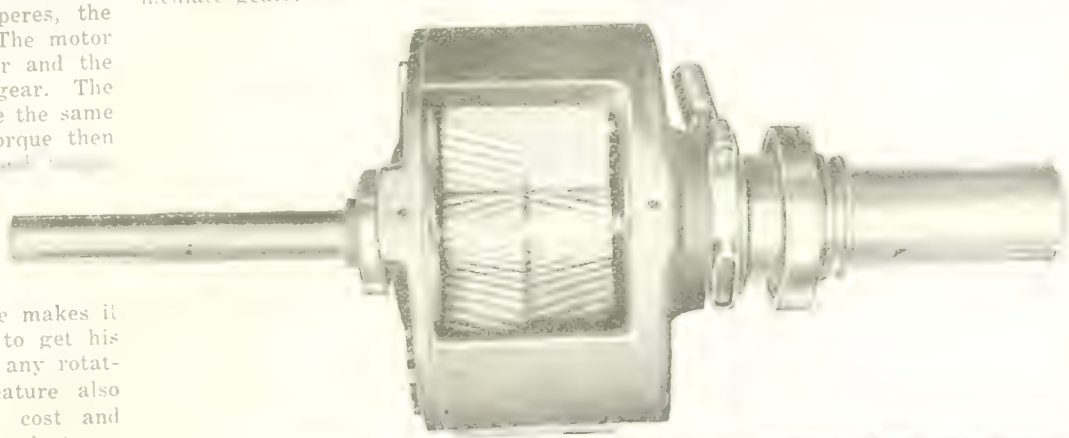
transmitted and consequently in a longer life.

The gear will drive in either direction without any changes and both the high and low speed shafts revolve in the same direction. Speeds as high as 6,000 r.p.m. and over are successfully handled.

### Turbine Drive

The high economy of the modern steam turbine makes it a desirable prime mover for the operation of various machines. Steam turbines to be economical must necessarily run at high speeds, yet many machines, such as centrifugal pumps, fans, generators, etc., require a speed much slower than that of the steam turbine. To reduce the speed of one or increase the speed of the other is a compromise which materially lowers the efficiency of both units. The mechanical speed reduction gear offers an admirable solution of this problem.

The extensive application of electricity throughout the industrial world has demonstrated the efficiency of motor



GENERAL VIEW SHOWING [illegible] AND INTERMEDIATE GEAR [illegible] REMOVED FOR CLEARNESS

drive. It is impossible, however, to secure a [illegible] motor and it will often be found advisable to purchase a high speed motor and to drive through a reduction gear.

### Construction

The gear members are cut by a [illegible] process which produces a true involute stub tooth of great accuracy and finish. These gears are not subjected to any process such as filing, scraping or polishing after being cut, as this is unnecessary.

This speed reduction gear consists of an internal double helical gear, see Fig. 1, made of a special analysis open hearth steel, forging heat treated to increase its ductility and to insure uniform hardness; a double helical pinion, Fig. 2, cut integral with the high speed shaft; intermediate double-helical gears shown in the same illustration made of high carbon steel forgings with large bronze bearings, mounted on hardened and ground steel shafts secured to the cast steel slow speed member.

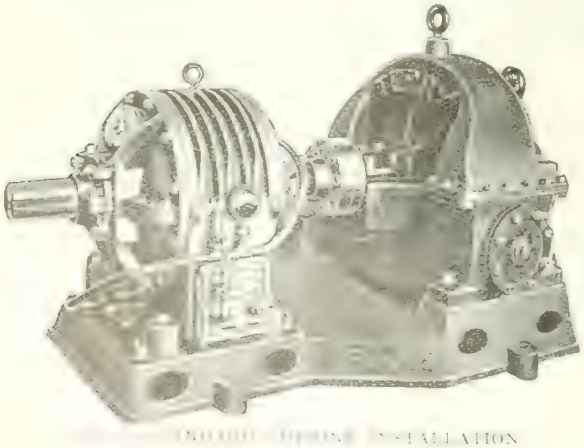
The high speed shaft and pinion as well as the slow speed members carrying the intermediate gears are accurately ground all over and are carefully tested for static and dynamic balance before being assembled.

The casing is made of tough, grey, cast iron, horizontally split. It is very substantial and well ribbed to provide a rigid support for the gear members, this insuring efficient and quiet operation.

The high-speed shaft has a central passage through which the oil is pumped, and continuous radial passages in the pinion. The oil after lubricating the gears and bearings is drained to the main oil reservoir in the base where it is filtered, cooled, returned to the pump and used over again.

### Operation

The internal gear is held rigidly in place in the casing and is kept from turning by means of two keys which slip into two keyways in the gear and casing. The pinion meshes with the intermediate gears and the intermediate gears mesh with the internal gears.



[illegible] INSTALLATION

Let us assume that we wish to drive a low speed machine with a high speed mover. The prime mover should be connected with the pinion shaft; this causes the pinion shaft to rotate and turn the intermediate or planetary gears. As the internal gear is held stationary, the intermediate gears must not only rotate but must of necessity revolve about the pinion shaft. This causes the low speed shaft, connected to the spider housing the intermediate gears, to rotate at the desired speed.

FIG. 1. TURBO-GEAR MOTOR LINE SHAFT DRIVE. 100 H.P. GEAR. SPEED REDUCTION 730-122 R.P.M.

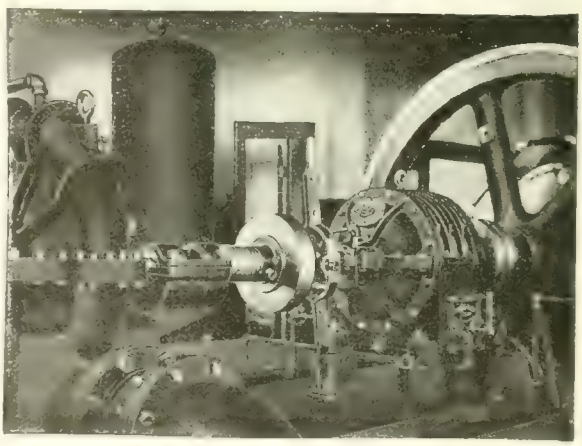
### Motor Line Shaft Drive

A very interesting application is found in Fig. 4, which shows two 100 h.p. motors direct connected to the line shafts through this device. It will be noticed that the gears and motors are mounted on base plates set upon concrete pillars.

An interesting application of a direct connected reduction gear and steam turbine is shown in Fig. 5. This illustrates a 100 horsepower turbo-gear direct connected to a Terry steam turbine reducing the turbine speed from 3,600 to 440 rev. per min., which is the speed of the driven unit—in this case a blower.

Two of the most noticeable features of this outfit are its compact and symmetrical appearance, together with the absence of offset shafts, the driving and driven shafts being in the same straight line. These features result in a considerable saving of floor space, as well as permitting a better grouping of the machines.

It is frequently found desirable to drive centrifugal pumps, fans, etc., with a low speed prime mover such as a gas engine. Fig. 6 shows an installation of this character where the engine speed is stepped up to the desired pump speed.



[illegible] 100 H.P. INSTALLATION STEPPING UP ENGINE SPEED TO THAT REQUIRED FOR PUMP.

## APPLICATION OF SHELL DISCARD STEEL

VARIOUS reports indicate a broader use of shell discard steel in rolling and manufacturing operations. It is believed that picks, crow-bars and digging bars are now being made largely from shell discard steel, while as already reported this steel, in the form of 1½-inch square billets, has become the regular material for stirring rods. No precise information is available as to the proportion of shell discard steel that is being used by the steel works for rolling light rails, but the common view is that this is now the chief material.

This steel is in general quite akin to rail steel in character. The carbon averages somewhat lower, in general, but as the manganese is higher the material is fully as hard as rail steel. The phosphorus and sulphur are somewhat better.

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THE most economical total load for belting must lie between 174 and 357 lbs. per square inch of section.—Belts.

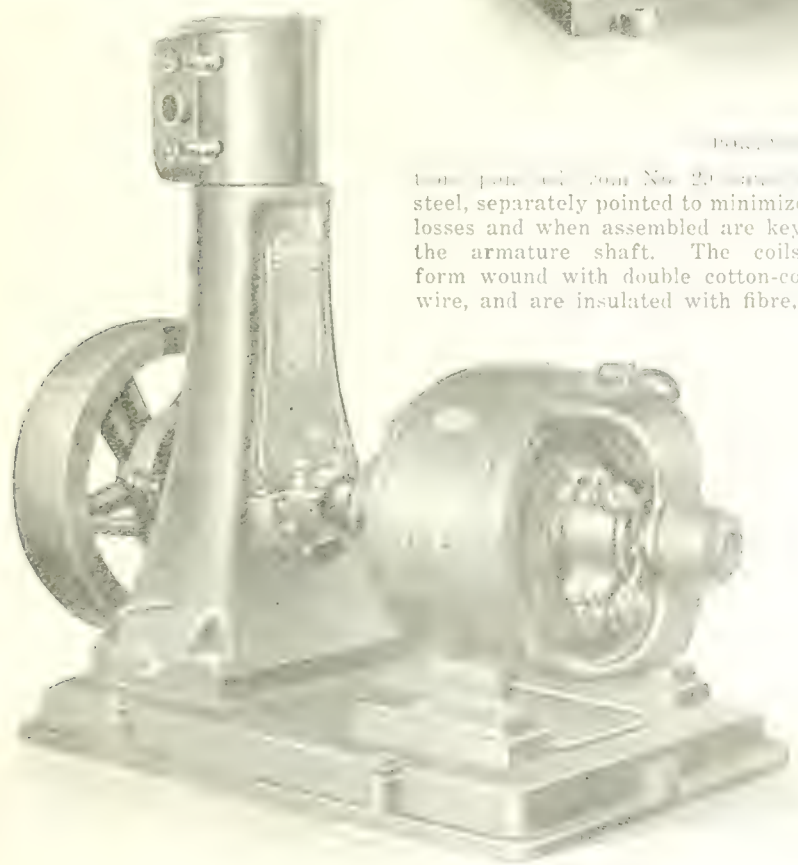
# PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

## SHIP LIGHTING UNIT

THE above illustration shows a unit lighting set particularly adapted to the lighting of ships. The Watson seven and one-half kilowatt generator is direct connected to a Canadian Sirocco high-speed vertical engine all mounted on one base.

The engine operates without noise or vibration, is oiled automatically, and is of the enclosed type. Lubrication is ample at any speed, and is not affected by the wearing of bearings, etc. Oil is separated from the water, cooled and filtered at every circuit. Careful analysis of hundreds of repairs ordered for engines lubricated with sight feed oil cups showed conclusively that over 80 per cent. of the repairs were due in one way or another to insufficient lubrication. The forced lubrication system with which these engines are provided enables them to run steadily for from three months to a year at high speed and full load without the adjustment of a bolt or screw or any additional oil after the first filling.



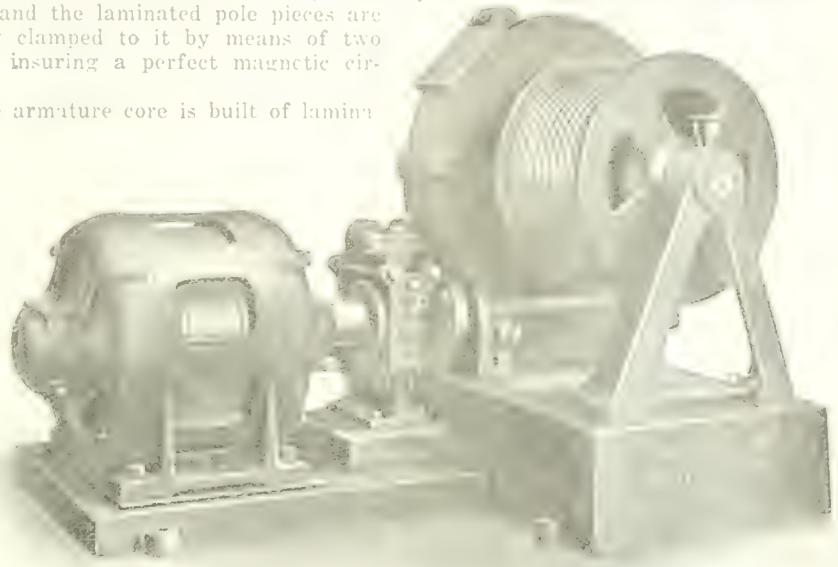
SEVEN AND ONE-HALF KILOWATT DIRECT CONNECTED SHIP LIGHTING SET

This is made possible by the positive feed of oil to every bearing and wearing surface from a pump in the base of the engine, driven through gears from the crank shaft.

The Watson generator which forms part of this unit is carefully tested during construction, and after completion with regards to mechanical features and electrical characteristics. The field ring is cast from a high grade of dynamo steel and the laminated pole pieces are firmly clamped to it by means of two bolts, insuring a perfect magnetic circuit.

The armature core is built of lamina[illegible] steel, separately pointed to minimize core losses and when assembled are keyed to the armature shaft. The coils are form wound with double cotton-covered wire, and are insulated with fibre, linen tape and high-grade insulating varnishes. The complete armature is given a running balance to eliminate vibration.

The sleeve bearings which form part of this generator are cast from bearing bronze, and are so designed as to align against a shoulder in the head casting. They are held in place by a fixed key instead of by the usual set screw. Oil cups are provided which serve the double purpose of a filling device and an overflow.



[illegible]

The brush holders are of the box type with radial feed, which prevents the shifting of the point of contact due to brush wear.

The A. R. Williams Machinery Co., Ltd., Toronto, Ont., are the Canadian agents for this equipment.

## PORTABLE ELECTRIC HOIST

THE accompanying engraving shows an electrically-driven hoist which is readily adaptable to the handling of material around yards and stores. It is operated by a standard A. C. motor which is supplied to suit various voltage and cycle requirements.

The motor drives the 12-in. diameter drum through worm gearing, the capacity of the output being 1,500 pounds. The drum is capable of overhauling 50 feet of ½-inch cable, and, as originally designed, the hoist was arranged to elevate material, reverse automatically and come back to charging position.

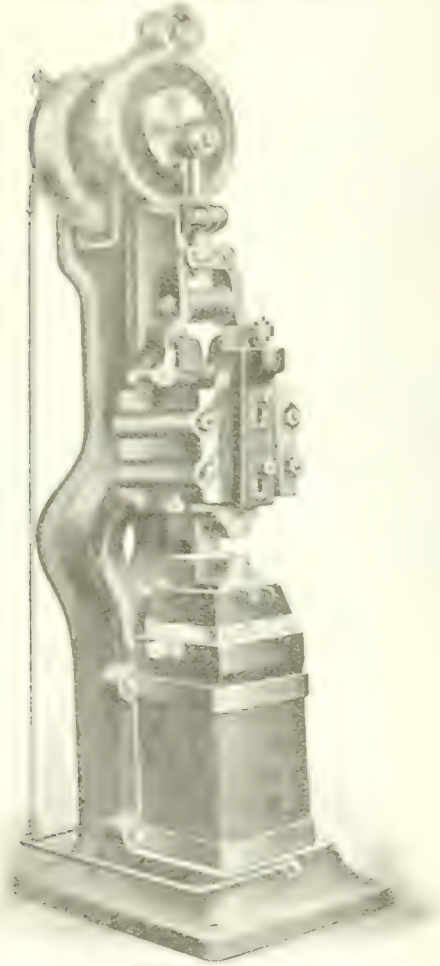
The motor is provided with standard reverse control, or where special requirements make it necessary specially designed controls can be designed to suit.

A magnetic brake of the horseshoe type is fitted. It is of simple and rugged construction, is not liable to jam, and insures a dead stop by the motor immediately the current is cut off. This hoist is the product of the Volta Manufacturing Co., Welland, Ont.

### POWER HAMMER WITH ADJUSTABLE TAPER GIB

The accompanying illustration shows a [illegible] power hammer as built by the United Hammer Co., Boston, Mass., in which provision has been made for the adjustment of the ram guides, so that a much finer ram adjustment can be obtained than hitherto.

The hammer is of the overhead crank type with adjustable stroke; the capacity under the ram being altered to suit requirements by adjustment provided on the connecting rod. The detachable anvil block is securely strapped to the column, which has an opening to accommodate work of unusual length or shape.



POWER HAMMER WITH ADJUSTABLE TAPER GIB

The ram guides are fitted with an adjustable bronze taper gib taken up accurately and quickly, and the gib and face plates have been so designed that they may be fitted to hammers of this type, which are already in use.

### A SMALL BENCH LATHE TOOL-HOLDER

THE accompanying illustration is an actual size view of the smallest bench lathe tool-holder on the market. It is manufactured by the Ready Tool Co., Bridgeport, Conn., and is known as their New Style O O Tool-holder, and in getting out this tool-holder the manufacturers have considered particularly the requirements of users of bench and watch lathes. Any size of holder required in these lathes can be secured.

The tool-holder is a fine quality of drop forging broached with a perfectly square and true hole for the cutter. The cutter furnished is finest grade of high speed steel treated by Taylor-White process. These tools are nicely finished and sent complete with a 3-16-inch square cutter and wrench. The size of the holder is 5-16 inch x ½ inch x 3½ inches.

ILLUSTRATION IS EXACT SIZE OF TOOL HOLDER

### UNIVERSAL CYLINDRICAL GRINDER

THE grinder illustrated is similar in some respects to the universal cutter and tool grinder, also manufactured by the Oakley Machine Tool Co., Cincinnati, but is particularly adapted to regular shop manufacturing operations. The grinder is fitted with a longitudinal power feed, thus insuring a smooth and even traverse of table and rapid production. A small handle at the front of the machine operates the power feed and the drive is through the table feed screw instead of by the customary rack and pinion. To allow the wheel to grind clean at the shoulders there is a short pause of the table before reversing.

The stop dogs provided with this machine are hinged so that the operator may run the work past the setting to measure both external and internal work.

Wet grinding may be used for tools where preferable and the attachment provided can be set up in a few minutes.

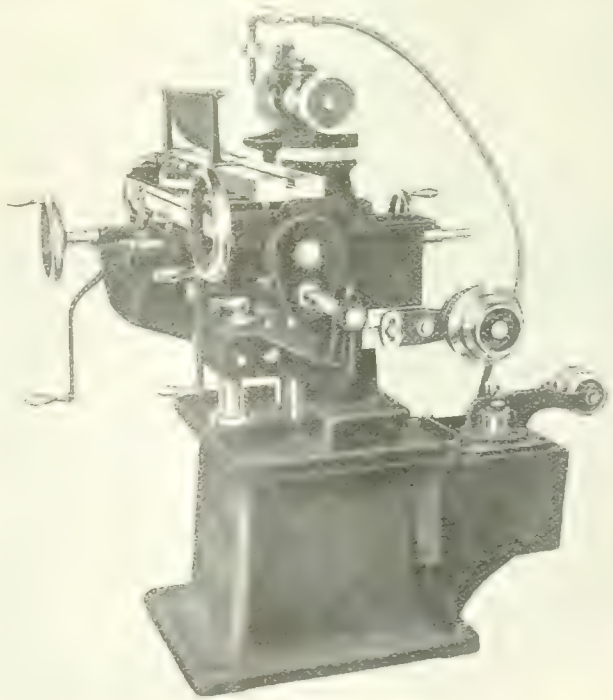
The column is bolted solidly to the base casting. The dovetail bearing for the knee overcomes the inaccuracy inherent in constructions depending upon swivelling of the operating parts around a small circular column.

The knee is of the box type and is provided with a taper gib which takes up wear and insures a solid accurate bearing during the life of the machine. Broad vees on the knee 16 in. apart give good support against rocking of the saddle.

The table is supported by ample bearings in the middle and at both ends. When grinding at right angles to the wheel it is never necessary to swing the table beyond the end supports as the wheel head itself swivels.

The wheel head swivels on column 180° either side of the center. Large graduations are provided for its proper indexing and dust proof taper bronze bearings insure accurate running.

This grinder has a longitudinal movement of 17 in., a vertical movement of

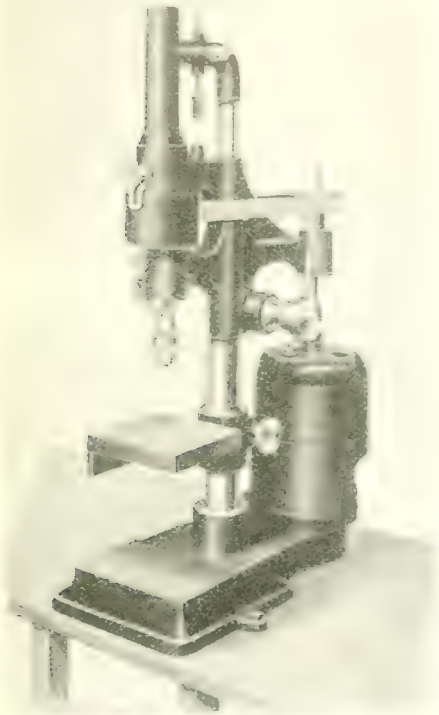


GRINDER EQUIPPED WITH POWER LONGITUDINAL FEED AND WET GRINDING ATTACHMENT.

10½ in. and a cross movement of 9 in. The table is 5¼ x 33¾ in., can be swivelled 270° and is provided with a taper adjustment up to 2 in. per foot. The maximum swing is 10 in. and the maximum length between centers is 20 in.

## SENSITIVE BENCH DRILL PRESS

THE high speed sensitive drill press illustrated in the accompanying engraving is manufactured by the High Speed Hammer Co., Rochester, N.Y. Weighing only 60 pounds the drill press is readily portable. The standard spindle speeds are 2,100 and 6,000 rev. per min. and



SENSITIVE BENCH DRILL PRESS

special pulleys can be furnished for driving main spindle at any speed up to 10,000 rev. per min.

The main spindle is heat treated and ground to size and is guided through a bronze quill supported at each end in an annular ball bearing. End thrust is taken up by an end thrust ball bearing under the feed arm.

The table has a working surface 5½ x 5 in. and will take work up to 4⅜ in. in height. The surface of the table is ground to insure accuracy. The table has a self cleaning bevel which keeps the ground main column free from chips and which also serves to guard the columns from injury.

The base has a ground working surface 4 x 6 in. and will take work up to 7½ inches in height. The base has an oil groove and a self cleaning column support. A special feature is furnished in a locking device which enables the operator to change drills without his hands coming into contact with belt or pulleys.

An idler pulley takes up any belt stretch which may occur in the endless woven canvas belt without impairing the efficiency of the machine.

The front pulley and upper part of the spindle are guarded by a semi-tubular guard, insuring safety. The machine may be operated either by hand or by foot control.

## SHOP MAIL BY TRICYCLES

THE Westinghouse Electric & Mfg. Company has departed from the old and slow method of delivering mail through its East Pittsburg works by means of a boy on foot, which required from three to four times longer than the newly-adopted method to deliver a piece of mail from the central mailing department to one of the outlying buildings.

The first improvement in this direction was that of the storage battery truck fitted up with racks similar to those used in a post office. This truck made trips throughout the works collecting mail and sorting it while the truck was on its rounds. This was found to be a considerable improvement over the old method, but on account of the trucks being large a great deal of time was lost in waiting to get through aisles where material was being loaded and unloaded. The truck required the services of two men, one for the sorting of the mail and one for operation. The new tricycle, which is 11½ inches narrower, costs considerably less, in fact 8 tricycles can be purchased for the cost of one storage battery truck, and it requires the services of but one boy to handle the mail and tricycle.

A great deal of time is saved in delivering mail from the central mailing office to the farthest outlying building, a distance which requires a 12 minute walk for a boy to cover, whereas a mail tricycle will make the trip in about 5 or 6 minutes and will carry three times as much mail as the boy can handle. At the present time there are four of these tricycles in use and an extra one is held in

TRICYCLE USED FOR SHOP MAIL

reserve for emergencies. Each tricycle will cover approximately three-quarters of a mile per trip, and the time will be between 30 and 60 minutes per trip.

These vehicles are of regular bicycle construction and were originally designed for use as delivery vans by small merchants for handling packages of light weight, a covered basket being attached to the front, but for factory use a sheet metal sorting box was substituted. There are twenty-two small and three large compartments, each having a metal label. The lower portion of the box has been divided into two large compartments for handling packages, and long rolls of blueprints which are too large to be handled in the upper compartment. When these are used a bright colored card is placed in the smaller compartment above marked to show what packages are below, this serving as a reminder to the operator. The total weight of the outfit is about 150 pounds and includes 1½-inch rubber tires, cyclometer, auto horn, etc., and is quite easy to operate on the grades.

Under the present management, where size will permit, all mail of light weight for the works is forwarded by a pneumatic mailing system; mail too large for the tube system is handled by the tricycles; and extremely heavy packages such as packages of stationery, screw machine details and other small parts will be handled by a works departmental express truck which will soon be placed in operation.

## MACHINERY MARKET IN BRAZIL

AS to the requirements of Brazil generally these are exceedingly diverse. In one market alone—that of mining machinery—there are boundless opportunities for the British manufacturer. Mining is, however, but one phase, and one phase only, of the republic's industry. Agriculture, which forms so large a share of the people's occupations, demands increasing supplies of implements and machinery; the many large towns are purchasers of electric lighting machinery, pumping plants, steel rails for tramways and mines, iron and steel manufactures, motors and stationary engines, tubes, structural material, tools, cement, and sewing machines. Windmills, refrigerators, huge quantities of barbed and plain fencing wire, lubricating oils, and innumerable other articles of a similar nature are constantly in repuest.

Neither should the great sugar producing industry be overlooked, with its demands for the latest type of crushing plant and distilling apparatus, while a further opening in the engineering line is to be found in connection with the many irrigation plants and installations of pumping works that are being installed, in addition to the equipment of numerous plants, large and small, to make use of the hydro-electric power available.

The most important of all Brazil's manufacturing industries is, however, that of cotton textile. The principal cities and towns in which textile machinery is needed are those of Rio de Janeiro, Sao Paulo, Petripolis, Sorocaba, Maranhao, Pernambuco, and Bahia.

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## TRADE BALANCE COMPELS EMBARGO

THE decision of the Canadian Government to correct the adverse trade balance by means of an embargo on selected imports should be welcomed by the majority of industrial circles as being both necessary because of present conditions and desirable in its probable effects on future trade expansion.

The list embraces a wide range of articles which affect the general public more or less directly and include many items which are now manufactured in Canada, but are subject to competition from imported articles made under more favorable conditions as regards quantity production and supplies of material. Intensive advertising and, in many cases, advantageous patent control have frequently militated further against home manufacturers.

Three immediate results should arise from the pending action. A substantial reduction in the trade balance should be rapidly effected: home production will be increased to a degree where economies arising from increased output may be effected: holders of Canadian patents who have limited their production here to a minimum while importing largely will be unable to do so longer and additional branches of industry are probable in this respect alone.

While many of the articles which it is proposed to prohibit are more or less in the nature of luxuries, the return of normal international trading conditions will find many of these in the lists of competitive exports and full advantage should be taken by every manufacturer whose production will be stimulated for some time to come.

Automobile manufacture has had a considerable footing here for some years although imported parts and chassis formed the bulk of the business. Tire factories are well established,—silverware, musical instruments, footwear and clothing have all been made here of high enough quality to suit the most fastidious and permanent enlargement of these activities alone will be of considerable benefit to many centres of industry long after the present financial conditions primarily responsible have been overcome.

The working out of the details by the Canadian War Board in consultation with those interests directly affected will be awaited with interest and confidence. The personnel of the board is ample guarantee that developments will be for the greatest good of the greatest number.

Similar action by the States is expected and its reactive influence on other lines here is the subject of much interested anticipation.

## INDUSTRIAL CO-OPERATION.

PROBABLY never in the history of the world has the great need for co operation between capital and labor been so pronounced as that of the period of revolutionary developments through which we are now passing. Few cannot but be impressed with the absolute necessity of "carrying on" to the very limit of our capacities. The present is no time for dissension and strife, with the natural consequence of decrease in production. The strain upon the country's resources, in the constant drain of men and material, has made it imperative for all to put their shoulder to the wheel, so as to maintain a steady, though oftentimes seemingly slow, progress to that end we have in view, namely, the successful prosecution of the war. Sitting still and telling others how they should proceed is not a man's work under existing conditions. What is required is that everyone should get out and push, thus lessening the load and making it easier for those who have, so far, assumed the greater portion of the burden.

The belief is becoming prevalent that the day of labor is approaching when the workingman's voice will be heard in the different councils of the world. Revolutionary changes have undoubtedly taken place during the past three years that will hasten the realization of their ideals—or rather ideas, as it is very improbable that the former will be achieved by the present, though waning, methods of agitation and strikes. However, even with the possibility and hope that a better day may dawn for the masses of the people, as a result of this devastating war, the present is surely no opportune time to throttle the valve of industry and agriculture and choke the flow of productive energy that is so essential to maximum attainment in every line of the country's activity.

While many of us may feel the apparent injustice of certain conditions, we should nevertheless realize that the sacrifice we at home are asked to share is almost infinitesimal when compared with what the soldier at the front is forced to endure, and that invariably without complaint or murmur. We here, far back of the actual firing line, have voluntarily taken on obligations that are equal in importance to those of the boys suffering untold dangers and hardships in the front line trenches. To forego these obligations would be to experience abject humiliation of our very manhood. To fulfill these unwritten promises and likewise pay in full the indebtedness are moral obligations placed upon, and practically accepted by, every individual citizen.

Unrestricted production of essential requirements, conservation of all resources, elimination of waste, are the foundation stones of success; unification and co-operation are the key-stones upon which the stability of the construction depends. Maximum efficiency is only possible where the co-ordination of capital and labor are based on a mutual understanding tending to perfect harmony in manufacturing operations. Conservation of material and the elimination of waste are educational features of vital significance under present circumstances, and their future importance cannot be underestimated. The shortest distance between any two points is a straight line; therefore, to attain the fullest realization of our present objective, it is obviously essential that industrial friction be entirely eliminated during the prosecution of this purpose. Employees should exercise fortitude in any seeming hardships they are called upon to endure, and employers should recognize their responsibilities to these workers and those men overseas whose sacrifices are equal to, if not greater than, any the manufacturer is called upon to face.

# In Developing the Future Trade of Canada The Question of Tariff Must be Considered

## C. F. Parsons, President of the Canadian Manufacturers' Association, Claims That it is Useless to Try to Develop Trade While it is Discouraged by Drastic Changes in the Tariff—Believes That Scientific Study Should Be Made of the Whole Situation.

"DISCUSSING trade conditions after the war, apart from their bearing on the matter of tariffs, is of little or no use. The two go together, and they cannot be separated. Trade cannot be developed apart from tariff regulations, and that might as well be faced at the very start."

That is the ground from which C. F. Parsons, President of the Canadian Manufacturers' Association, starts his reasoning when he discusses the big problem of Canada's trade, especially of the export sort, after the war. Mr. Parsons has the happy faculty of sticking to the point. He discussed the matter with a representative of CANADIAN MACHINERY a few days ago. No matter how far afield the talk ran, when it reverted to trade matters Mr. Parsons would keep his Trade and Tariff point to the top like a sore thumb. Apparently he reckons that his Two T's make a good tandem, but are not worth spoiling pasture on if an attempt is made to keep them alone.

### Reduce the Overhead

"If the Canadian manufacturers want to get in shape for the jolt that will come after the war, the time for the start to be made is right now. Don't let us make the fatal mistake of waiting until the acute situation is here. Although the war is our big problem at the present moment, the conditions following are so closely related to it that it's hard to separate them.

"The manufacturers of Canada," continued Mr. Parsons, "must realize that they will have to come together to reduce their overhead charges, not only in the ultimate disposal of the goods, but in the manufacture of them as well. We must come together that we will to a large extent cease fighting each other, and turn that energy into fighting for trade. The best brains of the land should get together. I don't mean that we should of necessity go in and copy the German system, because they were sinning against several very real economic laws in the pursuit of business. Sooner or later the inflation is bound to come out of such forced business, and then come depression and trouble."

CANADIAN MACHINERY representative here referred to the organizations that were springing up in the Old Country to meet the efforts of Germany and Austria, the latter including the purchase of the Woolfe News Bureau by the Krupp interests. The Old Country expects competition from Japan and United States to be keen also.

C. F. PARSONS, PRESIDENT CANADIAN MANUFACTURERS' ASSOCIATION

"It is interesting to note what is being done in Britain," replied Mr. Parsons, and to think that they are able, in spite of the tremendous war burdens, to plan for after-war trade, but conditions differ. Britain has five times our population, and her people are more centred in industrial pursuits than in this country. Then, too, it is much easier to control the transportation problem there."

### Wants One Central Board

"We could make a very good start in Canada by having a Trade and Tariff Board. I would apply the dual name to the organization because we must realize in Canada that these two things travel together. Let's get that clear at the start. It's no use talking about trade unless we include the tariff side as well. We are living alongside a nation that, under its low tariff, has an average trade protection of 25 per cent. above ours. That is the actual condition we have to face. This Trade and Tariff Board need not be a large or cumbersome body. It should be part of the machinery of the Government, and from the Government we should receive a direct and straight lead. The board to which I refer would make a scientific study of the whole question from a national standpoint, and would include not only manufacturers of all kinds, but the agriculturists of the Dominion. I believe in giving every needed stimulus to farming, but I do not believe in doing it at the expense of other interests. A scientific study of the whole situation would lead to all having fair play.

### Discouraging Trade

"But let's get back to the trade matter," continued Mr. Parsons, "and see how it can be discouraged as well as encouraged. Last week we were at Ottawa presenting the claims of the Canadian manufacturers and discussing a number of recent restrictions. The tractor situation took up our attention to a considerable degree. I can state the case of one Winnipeg man. He was prepared to start the manufacture of these machines in his city. There are 500 soldiers out of work in that city right now, and he figured that he would be able to provide employment for 200 of them. What happened? When the Government announced its policy of bringing in tractors free of duty without rebating the duty on the raw material brought into Canada for their manufacture here they simply quit. And I know of half a dozen other plants, most of them in Ontario, that are in the same position right now. What follows? Labor will not be employed, and when the munition plants are closed down the num-

(Continued on page 365)

# Extension of U.S. Prices Has Effect of Making the Canadian Market More Steady

## United States Shipbuilding Programme Is Most Encouraging One—Pittsburg Reports An Increased Output Of Pig Iron—Nova Scotia Mining Reports are Not Encouraging.

AN old saying can well be applied to the iron, steel and metal markets this week, viz., that the mountain has labored and brought forth a mouse, the mountain being the much talked-of changes that were due on the last day of the month just closed, and the mouse the one dollar cut on the price of pig iron. The one price change makes little difference to the Canadian market, although its action may be felt in certain specific lines later on. The supply of pig iron has been short in Canadian centres, and a number of manufacturers have been looking about for some time to see if they could locate a larger supply. News from Pittsburgh is to the effect that the blast furnaces there are making a near-normal output, and that prospects are for a continuance of this performance.

Big buying is going on in United States for equipping war shops, and there is a warning in market reports out to-day that this is likely to result in an upward tendency for the figures on machinery and machine tools. This has not worked in the Canadian market yet. The announcement of United States ship-building plans is worthy of note. It puts rather an effective quietus on the stories that have been persistently circulated to the effect that the Republic was going to fall down sadly in this regard. It is confidently expected that United States' building programme for this year will account for five million tons of new shipping.

Manufacturers buying steel plate in Canada are having a hard time to compete with U.S. firms in the same line of business, although the latest embargo, which has been announced with the purpose of equalizing the trade balance, may yet have some bearing on this matter.

Business in machines and machine tools continues brisk. Large size chucks are hard to secure, varieties from 12 inches up coming under this ruling. Metals and oils remain steady with trade brisk. Scrap dealers are not keen to stock up farther at list prices, although a fair volume of business is still being transacted.

## PLATE OUTPUT KEEPS SHIP WORK BEHIND

### Conditions in Montreal Nearly Normal With Clearing of Tracks

Special to CANADIAN MACHINERY

MONTREAL, Que., April 1, 1918.—Industrial conditions are gradually assuming more normal proportions owing to the betterment in the weather and the clearing of the snow; the transportation of freight is still a factor in the present situation, as the railroads are not yet free from the congestion of the recent months. The near approach to the opening of navigation has been reflected in the subdued activity in marine circles, and before the close of the current month considerable relief will be given to the railroads. Good progress is being made in the construction of steel and wooden vessels, both here and in the States, although the shipbuilding programme in both countries has been a little delayed owing to the inability to obtain sufficient plates for maximum operations. Satisfactory progress, however, has been made in the launching of boats in the States. Labor unrest may be a factor in the next month's development, although an agreement has been reached between representatives of capital and labor that industrial disputes will be considered and settled by a Government [illegible], so that no disorganization of activity will arise while the needs for production are so imminent. The steel market has become steadier as a result of the announcement of an extended period for the prevailing prices on steel products.

### Steel

The general market conditions of the steel situation have become additionally stabilized following the announcement of the American Government that the prices effective during the past three months will remain in force for the next quarter, if not longer. This decision has added firmness to the present position of steel, and may have the effect of increasing the production. One of the prominent steel dealers here expects that the situation will retain its stable character for the next six or nine months, subject, of course, to unforeseen developments. In order to strike a better balance in the cost of production and assist the producer in operating mills and furnaces to capacity, the Government has revised the price on basic pig and steel scrap; the former is now quoted at $32 per ton, while the price set for heavy melting steel scrap is $29 per ton, both these revisions representing a reduction over the old price of $1 per ton. The negotiations between the Canadian Government and the various steel interests has finally culminated in the placing of a contract with the Dominion Iron and Steel Company for the construction of a plate mill, with the object of increasing the supply of ship plates for the future needs of the Canadian Government and private shipbuilders. It is expected that approximately $4,000,000 will be spent in the erection of the mill and the installation of the plate rolling equipment, and it is anticipated that the plant will be in operation in about 18 months. Nothing definite has been announced as to when the work of construction will be commenced, but negotiations are now in progress with this end in view. Owing to the heavy demands for plate rolling machinery the Dominion Steel anticipate some difficulty in securing the equipment necessary for the new plate mill, and, as one of the officials stated, it will be necessary to obtain the desired machinery wherever the same is available. An easier market, but with firm quotations, prevails in local circles. Dealers report better deliveries of material, but in some instances shipments have been practically lost owing to the inability to trace the same. This condition, however, is fast becoming rectified and transportation of freight is rapidly becoming more normal. The local plate situation has an easier tendency, but dealers are content to quote the same price that has prevailed for some time.

### Metals

No outstanding developments have taken place during the week and the metal situation is much the same as that of last week. The better movement of freight upon the railroads has given some relief to transportation problems, but the situation is not yet all that could be desired. It is expected that the attitude of the Government in respect to the revision of copper prices will be similar to that recently taken regarding the steel conditions, and few are looking for any marked change in the price of copper for ensuing period. Tin is in great demand owing to the shortage and the inability to obtain adequate supplies. Spelter, lead and antimony are inclined to weaken, while aluminum is developing strength.

**Copper.**—The market has taken on a still further tone of firmness following the attitude of the American Government respecting the revision of steel prices. From this action it is anticipated that the present prices now effective will remain in force for an extended period after June 1st. War requirements are constantly on the increase, and domestic consumers are feeling more and more the restrictions that are placed upon their obtaining of metal. While production is somewhat over the existing demand, the larger producers are retaining considerable large stocks to take care of any sudden demand from Government sources. Eventually the situation may be such that plenty of metal will be available for private distribution. Local dealers continue to quote 29c and 30c per lb. on a steady market.

**Tin.**—The tin situation continues to maintain a very acute position owing to the inability to obtain sufficient metal to meet the requirements of the trade. Business is still done in considerable volume, but principally on futures, as no spot metal is at present available. The importation of tin from the East is dependent upon the obtaining of shipping permits, and the uncertainty of definite assurance in this respect has a tendency to make the dealers reluctant to take orders for specified delivery. The situation in the States is very firm, but all quotations are of a nominal character. The local situation continues to be somewhat unsettled, but dealers report a little easier market, with prices easier; present prices are on a basis of 98c per lb., this being a nominal figure.

**Spelter.**—Increased supply and greater pressure to sell on the part of holders of metal has influenced the market and prices have shown a tendency to decline. The consumers are not showing any anxiety to buy, and the market is becoming stagnant. The prevailing quotation on the New York market is now 7¼c, this being ¼c lower than last week. Dealers here report a slow market, with an undertone of further weakness. On a decline of ½c the quotation is 10½c per lb.

**Lead.**—Freer offerings to sell has developed a weaker situation and the tone of the market is downward. The tendency is reflected in this week's quotation on the local market, which shows a decline of ½c over that of last week. Dealers' prices are on the basis of 10c per lb.

**Antimony.**—The market is developing an easier tone as a result of the increasing supply and the slight falling off in the demand. The price in New York has fallen off ¼c, the quotation being 12¾c. Dealers here are asking 17½c, a decline of ½c per lb.

**Aluminum.**—A steady market is maintained on aluminum and the tendency is upward. Local quotations are 55c per lb.

### Machine Tools and Supplies

The general activity in the machine tool industry during the past week has been less pronounced than formerly and the demand for equipment is confined to the replacement of tools that have become ineffective for maximum production. A notable feature in connection with the manufacture of the American shells is the adoption of machinery that is designed and constructed in the plants that are engaged in this work. The experience that has been acquired on the other class of shells has enabled firms to develop special tools that are highly applicable to efficient operation for special purposes. Some little business has been reported in the placing of contracts for shipbuilding machinery, but inquiries for the heavier machine tools is comparatively light. Dealers still report considerable difficulty in obtaining anything like reasonable delivery on tools coming in from the States. The general demand for all classes of small supplies is well maintained, and prices on this line as well as the heavier tools are very firm.

### Scrap

The scrap situation has improved very little over that of the previous week, and buying is exceptionally light, consumers contenting themselves with just sufficient material for immediate needs. The Canadian demand for steel scrap at the present time is not very heavy, and the embargo still in effect prevents the free shipment of material to the States. This condition has the tendency to unsettle the market here, at the same time maintaining the future in a very uncertain tone. Dealers report an undertone of weakness, but are retaining the quotations on the basis of those listed last week.

## POINTS IN WEEK'S MARKETING NOTES

**Toronto dealers claim that steel plate prices will become easier, as it is necessary for the figures to be brought nearer to the level of prevailing U.S. quotations.**

**Supplies of high speed steel both in Toronto and Montreal are being seriously depleted, much faster in fact than there is any prospect of replenishing them.**

**Machine tool dealers find it harder to get the larger size chucks from American firms. U.S. government requirements make deliveries on anything over 12 inch more uncertain.**

**Canadian dealers think action of U.S. in setting present prices ahead to July 1 will have effect of eliminating to a large degree price fluctuations.**

**Construction of shipping in U.S. yards will reach the five million ton mark during the present year.**

**Railroads may be called upon to handle shipping formerly carried in Great Lake steamers to relieve pressure there, as large numbers of vessels have been requisitioned.**

**U. S. and Japan reach agreement for taking over by U.S. of 150,000 tons of Japanese shipping. Japan made a rather keen bargain on this.**

**American fuel administration has propaganda under way urging consumers to lay in next winter's coal supply as soon as possible.**

**Big U. S. government orders for the manufacture of ordnance, shells, etc., result in keen buying of tools and equipment, with prices showing a tendency to rise in consequence.**

**Pittsburgh indicates pig iron outlook is better, basing this on the now nearly normal output of the blast furnaces.**

## A STEADY MARKET AND BRISK DEMAND

### Dealer Contends That Prices Will Work Now Toward a Lower Level

TORONTO, April 1.—April 1 brought few jokers to the iron and steel trade. The announcement, made officially a day or so ago that the present prices, as approved by United States would remain until July 1, made it certain that Canada would see little departure from the present era of high prices. In spite of this, though, dealers in many cases seem certain that the tendency is for lower prices in Canada. It is contended that the spread is too great on certain lines between United States and Canada, and that, if Canadian firms are to successfully compete with the products of American mills, which they meet in competition all the time, they must have the advantage of cheaper raw material. Any attempt to reach such a condition suddenly would mean the wrecking of many of the Canadian dealers who are stocked up now with material bought before the United States set prices on the lower grade.

Toronto dealers cannot see where the $1 reduction on basic pig iron is going to have any reflected influence on the Canadian market. It is entirely different to a sweeping change, in which case the Canadian market would be very responsive to any tendency either up or down displayed across the border. The general view is that the dollar cut was made in the interests of the smaller roller. It served a dual purpose. It answered the demand for an increase in the price of steel plates, etc., by lowering slightly the cost of basic iron and scrap, the main raw materials used in these establishments.

Old material dealers are not affected by the slight change in the American price. Business is not brisk. There is apparently no immediate prospect of a lowering of the restrictions against the exporting of scrap metals from Canada, and the buyers are not keen to load up

yards with nothing in sight to see [illegible] of the Canadian markets.

Machine tools and supplies are in good demand. Oil pumps sell practically on arrival from the factory, and there is practically no surplus stock on hand.

### Iron and Steel

The tendency of prices for steel plates, sections, etc., is going to be lower. It may not come to the surface at once, but the indications are plain enough." That is the opinion of one of the best informed men on market conditions. "The setting ahead of the time for a revision of U. S. prices until the first of July will have a tendency to keep the market steady in the meantime. We were not anticipating any radical changes, and conditions are now practically where they were prior to the 31st of March." This dealer showed a quotation of prices for the same lines of material for Canadian and U. S. factories. The Canadian prices were in many cases practically double those of U. S. "Here's one case I know of for a fact," continued CANADIAN MACHINERY'S informant. "A Brantford firm tendered on a boiler contract against the Toronto branch of a United States firm for quite a large order. There was such a difference in prices of raw material that the United States firm was able to come in against a duty of 33 1-3 per cent. and secure the business, beating the Canadian maker by quite a comfortable margin. It is that condition that is going to be a powerful factor in a movement toward a lower level of prices for the Dominion."

### Machine Tools

Canadian dealers are finding it hard at present to get orders for the larger sized chucks filled in United States. Many of the larger machines made there are required for munitions plants, and the authorities are none too anxious to have them leave the country. Permits and licenses seem to stand in the way of the larger sizes, say from 12 inches up, and on that account deliveries for these are none too good or certain. Orders are steady and prices remain as quoted, there being no list changes of any notice.

### Scrap Metals

The market for scrap materials is just where it has been for the last two weeks. It is not brisk. Dealers are none too keen to buy largely. The dollar off the American pig iron and scrap price makes little or no difference to the Canadian prices. In fact the government control of large amounts of cuttings from munitions plants, etc., has made the market such that there are no surprises, nor are there likely to be any in store. There is a very wide margin at present between pig iron and scrap metal—in fact the difference is too great. The present figures show that there is a difference now between pig and scrap of $8, while in ordinary times a spread of two dollars would be considered a fair average. Sales at a shade off the list prices are being made in some cases, the dealers claiming that the narrowed scope in which they have to sell makes it necessary for them to protect themselves to this extent.

### High Speed Steel

"Shipping is the big problem now," stated a Toronto dealer to CANADIAN MACHINERY. This man deals principally in high speed steel. "It is not such a serious matter to get orders through now as it was a year ago. At that time I know for a certainty that certain good Canadian business had to be shelved for a time in order to allow Russian war orders to be filled Of course that has been done away with, and it is not such a serious matter to get orders through the mills as it is to get the shipping accommodation to forward them. The war situation has much to do with business also. It looks to me as though it would be good policy for Canadian buyers even at present prices to buy for import now. Of course that seems a strange policy when one considers the present very high prices of carbon steel."

Another feature that may be overlooked in this is that Canadians have been buying very peculiar shapes and sizes. These are hard to get, and they are going to be harder to get later on. Munitions shops want equipment to fit many different machines. The stock on hand of high speed steel is being depleted much more rapidly than it is being renewed. This, according to our information, is true of Montreal and Toronto in particular.

There is nothing of special interest in this week's happenings on the non-ferrous metal markets. The Canadian situation seems to be gradually working into a smaller circle, due to the excess of use over the available new supplies. Prices remain steady with business demands brisk.

## PRODUCTION OF COAL IN NOVA SCOTIA MINES IS NOT UP TO EXPECTATIONS

Special to CANADIAN MACHINERY

SYDNEY, N.S., April 1.—Production of coal does not show any improvement, and it is probable that the outputs of the Nova Scotian collieries for the first quarter of 1918 are the lowest in a decade. Unfortunately, also, there are no indications of improvement, and the best that can be hoped for is a maintenance of production at the present level. There are reasons to believe that outputs will still further decline. The production of the Dominion Coal Company for the first quarter is 130.000 tons below that of the corresponding period of last year. The Acadia Coal Company's output has suffered by the idleness of the Allan shaft mine which has not yet recomemnced operations since the explosion there.

Wage questions have been adjusted at the collieries of the Dominion Coal Company, of the Acadia Coal Company, and at the Inverness Co.'s mine. The wage question is still unsettled at the mines of the Nova Scotia Steel & Coal Company, although it is understood the company has offered an increase which will make the wages of its workmen practically the same as those of the workmen of the Dominion Coal Company on the other side of the harbor of Sydney. Although no serious trouble is expected there has been an occasional [illegible] Board of Conciliation will have to be appointed to adjust the trouble.

### Higher Selling Prices

The Fuel Controller has authorized the advance of coal selling prices to several coal companies in Nova Scotia, and other advances are likely to follow. To meet the increased cost of mining occasioned by increased wages and increased prices of materials a very substantial increase in selling prices will be required, possibly an increase to a figure between six and seven dollars per short ton at the pit mouth.

Newspaper reports from Ottawa announce that arrangements have been made between the Dominion Iron & Steel Company and the Federal Government for the erection of a plate mill, but locally nothing is definitely known. If a plate mill is established at Sydney it will necessitate a large expansion in the smelting departments of the Dominion works to provide the additional steel required over and above the ordinary activities of the plant. Public interest is very keen in the possibilities of expansion, and it is generally considered that the government is to be congratulated on its evident determination that Canada shall assist, as the country is very well able to assist, in meeting the shipping emergency. While the location of a plate mill in Sydney does not necessarily signify the commencement of a shipbuilding industry here, it makes the possibility a very real one. It is to be expected that some animated bidding for shipbuilding will from now on take place between those ports in Nova Scotia which are considered to have suitable facilities for the commencement of this most essential industry.

## PUTS SPIKE IN THE YARN ABOUT FAILURE

### U. S. Building Programme Will Float 5,000,000 Tons During the Year

Special to CANADIAN MACHINERY

WASHINGTON, April 1.—All rumors concerning the partial failure of the shipping programme of the United States were spiked this week, when Chairman Edward N. Hurley of the United States Shipping Board made a definite statement of the programme which he expects to conclude.

Summarized, Chairman Hurley's statement is as follows:—Eighty-one new shipyards are now in the course of construction or completed. These will afford 235 new ways for the construction of steel vessels. The programme for steel ships now includes 8.205.708 deadweight tons during the year 1918. This includes more than 2.000,000 tons of requisitioned vessels which were near-

ing completion when the Shipping Board seized them. Of this programme there are now 28 per cent. completed. Eight per cent. were in actual service on March 1. Three hundred and thirty-two ways for wooden vessels are under construction or completed. The programme calls for a construction of 2,300,000 deadweight tons.

### The Five Million Mark

This statement from Chairman Hurley has been received with considerable gratification in Washington. It shows that the actual construction of the Shipping Board will be approximately 5,000,000 tons during the present year. This estimate is the actual work of the Shipping Board and does not include the vessels which were under construction and vessels which have been commandeered and rebuilt.

### Regulate Shipping

Because of the fact that the Shipping Board has requisitioned a large number of vessels operating upon the Great Lakes, steps have been taken by the United States Shipping Board to regulate shipping on the Great Lakes during the coming season. It will be necessary that all possible conservation of shipping space be made in order that there may be no great shortage of Great Lake tonnage. A committee of four has been appointed to control the Great Lakes shipping as far as possible, by agreement with the interested parties. This committee will have a representative of the Shipping Board, a representative of the iron ore trade, a representative of the coal trade, and a representative of the railroads. As far as possible it is hoped that the business formerly carried upon Great Lakes steamers will be diverted to the railroads. Closer co-operation between the railroads and the steamship lines is sought.

The United States Shipping Board has placed contracts for 150 motor-driven ships. After investigation it has been found that ships of this type will give more cargo space, greater efficiency, and will save man power and present a less degree of visibility.

### U.S. and Jap Bargain

An agreement has been reached between the United States and Japan for the transfer of 150,000 tons of Japanese shipping to the United States. The agreement is based upon a promise of two tons of steel plates for one deadweight ton of shipping capacity. The agreement is a temporary one, and it is understood that another agreement will supplant it later. Japan is considered to be the gainer in this agreement as it is estimated that one ton of steel plate will make about three tons of shipping. In the face of a rather stringent steel market in the United States this agreement is looked upon by American industrial men as one which is very apt to cause an even greater steel stricture than there now is. It is the purpose of the government, however, to make up the steel sent to Japan by a greater elimination of the use of steel in non-essential industries.

### A Radical Step

The Fuel Administration has under advisement now a step which will be of the most vital importance to all manufacturers securing their coal supply from the United States—this step is the revocation of all contracts for delivery from producer to consumer. If the step is taken it is expected that it will have the effect of placing the entire coal supply of the United States under the direction of the Fuel Administration. In view of the amicable arrangements last year between the Canadian government and the United States government regarding coal supply it is not expected that the proposed order will work any serious hardship upon manufacturers in Canada.

The Fuel Administration is now carrying on a propaganda during all coal consumers to lay in their supplies for the coming winter at the earliest possible moment. No hope is held out that the shortage of last year can be greatly relieved, at least as far as the transportation problem goes.

The Fuel Administration has issued an order allowing producers to charge twenty per cent. more for cleaned coal.

The production of bituminous coal in the United States fell off 579,000 tons during the week of March 16.

Bids will shortly be asked by the United States Navy upon a considerable quantity of hand and machine tools. Specifications may be secured from the Bureau of Supplies, Navy Department, Washington, by asking for schedules 1741, 1742, 1743, 1744, 1746, 1747, 1750 and 1751.

Present fixed prices on steel, ore, coke and steel products which were subject to revision are to be continued until July 1. A reduction has been ordered of $1 a ton on all scraps, both gross grades and differentials.

Reports of the Interstate Commerce Committee show that during the first month of government control, the month of January, the railroads sustained a loss. The reports show that there was a deficit of $2,227,000 in the operating incomes of 177 out of 196 railroads.

Industry in the United States has been quietened this week by substantial reports that proposed legislation fixing the prices on all staple industrial commodities has been abandoned.

## MILLIONS BEING SPENT IN EQUIPMENT

### American Orders for Fitting up War Shops Coming on Large Scale

Special to CANADIAN MACHINERY

NEW YORK, April 1—Manufacturers of ordnance, shells, shell accessories, airplanes and of other war munitions are actively buying shop equipment in the eastern markets. The War and Navy Departments also have placed orders for machine tools in the last few days. It is estimated that contracts closed have aggregated between $5,000,000 and $6,000,000 and inquiries are now in the market for both large and small tools which call for the expenditure of $10,000,000 or more. The Singer Sewing Machine Co. has purchased $600,000 worth of machine tools which will be installed in its plants where recoil mechanisms for three-inch field pieces

## REVIVAL LIKELY IN MACHINERY TRADE IN CANADA ON CONCLUSION OF THE WAR

OVER fifty years ago Robert Donaldson arrived in Montreal and started in business there. Needless to say he hailed from Scotland. He claims that he has not celebrated his eightieth birthday, and the way in which he still gets around lends quite a bit of force to his claim. He has been in Toronto for a few days visiting relatives, and also looking over a few machines. He is the senior partner in Robert Donaldson and Son of Montreal. Discussing the developments that were taking place in Montreal at present, Mr. Donaldson remarked to CANADIAN MACHINERY that the shipbuilding enterprises were giving a great growth to all lines of industry that could handle any of the many lines required in that business.

"I'd like to go into that strong myself," he said, "but the great thing that prevents rapid and substantial development is the question of help. It's out of the question to get the kind needed for the successful operation of any plant that deals with the shipbuilding lines. The situation has never been worse. We have never trained enough men for particular work. Our people seem to be satisfied to make a living and have a good time. And there it ends.

"I may be wrong, but I look to see a great revival in the machinery trade at the conclusion of the war. I don't see how Germany can start in again and make stuff at the old price. It doesn't seem possible that any country could do this and make any money out of it. And there is where the question of skilled help for Canada is going to come in again. How is this country going to develop foreign or even home markets unless she has the men to make the goods? I don't think the training the men receive who have left other lines and gone into munitions is going to do them much good. I do believe though, that you will see female labor employed to quite a considerable extent after the war. There are a number of simple operations in almost every line that can be done by women.

"There have been remarkable changes in Montreal since I first went there," concluded Mr. Donaldson, "and give us clean government and honest dealing and it would be a great city and a splendid place."

of New York that will make 6-inch

& Sons, Ltd., St. Johns, N.B., who will make 9.2-inch shells for the United

Co., New York City, are asking for bids on several hundred dollars worth of tools to be installed at factories at Buffalo and Tonawanda, N.Y., and at St. Catharines, Ont.

The Cowdrey Machine Works, Pittsburg, Mass., is in the market for shop equipment to make gun mounts. The Leyland-Gifford Co., Worcester, Mass., for

for Liberty motors. The Willys-Overland Co., Toledo, is expected soon to buy $500,000 worth of tools to be used in the manufacture of 8-inch shells. The Savage-Arms Corp., Utica, N.Y., has confirmed the purchase of several hundred tools, including milling, drilling, profiling and screw machines. The Armstrong Cork & Insulation Co., which is making 4.7-inch shells at its Lancaster, Pa., plant, has been purchasing machine tools. The Budd Manufacturing Co., Philadelphia, making aerial bombs, and the S-S-E Co., Kensington, making quadrant sights, have placed supplementary orders for shop equipment.

### Prices are Higher

The heavy demand for machinery and machine tools is again reflected in higher prices. One manufacturer of shapers has advanced prices 20 per cent., and makers of sensitive drills are asking an advance of 10 per cent.

The Ordnance Bureau of the War Department, in anticipation of ordering gun carriages in large numbers to be finished the latter part of this year and throughout 1919 has begun placing large orders for machine tools. The tools will be warehoused to be in readiness for manufacturers who are awarded the carriage contracts. One of the large warehouses now being constructed by the government will be utilized for this purpose. Negotiations for this machinery are now being actively conducted at Washington. The Navy Department is also buying machine tools for stock.

The International Motor Co., Plainfield, New Jersey, has purchased about $50,000 worth of shop equipment in the last week, and the new tools will be utilized in making motor trucks. Fred. T. Ley & Co., New York contractors, are building a munitions plant and are pre- for a large machine shop. Orders for seven hand power cranes have already been awarded. Several steel companies have been buying shop equipment in the last few days, among the purchasers being the American Sheet & Tinplate Co., the Mansfield Co., Sheet & Tinplate Co., the Canton Sheet Steel Co., and the Brier Hill Steel Co.

The Marlin-Rockwell Co., New Haven, manufacturers of machine guns, radiators and bearings, has leased the New York plant of the Murray & Hill Co. with the privilege of purchase; the consideration is reported to be $500,000. Radiators will be manufactured exclusively at the New York plant. The American Condenser & Engineering Co. is buying 75 to 80 tools for a new factory and bids are now being taken on lathes, boring mills, air compressors and motors for operating travelling cranes.

## PIG IRON OUTPUT NEARS NORMAL MARK

### Figures of Pittsburg Blast Furnaces Show an Increased Production

Special to CANADIAN MACHINERY

PITTSBURG, Pa., April 1.—By announcement at Washington late Tuesday night the iron and steel price schedule is carried for another three months, to June 30, the only revision being that basic pig iron is reduced $1 a ton to $32 at furnace, this carrying with it a reduction in Bessemer to $35.20, to maintain Bessemer at 10 per cent. above basic, and all grades of scrap on which prices have heretofore been set are reduced $1 a ton.

The steel manufacturers generally desired the set prices for steel to be continued. There were very few who were disposed to urge any advances and still fewer who thought it at all possible that plates, the only commodity about which there was any real discussion, would actually be advanced. The manufacturers desired that prices be continued to the end of the year, but it seems they later offered to be satisfied with a continuance for six months. They were in a somewhat awkward position in this matter, however, seeing that, to preserve the existing schedule, they had argued that costs had been advancing, and the argument of advancing costs did not altogether harmonize with the plea that prices should be fixed for a long period.

### The Probable Effect

Now that the price matter is settled it remains to be seen whether the new situation will result in either buyers or sellers taking more interest in the market. There was no distinct evidence that buyers were holding off by reason of uncertainty as to prices, and indeed if they had bought they would have been fully protected against a decline by the government clause. As to sellers, now that they are assured they will not be compelled to accept lower prices on second quarter deliveries they may be more ready to sell.

The market is still, up to date, a tight one from the viewpoint of the buyer. It is very difficult for him to place orders. That is probably a reflection more of the shipping situation than it is of the volume of business on the books of the mills. Nominally the mills have a very large volume of business on books, between 12,000,000 and 15,000,000 tons, exclusive of government orders. The question is how much of this is live business, how much of the business the buyers would actually be willing to accept shipments against. As long as it is so difficult to make shipments on account of traffic congestion it is impossible to have this matter tried out, and apparently the mills simply proceed on the assumption that the business is all live, and none needs to be written off. A period of a few weeks of really free shipments might put an entirely different aspect on the matter. The whole question is an involved one, for even the usual distinction cannot be made between contract tonnage that is not specified and contract tonnage that is, for the reason that the mills have a large volume of specifications unfilled that was received months ago, and they do not know that buyers would be willing to receive all this steel according to the specifications. Their requirements might have changed very materially even if they had not decreased as in most cases doubtless they have.

### Pig Iron

There ought to be a freer supply of pig iron by this time, as blast furnace operations have been increasing more or less steadily and are now not far from normal. Production is between 85 and 90 per cent. of capacity, whereas late in January and early in February it was below 60 per cent., if not below 50 per cent. For three successive weeks Connellsville coke shipments have run at about 334,000 net tons a week, against less than 300,000 tons shipped in any preceding week of the year. A fair estimate seems to be that full requirements of the furnaces depending on the Connellsville coke region are about 375,000 tons weekly, but they may possibly be somewhat less. In any event there remains some deficiency in beehive coke, but the by-product coke plants have lately been receiving practically full shipments of coal so that the blast furnaces depending on by-product ovens are practically fully supplied with coke. It is a fact that pig iron is accumulating, but in the case of the merchant furnaces the accumulation is attributed—by the furnaces—to lack of shipping facilities, while in the case of the steel interests it is asserted that any accumulation merely operates to restore in small measure the stocks the steel works normally carry, but which were completely used up last year. It will be strange indeed if pig iron is not easier to buy in the near future.

With the reduction of $1 a ton in basic iron ordered by the government and the attendant reduction in Bessemer to keep it 10 per cent. above basic, the new schedule of prices ruling on all deliveries April 1 and later, except on contracts made prior to January 1 is as follows, f.o.b. furnace irrespective of location: Bessemer, $35.20; basic, $32; No. 2 foundry, $33; malleable, $33.50; gray forge, $32. Leaving malleable at $33.50 can hardly be called anything but an oversight, for it should stand in relation to basic. Most of the malleable sold lately has been, generically, simply off basic.

### Government Buying

Word comes that the government's

(Continued on page 86.)

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago | 37 50 |
| Standard low phos., Philadelphia | |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 32 00 |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | | |
| Victoria | | 50 00 |

## FINISHED IRON AND STEEL

| Per lb. to Large Buyers. | Cents |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 5 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 5 75 |
| Chequered floor plate, 3-16 in. | 12 20 |
| Chequered floor plate, ¼ in. | 12 00 |
| Staybolt iron | 8 50 |
| Bessemer rails, heavy, at mill | |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | *3 50 |
| F.O.B., Toronto Warehouse | |
| Steel bars | 5 50 |
| Small shapes | 5 75 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

## FREIGHT RATES

Pittsburgh to Following Points

| | Per 100 lbs. C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 38.1 | 50.5 |
| Halifax | 39.1 | 51.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

## METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $30 00 | $28 00 |
| Electro copper | 30 00 | 28 50 |
| Castings, copper | 29 00 | 28 00 |
| Tin | 98 00 | 99 00 |
| Spelter | 10 50 | 11 00 |
| Lead | 10 00 | 9 50 |
| Antimony | 17 50 | 17 00 |
| Aluminum | 55 00 | 52 00 |

Prices per 100 lbs.

## PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¼ to ½ | $10 00 | $10 00 |
| Heads | 10 30 | 10 25 |
| Tank plates, 3-16 in. | 10 10 | 10 10 |

## WROUGHT PIPE

Effective Feb. 5, 1918.

| | Black | Galvanized |
|---|---|---|
| **Standard Buttweld** | Per 100 feet | |
| ⅛ in. | $ 6 00 | $ 8 00 |
| ¼ in. | 5 16 | 7 29 |
| ⅜ in. | 5 16 | 7 29 |
| ½ in. | 6 55 | 8 12 |
| ¾ in. | 8 28 | 10 41 |
| 1 in. | 12 24 | 15 39 |
| 1¼ in. | 16 56 | 20 82 |
| 1½ in. | 19 80 | 24 89 |
| 2 in. | 26 64 | 33 49 |
| 2½ in. | 42 72 | 53 53 |
| 3 in. | 55 85 | 70 00 |
| 3½ in. | 70 84 | 87 86 |
| 4 in. | 83 93 | 104 10 |
| **Standard Lapweld** | | |
| 2 in. | $ 29 60 | $ 36 08 |
| 2½ in. | 44 46 | 54 70 |
| 3 in. | 58 14 | 71 53 |
| 3½ in. | 72 68 | 90 62 |
| 4 in. | 86 11 | 107 37 |
| 4½ in. | 97 79 | 122 56 |
| 5 in. | 114 00 | 142 82 |
| 6 in. | 147 80 | 185 28 |
| 7 in. | 192 80 | 241 57 |
| 8 L in. | 202 50 | 253 75 |
| 8 in. | 233 30 | 292 32 |
| 9 in. | 279 50 | 350 18 |
| 10 L in. | 259 20 | 324 80 |
| 10 in. | 333 70 | 418 18 |

Prices—Ontario, Quebec and Maritime Provinces.

## WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%
4½" and larger, 15%.

## OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 22 50 |
| Copper, heavy | 22 50 | 22 50 |
| Copper wire | 22 50 | 22 50 |
| No. 1 machine composition | 22 00 | 21 50 |
| New brass cuttings | 16 00 | 14 00 |
| Red brass turnings | 18 00 | 17 00 |
| Yellow brass turnings | 12 50 | 12 50 |
| Light brass | 10 00 | 9 50 |
| Medium brass | 12 00 | 12 00 |
| Heavy brass | 15 00 | 14 00 |
| Heavy melting steel | 24 00 | 21 00 |
| Steel turnings | 12 00 | 12 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 27 00 | 18 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 23 00 |
| No. 1 machine cast iron | 31 00 | 25 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 20 00 | 13 00 |
| Car wheels, iron | 26 00 | 25 00 |
| Steel axles | 38 00 | 35 00 |
| Mach. shop turn'gs | 9 00 | 8 50 |
| Cast borings | 12 00 | 12 00 |
| Stove plate | 19 00 | 19 00 |
| Scrap zinc | 6 50 | 6 50 |
| Heavy lead | 7 50 | 7 00 |
| Tea lead | 5 00 | 5 75 |
| Aluminum | 21 00 | 20 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent |
|---|---|
| Carriage bolts, ⅜" and less | 10 |
| Carriage bolts, 7-16 and up | net |
| Coach and lag screws | 25 |
| Stove bolts | 55 |
| Plate washers | List plus 20 |
| Elevator bolts | 5 |
| Machine bolts, 7-16 and over | net |
| Machine bolts, ⅜ and less | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | 10 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | add 25 |
| Nuts, square blank | add $1 50 |
| Nuts, square, tapped | add 1 75 |
| Nuts, hex., blank | add 1 75 |
| Nuts, hex., tapped | add 2 00 |
| Copper rivets and burrs, list plus | 30 |
| Burrs only, list plus | 50 |
| Iron rivets and burrs | 25 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 57½ |
| Wood screws, O. & R., brass | 32½ |
| Wood screws, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

## MILLED PRODUCTS

| | Per Cent |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil. Head Cap Screws | net |
| Flat But. Hd. Cap Screws | plus net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. & Semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2 in. | plus 10 |
| Studs | net |
| Taper pins | 40 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | list plus 20 |
| Collar screws | list plus 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | 65 |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add 7 00 |

## BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $47 50 |
| Open-hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.

F.O.B. Pittsburgh.

## NAILS AND SPIKES

| | | |
|---|---|---|
| Wire nails | $5 25 | $5 20 |
| Cut nails | 5 70 | 5 65 |
| Miscellaneous wire nails | 60% | |
| Spikes, ⅜ in. and larger | $7 50 | |
| Spikes, ¼ and 5-16 in. | 8 00 | |

## ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 41 |
| Plumbers' oakum, per lb. | 0 09 |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila rope | 0 33 |
| New Zealand hemp | 0 33 |
| Transmission rope, Manila | 0 45 |
| Cotton rope, ¼-in. and up | 0 47 |

## POLISHED DRILL ROD

Discount off list, Montreal and Toronto net

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | 0 45 |
| Solder, guaranteed | 0 50 |
| Babbitt metals | 18 to 70 |
| Soldering coppers, lb. | 0 53 |
| Lead wool, per lb. | 0 16 |
| Putty, 100 lb. drums | 4 75 |
| White lead, pure, cwt. | 16 05 |
| Red dry lead, 100 lb. kegs, per cwt. | 15 50 |
| Glue, English | 0 35 |
| Tarred slater's paper, roll | 0 95 |
| Gasoline, per gal., bulk | 0 31½ |
| Benzine, per gal., bulk | 0 30½ |
| Pure turpentine, single bbls., gal. | 0 71 |
| Linseed oil, raw, single bbls. | 1 95 |
| Linseed oil, boiled, single bbls. | 1 98 |
| Plaster of Paris, per bbl. | 2 50 |
| Sandpaper, B. & A. | list plus 20 |
| Emery cloth | list plus 20 |
| Sal Soda | 0 03½ |
| Sulphur, rolls | 0 05 |
| Sulphur, commercial | 0 04½ |
| Rosin "D," per lb. | 0 03 |
| Rosin "G," per lb. | 0 03½ |
| Borax crystal and granular | 0 12 |
| Wood alcohol, per gallon | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

### CARBON DRILLS AND REAMERS

| | Per Cent. |
|---|---|
| S.S. drills, wire sizes up to 52 | 40 |
| S.S. drills, wire sizes, No. 53 to 80 | 40 |
| Standard drills to 1½ in. | 40 |
| Standard drills, over 1½ in. | 40 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 |
| Bit stock | 40 |
| Ratchet drills | 15 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 40 |
| Sleeves | 40 |
| Taper pin reamers | net |
| Drills and countersinks | list plus 40 |
| Bridge reamers | 50 |
| Centre reamers | 10 |
| Chucking reamers | net |
| Hand reamers | 10 |

### COLD ROLLED SHAFTING

| | |
|---|---|
| At mill | list plus 40% |
| At warehouse | list plus 50% |

**Discounts off new list. Warehouse price at Montreal and Toronto**

### IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 8 00 | $ 8 25 |
| Sheets, black, No. 10 | 10 00 | 10 00 |
| Canada plates, dull, 52 sheets | 9 00 | 9 00 |
| Can. plates, all bright | 9 50 | 9 50 |
| Apollo brand, 10¾ oz. galvanized | ..... | ..... |
| Queen's Head, 28 B.W.G. | ..... | ..... |
| Fleur-de-Lis, 28 B.W.G. | ..... | ..... |
| Gorbal's Best, No. 28 | ..... | ..... |
| Colborne Crown, No. 28 | ..... | ..... |
| Premier, No. 28 U.S. | ..... | 8 95 |
| Premier, 10¾ oz. | ..... | 9 25 |
| Zinc sheets | 20 00 | 20 00 |

### PROOF COIL CHAIN

B

¼ in., $12.35; 5-16 in., $11.85; ⅜ in., $11.50; 7-16 in., $10.90; ½ in., $11.20; 9-16 in., $11.20; ⅝ in., $11.10; ¾ in., $11.00; ⅞ in., $10.90; 1 inch, $10.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $15.50; 3-16 in., $11.70; ¼ in., $8.40; 5-16 in., $7.40; ⅜ in., $6.35; 7-16 in., $6.35; ½ in., $6.35; ⅝ in., $6.35; ¾ in., $6.35.

**Prices per 100 lbs.**

### FILES AND RASPS.

| | Per cent |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 40 |
| Black Diamond | 40 |
| J. Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 37½ |
| Disston | 50 |
| Whitman & Barnes | 50 |

### BOILER TUBES.

| Size | Seamless | Lapwelded |
|---|---|---|
| 1 in. | $36 00 | $..... |
| 1¼ in. | 40 00 | ..... |
| 1½ in. | 43 00 | 36 00 |
| 1¾ in. | 43 00 | 36 00 |
| 2 in. | 50 00 | 36 00 |
| 2¼ in. | 53 00 | 38 00 |
| 2½ in. | 55 00 | 42 00 |
| 3 in. | 64 00 | 50 00 |
| 3¼ in. | ..... | 58 00 |
| 3½ in. | 77 00 | 60 00 |
| 4 in. | 90 00 | 75 00 |

Prices per 100 ft., Montreal and Toronto.

### OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | |
| Royalite, per gal., bulk | 18 |
| Palacine | 21 |
| Machine oil, per gal. | 26½ |
| Black oil, per gal. | 15 |
| Cylinder oil, Capital | 45½ |
| Cylinder oil, Acme | 36½ |
| Standard cutting compound, per lb. | 0 06 |
| Lard oil, per gal. | $2 50 |
| Union thread cutting oil antiseptic | 88 |
| Acme cutting oil, antiseptic | 37½ |
| Imperial quenching oil | 39½ |
| Petroleum fuel oil | 13½ |

### BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30-5% |
| Standard | 40% |
| Cut leather lacing, No. 1 | 1 95 |
| Leather in sides | 1 75 |

### TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 06 |
| Emery glue | 15 to 20 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 35 |

**Prices Per Lb.**

### BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 38 |
| Brass sheets, 24 gauge and heavier, base | 0 43 |
| Brass tubing, seamless | 0 46 |
| Copper tubing, seamless | 0 48 |

### WASTE.

| White. | | Cts. per lb. | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 18½ |
| Peerless | 21 | X Empire | 17¼ |
| Grand | 19¾ | Ideal | 17¼ |
| Superior | 19¾ | X press | 16 |
| X L C R | 18½ | | |

**Colored.**

| | | | |
|---|---|---|---|
| Lion | 15 | Popular | 12 |
| Standard | 13½ | Keen | 10½ |
| No. 1 | 13½ | | |

**Wool Packing.**

| | | | |
|---|---|---|---|
| Arrow | 25 | Anvil | 15 |
| Axle | 20 | Anchor | 11 |

**Washed Wipers.**

| | | | |
|---|---|---|---|
| Select White | 11 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING.

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

### ANODES.

| | |
|---|---|
| Nickel | .50 to .54 |
| Cobalt | 1.75 to 2.00 |
| Copper | .44 to .46 |
| Tin | .49 to .56 |
| Zinc | .23 to .25 |

**Prices Per Lb.**

### COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | 42 50 | 43 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 46 00 | 44 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 48 00 | 48 00 |
| Copper sheet, planished, 16 oz. base | 57 00 | 45 00 |
| Braziers,' in sheets, 6x4 base | 45 00 | 44 00 |

### LEAD SHEETS.

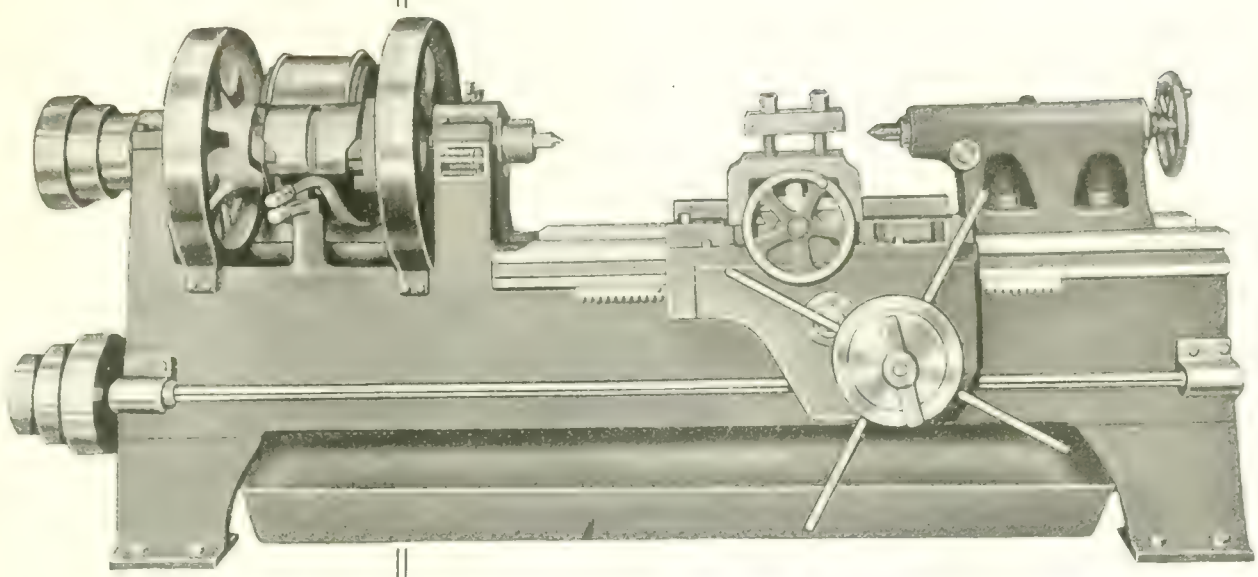
| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $13 25 | $13 25 |
| Sheets, 3½ lbs. sq. ft. | 13 25 | 13 25 |
| Sheets, 4 to 6 lbs. sq. ft. | 12 50 | 12 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS.

| | |
|---|---|
| Acid, boracic | $ .15 |
| Acid, hydrochloric | .05 |
| Acid, hydrofluoric | .14½ |
| Acid, nitric | .10 |
| Acid, sulphuric | .05 |
| Ammonia, aqua | .08 |
| Ammonium carbonate | .15 |
| Ammonium, chloride | .11 |
| Ammonium hydrosulphuret | .40 |
| Ammonium sulphate | .07 |
| Arsenic, white | .12 |
| Copper, carbonate, anhy | .35 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .70 |
| Iron perchloride | .20 |
| Lead acetate | .16 |
| Nickel ammonium sulphate | .12 |
| Nickel carbonate | .35 |
| Nickel sulphate | .15 |
| Potassium carbonate | .75 |
| Potassium sulphide (substitute) | .20 |
| Silver chloride (per oz.) | .65 |
| Silver nitrate (per oz.) | .55 |
| Sodium bisulphite | .10 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .41 |
| Sodium hydrate | .04 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | .14 |
| Tin chloride | .60 |
| Zinc chloride | .60 |
| Zinc sulphate | .09 |

**Prices per lb. unless otherwise stated.**



# Here are the Specifications

## (TURRET LATHE)

| | |
|---|---|
| Swings over bed | 20" |
| Bed length | 9' 4" |
| width | 18" |
| Front bearing length | 8½" |
| diameter | 10" |
| Drive pulley width | 8" |
| diameter | 19" |
| Feeds | 1/16, 5/64, 3/32 |
| Turret, diameter | 18" |
| Height floor to centre | 40" |
| Weight | 7800 lbs. |

**Built both as Turning and Boring Lathe**

## Special Features:

Headstock integral with bed.

Broad flat ways

Long carriage

Large turret

Unbreakable apron

# THE "MONTREAL" LATHE

Designed and built specially to stand continuous operation and the abusive treatment given in boring and turning shells.

The success with which it has met this condition in shell plants throughout Canada fully justifies us in asserting that it is

## The Lathe with a Big Reputation

**Its production capabilities will astonish you.**

***Early Delivery—Write for Prices.***

**The A. R. Williams Machinery Co.**
Limited

64 WEST FRONT ST. TORONTO, CAN.

# INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

## ENGINEERING

East Broughton, Que.—The Quebec Asbestos Co. propose to expend about $30,000 for power plant and development, etc.

**Toronto, Ont.**—Canadian Allis-Chalmers, Ltd., will erect a $6,000 steel and galvanized iron addition to smith shop at Lansdowne Ave.

**Bridgewater, N.S.**—The Davison Lumber Co. contemplate the erection of a sulphite pulp mill, planing mill and box factory. Acting manager, A. F. Pamenter.

**New Westminster, B.C.**—It is reported here that the C. N. R. shops at Port Mann will be in operation soon, also that a wing dam on the north jetty will be constructed.

**Cobalt, Ont.**—The Spruce Falls Pulp and Paper Co. propose to erect a pulp mill at once to cost $1,000,000. Elihu Stewart, managing director, Canada Timber and Lands, Ltd., Toronto, Ont.

**Huntsville, Ont.**—The Bethune Pulp and Lumber Co. will erect a saw mill with a cutting capacity of 40,000 feet per diem on Vernon Lake. A rossing plant also will be installed. Chas. Dinsmore, manager; head office, Toronto.

**Moncton, N.B.** — Company is being formed at present but it is contemplated to commence construction of development otthe Tungsten Mine at Burnt Hill, N.B., about May 1. Concentrating mill, etc., to cost about $150,000. Address Mr. Matthew Lodge, 274 Union St., Moncton.

**Niagara Falls, Ont.**—A deposit of coal has been found by the engineers of the Hydro constructing the Chippewa-Queenston Hydro Power Canal. Excavations of 170 feet are necessary to construct the canal, and on Saturday the coal deposit was struck at a depth of about 150 feet, near the Whirlpool. The coal is of rough variety, being what is known as rock coal, but it is burnable, and if there are any quantities of it there this may prove a rich find for the Hydro and the province generally.

**Montreal, Que.**—W. C. Hawkins, president of the Southern Canada Power Co. was in the city recently in conference with the other officials and engineers of the company in connection with the completion of the plans for the company's hydro-electric development at Drummondville, Que. This development will have an ultimate capacity of 17,000 to 20,000 h.p., but the electrical equipment to be installed now will be about 10,000 h.p., the remaining equipment to be installed as the demand warrants. The installation will be completed within a year or 15 months.

## GENERAL

**London, Ont.**—The London & Petrolea Barrel Co. contemplate building an addition to their factory.

**Nelson, B.C.**—A company has recently been formed for the purpose of building a cordage factory near the Pacific Coast. About $250,000 is to be spent on the plant, and it will probably be located at Nelson.

**Rawdon, Que.**—The Miner Lumber Co. lost its big mills here last Sunday by fire, that did $50,000 damage. The head office of the company is in Montreal. Thousands of feet of lumber were destroyed also.

**Alliston, Ont.**—D. M. Gilpin and Roy Wakefield, vice-president and secretary respectively of the Veterinary Specialty Co., spent a couple of days of last week in town. It is understood that the company proposes establishing a factory here.

**Toronto, Ont.**—The Jefferson Glass Factory at 388 Carlaw Avenue was totally destroyed by fire early on Monday morning. The loss is estimated by General Manager W. A. Martin at $30,000, divided about equally between the contents and the building. The building was owned by the company and the loss is covered by insurance.

## BUILDING

**Toronto, Ont.**—City Architect Pearse has issued a permit to the Imperial Oil Co. to erect a bulk storage station for petroleum products on the south side of Keating street, at a cost of $104,200.

**Toronto, Ont.**—The City Architect issued a building permit to the Imperial Munitions Board for the erection of a stores depot on the west side of Weston Road, near St. Clair Avenue, at an estimated cost of $125,000. The Royal Flying Corps, it is understood, require the building.

## MUNICIPAL

**Woodstock, Ont.**—Council are in the market for prices on 500 feet of fire hose at once.

**Alliston, Ont.**—The Town Council have decided to install a triplex plunger pump at the waterworks plant.

**Brantford, Ont.**—A fixed assessment of $100,000 per year for a ten-year term has been granted the Dominion Steel Products.

**Summerland, B.C.**—The City Council have decided to purchase a 6-inch centrifugal pump for the Trout Creek Point pumping station.

**Strathroy, Ont.**—By-law has been passed appropriating $5,000 for the purchase of a motor-driven turbine pump to be installed in waterworks system for fire protection.

**Mimico, Ont.**—The council is considering the purchase of fire apparatus, and an American company will be given an opportunity to demonstrate their equipin the near future.

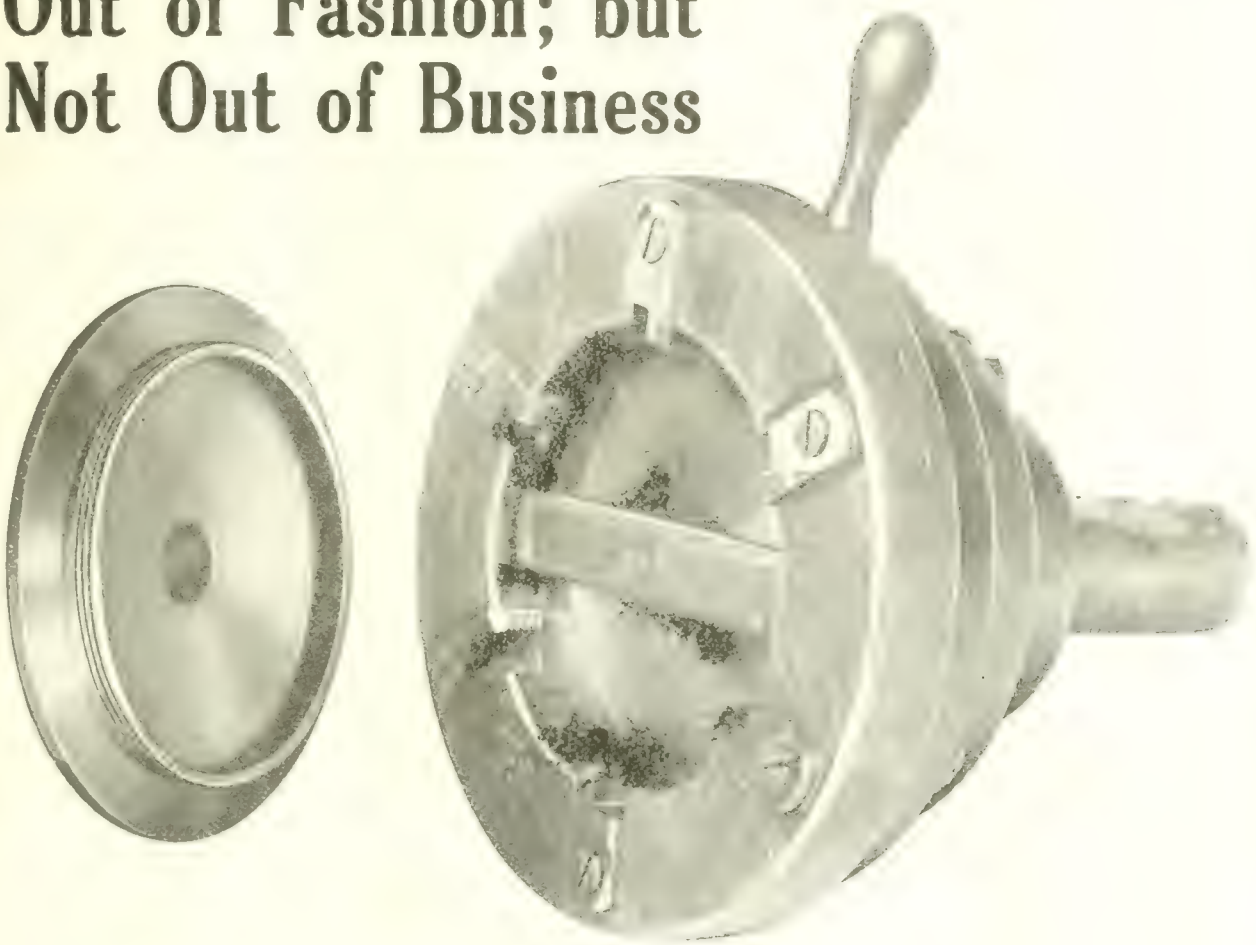
**Brantford, Ont.**—The depleting of the Onondaga gas field to the south of Brantford is shown by the announcement that the Standard Gas Co., which had a charter for operating in this field, will apply on April 15 to have its charter cancelled. The playing out of this field cut off the supply of pure gas to this city.

**Chatham, Ont.**—Use of chemicals in increased quantities in the treatment of the civic water supply is recommended in a letter received by the water board from Engineer Willis Chipman, of Toronto, following an investigation made into local conditions recently. It is stated that the quantity of sulphate of alumina could safely be doubled and an increase of 25 per cent. made in hypochlorite. Tests of the city water show that it contains bacteria of intestinal origin.

**Toronto, Ont.**—Reclamation work involving an expenditure of $1,732,000 according to the gross estimates which have been approved for the year will be undertaken by the Board of Harbor Commissioners of Toronto this summer. So far as is known at present no work will be done over at the Island, and the entire activities this summer will be in reclamation work in the industrial area east of Cherry street and along the water front from Bathurst street east, according to the officials of the commission. The commission is at present engaged in rebuilding the passenger sheds of the Toronto Ferry Co., which were burned this winter.

**Windsor, Ont.**—Ratepayers of Windsor Walkerville, Ford, Sandwich and Ojibway have decided by an overwhelming vote in favor of the proposed new trunk sewer connecting the municipalities, thus doing away with water pollution. The vote stood 1,332 for and 183 against, and provides for an expenditure by the municipalities of $210,300 for the construction of an intercepting sewer which will carry out all sewage below the waterworks intakes. Of the total amount Windsor's proportion of the cost will be $26,200; Sandwich West, $28,333.33; Sandwich Town, $25,333.34; Ford, $65,300, and Ojibway, $46,533.44. The sewer will be in two sections, the easterly portion extending from the town of Ford to Parent Avenue, in Windsor, emptying below the Windsor waterworks intake. The other section will serve Ojibway, Sandwich and Sandwich West.

# Out of Fashion; but Not Out of Business



This old "war horse" of a Geometric Die Head has been cutting Screw Threads for a Chicago concern for seventeen years. It was recently sent back to the Geometric Factory for overhauling, and has gone again to Chicago, for possibly seventeen years more of duty.

A Geometric Collapsing Tap, purchased by the same people seventeen years ago, is still cutting the inside threads to match. Can you match that?

Geometric Thread Cutting Tools of to-day can surpass it. What thread cutting method are you using? Learn the Geometric way. It is a path others have trod for the past twenty-five years. Geometric experience has smoothed the path of thread cutting for many. What will you let it do for you?

*We could help you—let us.*

## THE GEOMETRIC TOOL COMPANY

NEW HAVEN, CONNECTICUT, U.S.A.

*Canadian Agents:* WILLIAMS & WILSON, LIMITED, MONTREAL. THE A. R. WILLIAMS MACHINERY COMPANY, LIMITED, TORONTO, WINNIPEG AND ST. JOHN, N.B.

# TRADE GOSSIP

McKinnon, Holmes & Co., of Sherbrooke, Que., have opened a sales office at 304 New Birks Building, Montreal, Que. W. J. Lockhead is in charge.

**St. John's, Nfld.**—The steamer Erik has arrived here with twenty-four thousand seals. An agreement will be probably made between the crews and owners of all the sealing steamers for the purchase of seals at $12 per hundredweight for young and $9 for old seals.

**The Canadian Car & Foundry, Co.,** Montreal, has bought out the interests of the Standard Steel Co. in Montreal. The plant of the latter has been in operation on munitions steel for the past two years, and under the new management will continue on this class of work for the Imperial Munitions Board.

**Order for Canadian Locomotive Co.**—The Canadian Locomotive Co., Kingston, has received a contract for 70 locomotives from the Dominion Government for the government railways. The approximate cost of each locomotive is $60,000, which makes the contract worth about $4,200,000.

**Montreal Locomotive Gets Large Order.**—The Montreal Locomotive Works, the Canadian branch of the American Locomotive Co., has received an order for 80 locomotives from the Canadian Government Railways. The locomotives will have an approximate value of $60,000, so that the total order will aggregate some $4,800,000.

**Big Steel Plant at Sydney, N.S.**—The Dominion Government has made arrangements with the Dominion Steel Corporation for the installation of a plate mill at Sydney, N.S. The mill will cost between $3,000,000 and $5,000,000, and will be capable of producing 150,000 tons of ship plates annually. It is hoped to have the mill in operation by the autumn of 1919.

**The Holmes Electric Protection Co.** is installing its system consisting of Combination Fire Alarm and Watchman's Signal Boxes in the warehouse and storerooms of the Toronto Hydro-Electric System, 27-29-31 St. Patrick Street. Fire Alarm Boxes have also been installed at the plants of Woods Mfg. Co., Logan Avenue, and Phillips Mfg Co., Carlaw Avenue, Toronto.

**Drop in Rubber Shipments.**—Shipments of crude rubber from Para and Manaos, Brazil, in December fell heavily from the total for the corresponding month a year previously. The total for these two ports, the only South American ports shipping in December, was 3,129,438 pounds, against 9,224,671 pounds for the same month in 1916. There were no shipments to Europe last December.

**Cast Iron Pipe Wanted.**—A London, England, dealer in iron and steel products and cast iron pipes of all kinds asks to be put into touch immediately with Canadian manufacturers of cast iron rainwater and soil pipes. For specifications and illustrations see pages 484-485 of March 25 issue of the "Weekly Bulletin," published by the Department of Trade and Commerce, Ottawa.

**Welland Canal May Open Early.**—Because the ice is moving so satisfactorily it is expected that navigation through the Welland Canal will be opened earlier than usual this year, and this is the desire of the Government. Lock tenders all along the canal have been instructed to be ready to go on duty soon. The ice has left the canal, and it is hoped that conditions at Port Colbourne harbor will allow an early start. The opening is April 15. A large number of boats taken over by the Government for Atlantic service to carry supplies to the allied armies, it is understood, are waiting to be rushed through.

**Tender for Power Plant Equipment.**—Tenders for the following equipment for the Water Supply Department, Queensland, Australia, will be received until July 15, 1918:—1. Supply, delivery and erection of complete boiler-house equipment for an electric power-house in connection with the Inkerman irrigation area, near Townsville, North Queensland. 2. Supply, delivery and erection of steam-driven turbo-alternators to be installed for the Inkerman irrigation area, near Townsville, North Queensland. Tenders to be addressed to the Under Secretary, the Treasury, Brisbane, Queensland.

**Will Not Take Lake Steamers.**—It is announced that the five steamers of the Great Lakes Transit Co. will not be taken from the lakes by the U.S. Shipping Board. The steamers are the Milwaukee, Chicago, Utica, Cook and Underwood. When it was first learned that the Shipping Board was making inquiries relative to commandeering these five ships several big shippers and other business interests along the Great Lakes called the attention of the Government officials to the great need for the boats on the lakes, and declared that lake shipping would suffer materially if the boats were taken out of service on the fresh water bodies.

**Launching in U.S. in March.**—A despatch from Washington, states that the United States Shipping Board exceeded its launching programme in March by 52,000 tons, but fell behind in its schedule of completed ships, owing to difficulty in obtaining steel plates. Figures given out at the Board's office Saturday showed that 36 ships of 272,786 tons were launched and 20 of 162,200 tons were completed and delivered. At the beginning of the month it was announced that it was hoped to launch 35 ships of 220,591 tons during March and to deliver 23 ships of 188,275 tons.

**Cannot Locate Henry Cort Wreck.**—Efforth to locate the sunken wreck of the whaleback steamer Henry Cort have been unsuccessful. The Cort sank Dec. 12, after being rammed by the Midvale while working as an ice-breaker to help the lake fleet down the lakes. The Lake Carriers' Association desires to mark the wreck for the protection of other vessels. President William Livingstone has announced that $250 will be paid for information by which the wreck is found. Ice during the winter carried away the whaleback's stack and upper works. She sank between five and six miles below Bar Point light.

**Navigation Examinations Held at Kingston.**—The examinations at the School of Navigation in connection with Queen's University were held under Capt. H. King, Toronto supervising examiner for inland waters. The following candidates were successful:—Matthew Augustus McDonald, miner tub-boat master and miner passenger steamer mate; William Vincent Smith, Kingston, freight steamer mate; Jos. Menard, Kingston, passenger steamer master. Capt. H. M. McMaster, of the Montreal Transportation Co., is in charge of the school, carrying on good work for the Marine Service, and is on a most successful basis.

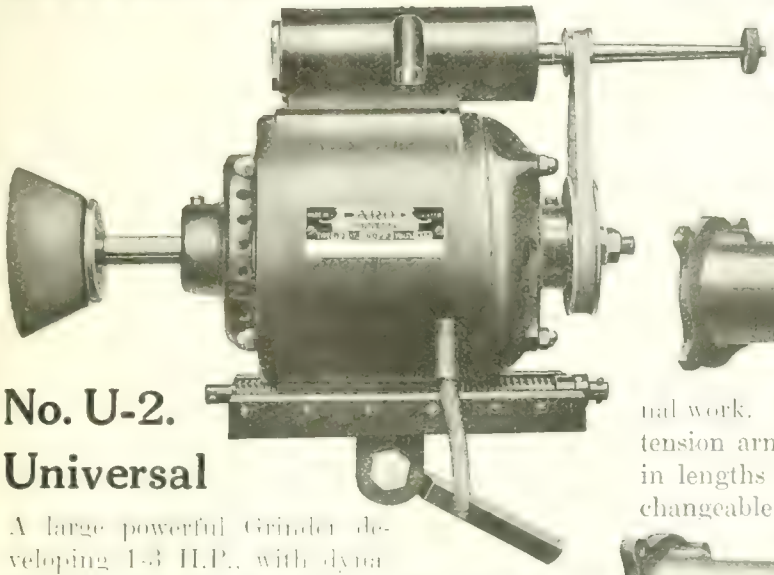
**Algoma Steel Corporation Developments.**—The Algoma Steel Corporation has just installed its fourth blast furnace with a capacity of 500 tons of pig iron per day, according to information obtained from an official of the company. The company's output of steel ingots per month ranges from 43,000 to 45,000 tons, and when the coke ovens, which are at present under construction and are expected to be completed some time in June, are in commission the monthly output is expected to rise to 50,000 tons. Business is confined solely to shell steel, and orders on the books are sufficient to keep the company busy for a long time to come.

**Nova Scotia Steel Fills Vacancy on Board.**—At the annual meeting of shareholders of the Nova Scotia Steel & Coal Co. at New Glasgow, N.S., the number of the board was increased to sixteen, and there was one vacancy to fill, through the death of Hon. Jas. D. MacGregor, vice-president and charter member of the directorate. That vacancy was filled by the appointment of Hon. Robert M. MacGregor, only son of the deceased, while the two newly-created positions were filled by the appointment of D. C. Jackling, New York, and W. Hinkley Smith, Philadelphia. All the old members were re-elected with the exception of A. S. Rendall, of St. John's, Nfld.

**New Statistics Bureau at Ottawa.**—Hon. C. J. Doherty has given notice of a resolution providing for the creation by the Minister of Trade and Commerce of a Dominion Bureau of Statistics to be called the Dominion Bureau of Statistics, to collect and compile all statistical information relative to the commercial, social, economic and general activities and conditions of the people of Canada. Provision is also made for the appointment of an officer to be called the Dominion Statistician to have control over the new bureau, which will collaborate with all Government departments in the compilation and publication of statistical records of administration and at intervals take the census of Canada.

**Prices Maintained on Steel Products.**—Prices on ore, coke, steel, and steel products recommended previously by the Price Fixing Committee of the War Industries Board, Washington, subject to revision on April 1, were ordered by President Wilson to-day to be continued in effect until July 1. From April 1 to

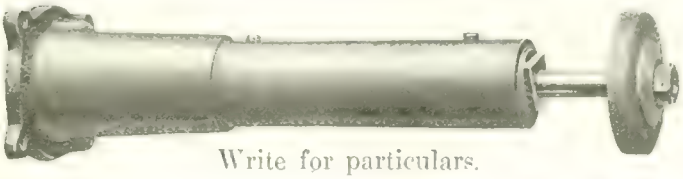
# Aikenhead's Portable Electric "Aro" Grinders



As seen in cut fitted with "A" Arm for small internal work. For large internal grinding we supply extension arms which attach direct to armature shaft, in lengths 5", 10", 15" and 20" long. All are interchangeable.

**No. U-2. Universal**

A large powerful Grinder developing 1-3 H.P., with dynamically balanced armature. This insures smooth running and accurate work. The Armature speed is 10,000 R.P.M. "A" Arm speed 30,000 R.P.M.



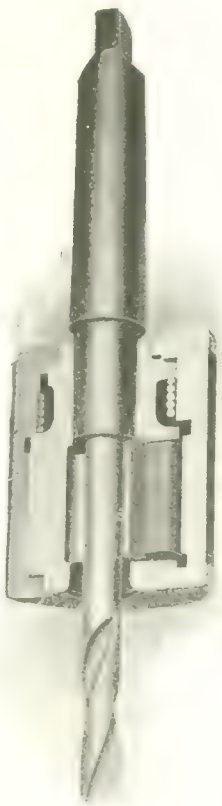
Write for particulars.

**Aikenhead Hardware Limited,**

17, 19, 21 Temperance Street
TORONTO, CANADA

# One Man

on piece work left a certain plant to do similar work in another, which paid slightly more per piece. We can't say how much money he lost through the change, because we do not know how long it took him to persuade the superintendent to order one



Aikenhead's

## Wahlstrom Automatic Chuck

But we know that shortly after the first order for one *a second order for 11 Wahlstrom Chucks was placed.*

The Wahlstrom enables operators to make tool changes in less than two seconds without stopping spindle of machines. It perfectly self-centers the tool automatically. It is a production-booster, a time-saver, a money-maker.

*Write quickly for Wahlstrom Booklet. It will be sent you.*

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17, 19, 21 Temperance Street - Toronto, Canada

[illegible] the maximum price of [illegible] was ordered reduced from [illegible] per gross ton, and of scrap steel from $30 to $29 per gross ton. It is provided that new contracts calling for delivery of these products on or after July 1 are not to specify a price except with the understanding that it is subject to revision by any authorized Government agency. The announcement was made after approval by the President of a recommendation made to him by the Price Fixing Committee, and all manufacturers and producers are expected to observe the maximum prices.

**Lyall Construction Co. Gets American Contract.**—It is reported that the Lyall Construction Co. of Montreal is installing new machinery for the purpose of manufacturing a new size or type of shell. It is learned that the rumor is based on the arrangement being made by the company to turn out for the American Government the 4.7-inch shell, this being a new size, so far as Canadian plants are concerned. The machinery has now all been installed and the manufacture of the shells is beginning. This size takes the place in many respects of the 4.5-inch shell which the company was manufacturing for the British Government. It is understood that no great difficulty was experienced in securing the machinery in Canada. This American contract will take about six months to fill. The company is still working on 6-inch shells for the British Government, and the orders on hand are of sufficient magnitude to keep the plant operating for some months to come. The output of the factory is being well maintained and the statement is made that shipments are larger than ever.

## TENDERS

**Halifax, N.S.**—Tenders are being received by the City Council, until April 18 for the supply of 2,000 feet of 2½-inch fire hose, with couplings.

**Toronto, Ont.**—Tenders are being received until April 16th for construction and delivery of air chambers and cast iron special castings, feed water heater for main and high-level pumping stations for the Board of Control. Specifications, etc., at waterworks department.

**Toronto, Ont.**—Tenders will be received by the chairman, Board of Control, City Hall, up to Tuesday, April 23, 1918, for supply and delivery of special track work for Bloor Street viaduct. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

**Ottawa, Ont.**—Tenders for tungsten lamps, Departmental Buildings, Ottawa, Ont., will be received until Monday, April 15, 1918. Specifications and forms of tender can be obtained at the offices of the Chief Architect, Department of Public Works, Ottawa; the Clerk of Works, Postal Station "F," Toronto, and the Overseer of Dominion Buildings, Central Post Office, Montreal.

**Ottawa, Ont.**—Tenders will be received until April 11, 1918, for the electric wire and cable required in the reconstruction of the Parliament Buildings. Deliveries to commence by July 1, 1918, and to continue as directed in such quantities as to ensure complete delivery by August 31, 1918. The schedule of materials, specification and other information required can be obtained at the office of P. Lyall & Sons Construction Co., Ottawa.

**Ottawa, Ont.**—Tenders are being received by the secretary, R. C. Desrochers, Ottawa, until 4 p.m., April 15, for 12 knots of single conductor telegraph cable. Delivery Halifax, N.S., within eight weeks after order. Also for five knots on several reels for Vancouver, B.C. Earliest date of delivery. Specifications, etc., with the General Superintendent, Telephone Service, Ottawa.

**Melbourne, Australia.**—Tenders for the following may be addressed to the Director of Navy Contracts, Navy Office, Melbourne: Supply, delivery and erection at Garden Island of one 200 horse-power prime mover set of either semi-Diesel type or other heavy oil engine direct coupled to 2-65 K.W. 240 volt D.C. electric generating set. All accessories, tank and fittings to be supplied by tenders as per specification. Date of closing, June 7, 1918. Tender forms are open for inspection at the Department of Trade and Commerce, Ottawa. File No. 20,117.

**Ottawa, Ont.**—Tenders will be received until April 11, 1918, for the supply of reinforcing steel required in the reconstruction of the Parliament Buildings. All tenders shall be based on the supplying and delivering to the site of the central heating plant at Cliff Street of the quantities of the schedule of material for reinforcing steel (140 tons, more or less) in strict conformity with the specification and the samples submitted, and to the satisfaction of the architect. The schedule of materials, specifications, and any other information required can be obtained at the office of the general contractor, P. Lyall & Sons Construction Co., Ottawa.

**Ottawa, Ont.**—Tenders will be received until April 11, 1918, for the switchboards, panel boards and transformers required in the construction of the Parliament Buildings. All tenders to be based on the execution, completion, and delivery on the site, together with the furnishing of all material, tools, appliances, labor, etc., for the work as required and described by the plans and specifications for switchboards, panel boards and transformers. Plans and specifications and any other information required can be obtained at the office of the general contractor, P. Lyall & Sons Construction Co., Ottawa.

**Ottawa, Ont.**—Tenders will be received until April 11, 1918, for the steam boiler and stoker equipment required for the central heating plant of the Parliament Buildings. All tenders shall be based on the supplying and erecting of four water tube boilers, each having a rated capacity of 500 horse-power, together with fittings and soot blowers. Each tender shall give separate quotations for supplying and erecting in connection with these boilers four automatic stokers. Prices are to be based on the complete erection ready for operation of this equipment by October 1, 1918. Plans, specifications and any other information required can be obtained at the office of the general contractor, P. Lyall & Sons Construction Co., Ottawa.

**Ottawa, Ont.**—Tenders will be received by Alexander Johnston, Deputy Minister of Marine, until April 8, 1918, for the purchase of the steel twin screw suction and hopper dredge Galveston, now lying at Sorel, P.Q. Persons desiring to inspect the dredge should apply to the superintendent of the shipyard at Sorel. Length, 233 ft. x 39 ft. x 15-6 depth of hold; gross tonnage, 1,332; net tonnage, 838; draft loaded, 14 ft. 9 in. aft and 13 ft. 1 in. forward; dead weight, 1,800 tons; two suction pumps, Dutch type; working capacity, 1,350 cu. yds. in 45 minutes; hopper capacity, 1,500 cu. yds.; engines, 15 x 24 x 39 x 34-inch stroke; propellers solid, 4-bladed, 8 ft. 4 in. dia. x 10 ft. pitch; two Scotch boilers, 13 ft. 9 in. dia. x 11 ft. long x 180 lbs. W. pressure. Built in Germany in 1904. The dredge will be sold as it now stands, and no additional equipment or apparel will be supplied by the department.

**Toronto, Ont.**—Tenders will be received up to Tuesday, April 6, 1918, for supply and delivery of: No. 34 (Recall)—One 5-million Imperial gallon centrifugal pump, at the Riverdale Pumping Station. No. 37—Coal crusher. No. 38—Basic sulphate of alumina. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

**Ottawa, Ont.**—Tenders will be received until April 15, 1918, for 12 knots of single conductor submarine telegraph cable (107 lbs. copper and 150 lbs. guttapercha per knot) with sheathing of 12 No. 8 S.W.G. iron wires, to be delivered at Halifax, N.S., within eight weeks after order if one is given. Also for five knots same as above on several reels for distribution to be delivered at Vancouver, B.C. Earliest date of delivery desirable. Specification and forms of tender can be obtained on application to the General Superintendent of the Government Telegraph Service, at the Department of Public Works, Ottawa.

## PERSONAL

**W. W. Butler,** vice-president and managing director of the Canadian Car & Foundry Co., left last week for New York and Washington, en route for the southern states. Mr. Butler is convalescing from a recent illness, and has been advised to spend some time in the south.

**Lt.-Col. C. N. Monsarrat,** chief engineer of the Quebec Bridge, has been retained by the Dominion Government to assist the Minister of Railways and Canals in certain work in connection with the completion of the Quebec Bridge. Col. Monsarrat will have his headquarters in Ottawa and the work will occupy him for about twelve months.

**Frederick Field,** engineer superinten-

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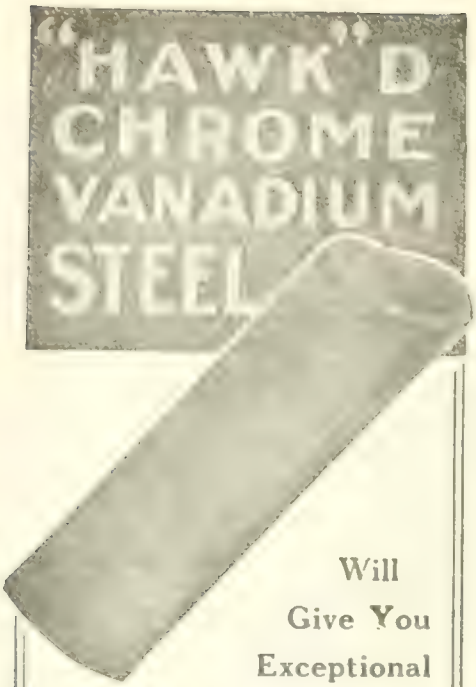


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Made to
Order


dent of the city filtration plant, has written to the Montreal Board of Control asking for indefinite leave of absence so that his services may be available for the United States Government. In his letter he says that he has received a request from the chief engineer of the Housing Department of the U.S. Shipping Board to accept a position in Washington.

## MARINE

**Port Stanley, Ont.**—The public works estimates include $77,000 for harbor improvements here.

**Port Arthur, Ont.**—Shipping men look for the opening of navigation between April 18 and 25.

**Sarnia, Ont.**—Millions of tons of lake ice is floating into the St. Clair River from Lake Huron. Southerly winds prevail, and the ice is drifting northward on the lake.

**Vancouver, B.C.**—The British-American Shipbuilding Co. propose to establish a shipbuilding plant here and have reached an agreement with the Harbor Board in regard to a site on the Kitsilano Indian Reserve.

**Vancouver, B.C.**—The Standard Shipbuilding Co., which has recently received a contract for the construction of ten steamers for the Imperial Munitions Board, will erect a plant at Ruskin, on the Frazer River.

**Owen Sound, Ont.**—The statement from Owen Sound that the Northern Navigation Co. had abandoned its service there for the coming summer is denied by officials of the Canada Steamship Lines at Sarnia, which owns the N. N. Co. The local officials state that the Georgian Bay routes will be covered by the company's boats as usual.

**Halifax, N.S.**—Three steamers, two Dutch and one Russian, have been seized by the naval authorities here and will before long be engaged in the British merchant marine. The Dutch steamers, which are about 2,000 tons net each, have been in Bedford Basin for some time, while the Russian steamer was towed into this port minus a propeller blade.

**Collingwood, Ont.**—The Collingwood Shipbuilding Co. has launched another steel trawler, making five of this type built here. Two others were launched during the winter and are now well on toward completion. All three will be ready to leave on the opening of navigation. The vessels are all alike in design and construction, a standard plan being followed.

**Liverpool, N.S.**—There was launched recently at the shipyard of the Nova Scotia Shipbuilding & Transportation Co. a 400-ton tern schooner named "Abemama," built under contract for Messrs. Peter Yee Wing & Co., of Sydney, Australia. This vessel is the second of this size launched from that yard within eight months. The name is given in honor of the island where this Australian firm is trading.

**Amherstburg, Ont.**—Efforts of Capt. Fred J. Trotter have been successful in raising the Canadian lightship Falken, which was sunk by ice last winter while lying at Scudder's dock on the north side of Pelee Island. Captain Trotter will take the vessel to Detroit for repairs before going to her station at south-east shoal, Lake Erie. The Falken is now at this port.

## RAILWAYS

**Toronto, Ont.**—Tenders for the completion of the interior work at the new Union Station were opened last week. Although the contracts call for the completion of the work by December 31, it is not likely this will be done under the present conditions, and the summer of 1919 is the most probable date for the opening of the offices.

**Montreal, Que.**—On August 1 next passenger traffic service is expected to begin through the Canadian Northern Mount Royal Tunnel. This is the expectation of the engineers now engaged on the work, and the statement is based upon the amount of the work already completed. The cleaning up of the yards is all that remains to be finished, and gangs of men are working hard on this job, doing everything possible to enable the first passenger train to pass under the mountain in five months' time.

**Montreal, Que.**—After years of intermittent negotiation, the Montreal and Southern Counties Railway has come to an agreement with the Montreal Tramways Co., by which the latter will allow the former to construct a loop line around their terminal station at Montreal, using Grey Nun, Youville and Common Streets. Work will be started early in the spring. Plans have also been prepared for the erection of a new station, freight, express and general offices on Youville Street. The station will be three storeys in height and will be built of steel, concrete and pressed brick.

## CONTRACTS

**Regina, Sask.** — The Otis-Fensom Elevator Co. has the contract for elevator for $395,000 warehouse for the T. Eaton Co., Ltd.

**Windsor, Ont.**—The Board of Control has awarded contracts for sludge pumps, motors, etc., for the sewage disposal works to Noble & Rich.

**Toronto, Ont.**—The A. B. Ormsby Co. have been awarded contracts for steel sash, tin-clad doors, skylights, etc., for the Bond Engineering Co's. new foundry at Ashbridge's Bay industrial district.

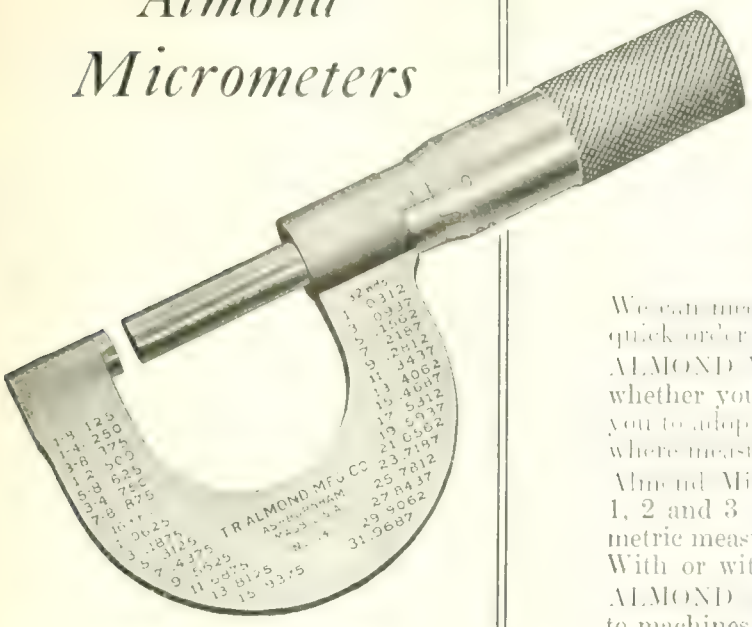
## WOODWORKING

**Sarnia, Ont.**—The Cleveland-Sarnia sawmills, which have been closed since the early part of the winter, have reopened for the season.

## INCORPORATIONS

The Pioneer Collapsible Tubes, Ltd., has been incorporated to manufacture, buy, sell and deal in goods, wares and merchandise of all kinds. The capital stock is $50,000. and the incorporators A. T. Bonathan, C. W. Toms, H. L. Crossland, C. Rimmer, and W. B. Shepherd.

*Almond Micrometers*

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It will immediately return the condensed steam in your pipe lines to your boiler as pure hot feed water.

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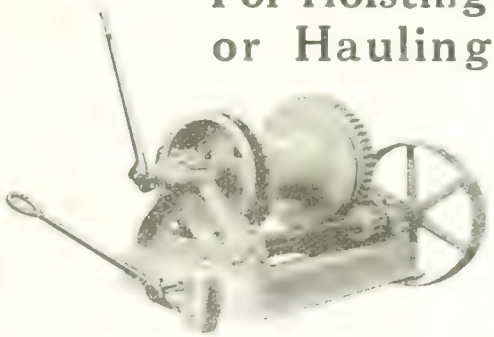

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# CATALOGUES

**Cochrane Multiport Valves**, a new bulletin issued by the Harrison Safety Boiler Works, Philadelphia, Pa., contains information covering the principal features of the Cochrane multiport valves. Copies may be obtained on application from the exclusive Canadian agents, Canadian Allis-Chalmers, Ltd., Toronto.

**The Smooth-On Mfg. Co.**, Jersey City, N.J., have issued a sixteen-page circular containing extracts from Smooth-On instruction book No. 16. One particular feature of this circular is that it contains the standard sizes of Smooth-On coated corrugated gaskets for flanged pipes from 2-inch up to 26-inch. Copies of the booklet will be gladly sent on application.

**Power-Driven Air Compressors.**—The Canadian Ingersoll-Rand Co., Ltd., Montreal, has issued recently bulletin K-301-A, describing two-stage, power-driven air compressors, of the duplex type, "PLB-2." This is a 16-page 6 x 9 pamphlet outlining notable features of construction, such as the "Circo" leaf valves, Haight 100 per cent. belt wheel joint, bath lubrication system, dust-proof frames and casings, etc., as well as the marked compactness of the design, yet easy accessibility of all parts.

**The Darling Digest** is the title of a new house organ to be issued monthly by Darling Bros., Ltd., Montreal. The first March edition has been distributed. It is the intention of the company to make the publication interesting, helpful and instructive, and to give each month information of a reliable nature regarding their products and doings and to bring their customers and friends into closer personal touch with the organization. The bulletin will also from time to time contain interesting technical talks on the manipulation of heating systems, steam specialties, pumps and products generally.

# BOOK REVIEWS

**Comparative Tests of Six Sizes of Illinois Coal on a Milkado Locomotive.**—Bulletin No. 101 contains data covering a series of tests to determine the value of different sizes of coal as conducted by the Engineering Experiment Station of the University of Illinois under a co-operative agreement with the International Railway Fuel Association and the U.S. Bureau of Mines. A Mikado locomotive weighing 142 tons belonging to the B. & O. R. R. was used, the tests being made in the locomotive laboratory at Urbana. The results are published in above bulletin No. 101 by E. C. Schmidt, J. M. Snodgrass, and O. S. Beyer, Jr. Copies may be had without charge by addressing the Engineering Experiment Station, Urbana, Illinois.

THE safe load on belts per square inch of section, according to different writers, ranges from 290 to 500 lbs. per square inch.—Belts.

## DEVELOPING THE FUTURE TRADE OF CANADA

(Continued from page 363.)

ber of idle men will increase. When the jolt comes it will not be the men from the farms who will be walking the streets looking for work. They will still be enjoying an era of high prices for farm produce. To my mind it is not feasible to develop foreign trade in an atmosphere that it discourages it at home.

### About Standardization

Mr. Parsons is apparently convinced that, with other conditions being favorable, it is possible for Canadian manufacturers to work in groups to develop foreign trade. "We want one strong committee to go into this work. A few live men around a table could do a lot to bring some real organization into existence. We want to avoid a multiplicity of committees and a cumbersome organization or an approach to the Irishman's horse that was all harness."

CANADIAN MACHINERY here inquired if working in groups would involve standardization of farm implements or supplies, which might not be an agreeable proposition to the manufacturers.

"That's a big question," concluded Mr. Parsons, "and one in which there is room for a lot of discussion. I believe there are some shops which, from their location and equipment, can do certain work to much better advantage than others, and it would be well to make use of this fact. But I am in serious doubt as to the advisability of standardizing implements throughout. Don't you think it would lead to stagnation? The present system, defective as it is in some ways, but also capable of correction, is a constant stimulus to invention and improvement. Remove that and I am afraid we would soon drift into that poor state of letting well enough alone."

Mr. Parsons, in concluding, stated that he believed the first step in after-war trade would be the appointment of a Trade and Tariff Board, and he was certain this should be proceeded with at once.

## PITTSBURG MARKET LETTER

(Continued from page 368.)

shell steel buying program for second half is enlarged. It was first reported at 2,500,000 tons, but is now reported at 3,000,000 tons for the government's own shells, and 500,000 tons for account of the government's allies. The freight car buying programme appears to cover 100,000 cars, 50,000 box, 25,000 hoppers and 25,000 gondolas, at least that is what is contemplated in the enquiries against which bids were to be filed at Washington last Wednesday. It is stated that 50,000 cars may be bought late in the year. Reports several weeks ago indicated 150,000 cars or more, but very lately there was a rumor that only 50,000 would be bought.

The government is seeking heavier de-

liveries of plates from the plate mills, asking in general that they make 75 per cent. of their output in government form.

The Steel Corporation's steel ingot production is this week reported at 20,285,061 gross tons, against 29,910,589 tons in 1916, indicating a decrease of 625,000 tons. The Institute's recent preliminary report on total ingot production indicated 42,200,000 tons, against 41,400,000 tons made in 1916. If these figures are to be followed it would mean that the independents increased their production by 1,400,000 tons while the Steel Corporation had a decrease of 625,000 tons. That might be a reflection of the fact that the independents increased their capacity more than did the corporation, while it is a fact that both suffered from lack of coke. The corporation, however, was particularly short of coke and was awaiting completion of its very large by-product coking plant at Clairton, near Pittsburgh, which was originally expected by the end of last September, but is only now nearing completion. When that plant is in operation the corporation will probably have no coke troubles. The plant will be entirely independent of the railroads, receiving its coal by water exclusively and shipping its coke to the nearby Carnegie furnaces over the interplant railroad.


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# CANADIAN MACHINERY

## AND MANUFACTURING NEWS

*A weekly newspaper devoted to the machinery and manufacturing interests.*

Vol. XIX. TORONTO, APRIL 11, 1918 No. 15


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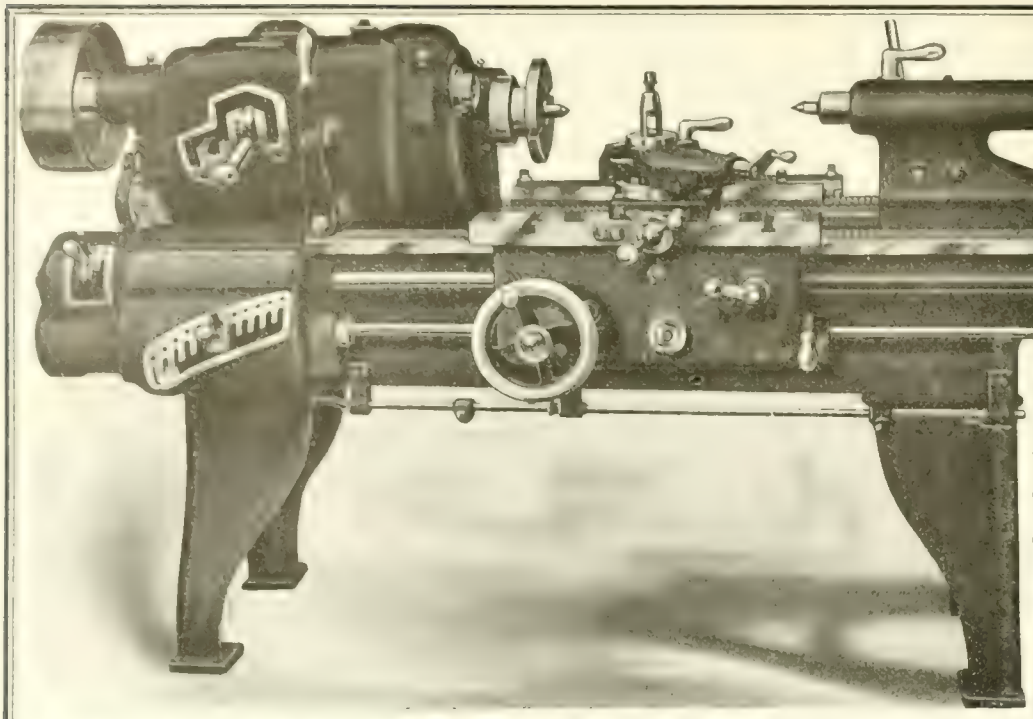

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# Worm Gearing: Principles of Design and Manufacture I

By Francis J. Bostock

*For many years the manufacture of worm gears was [illegible] and more or less out of thumb methods and as a consequence efficiencies were unsatisfactory. Improved methods of design and manufacture have recently effected such improvements that the worm gear is to-day one of the most efficient methods of power transmission. Considerable interest attaches to the [illegible] machines and methods used in the production of worm gears.*

UNTIL recent years the theory of worm gear, and still less its manufacture, was very little understood; the gears previously in use were generally for the purpose of transmitting "motion" from one member to another, and usually consisted of a worm of large diameter and low lead angle meshing with a cast wheel, the teeth of which had not been machined. The natural result was that low efficiencies were obtained, hence their use was discountenanced by engineers. All this has now changed; its construction has of late years become a science and its manufacture a precision accomplishment, and it will be the endeavor of the author to indicate some of the factors which have enabled this to be accomplished.

It is not the author's intention to discuss the Hindley or globoidal type, because for general purposes it does not, to his mind, represent such a sound manufacturing proposition as the parallel type, to which the following remarks upon design and manufacture will apply.

### Theoretical Considerations

Before proceeding with the practical part, however, it will be well for one to become acquainted with the terms used, their relations and the theoretical conditions which have to be fulfilled in order to obtain successful gears.

The ratio, as in all other forms of gearing, is dependent directly upon the number of teeth or threads. The distance from one tooth to the next, measured along the pitch line, is called the pitch, and when measured along a line parallel to the axis it is called the linear pitch. The normal pitch is that when it is measured normal to the thread, whilst the circular pitch is measured circularly at right angles to the axis. It will be observed that the circular pitch of the wheel is equal to the linear pitch of the corresponding worm.

The distance travelled, parallel to the axis, by a thread when making one revolution round the worm is called the lead; obviously it is the product of the number of threads and the pitch. As the thread or helix travels round and along the worm it naturally makes an angle to the axis, or to a line parallel to it; this angle is called the spiral angle, and its complement the lead angle. Trigonometry easily establishes their relations.

There are many factors entering into the design of worm gearing. It is not the author's intention to elaborate them, but chiefly to mention a few all-important points that make or mar efficiency.

The lead angle bears an important relation to the efficiency and durability of a worm gear. For many years the makers did not realise the importance of using a high lead angle, and the unfortunate experience that many have had has not been due to any inherent defect in the system, but to bad design.

If the worm thread be considered as an inclined plane, one will immediately see that the effect of friction is to increase the slope by an amount equal to the angle of friction; this has the effect of deflecting the direction of the resultant pressure and consequently reducing the torque on the wheel. The maximum efficiency of a worm gear is obtained when the lead angle approximates 40°—40′, and that 50 per cent. efficiency obtains when the worm angle is equal to the angle of friction, at which point the gear is irreversible.

[illegible] importance of a high lead angle

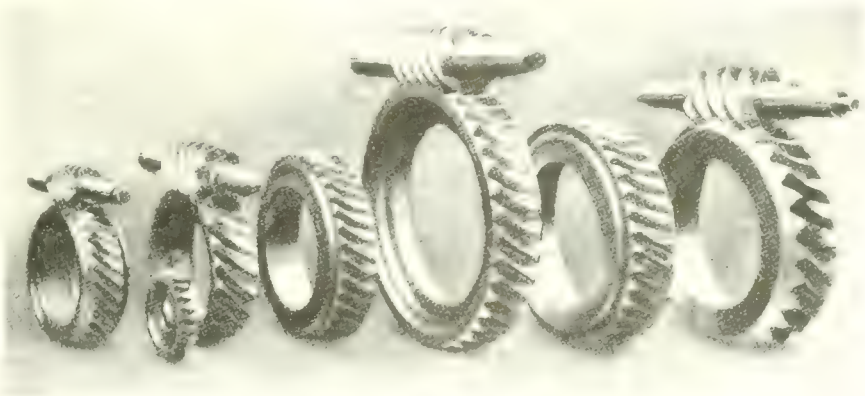


FIG. 1. A GROUP OF WORM GEARS, SHOWING SMALL NUMBER OF WORM

[illegible] paper read before the Manchester [illegible] and Association of Engineers.

FIG. 2. SECTION BY A PLANE CONTAINING THE WORM AXIS AND AT RIGHT ANGLES TO THE WHEEL

FIG. 3. [illegible] WORM AND WHEEL

cannot be too strongly emphasised, and it is useless trying to get high efficiency with a low lead angle. In order to obtain this angle it is necessary to reduce the diameter of the worm as much as possible, which not only gives a better angle, but also reduces the rubbing velocity. Thus one will readily see the reason why so many worms are of small diameter and solid with their shafts, similar to those shown in Fig. 1.

### Influence of Speed on Pressure

Following this are other important factors, namely, the rubbing velocity and its relation to the pressure, the materials used, the area and form of contact. It has often been stated that the permissible pressure multiplied by the velocity is practically constant; this is not so, as it would mean that an increase in velocity would be accompanied by a corresponding proportional decrease in the permissible pressure, hence the same horse-power capacity at all speeds. Within the usual limits the law appears to be that the permissible pressure varies almost inversely as the cube root of the velocity.

Various materials naturally withstand different pressures; for comparatively light loads at somewhat slow speeds the combination may be a cast-iron wheel and a soft mild steel worm; then, for heavier duty, a cast-iron wheel and a hardened steel worm; afterwards, a phosphor-bronze wheel and a hardened and ground worm. The former may be purely motion transmitting, whilst the latter is for transmitting considerable power at high speeds.

### Contact Between Worm and Wheel

The next important consideration is the form and the area of the contact between the worm and the wheel. If one takes a section by a plane containing the worm axis and at right angles to the axis of the wheel, one obtains an idea of their contact, as will be seen in Fig. 2. On the involute system their engagement corresponds to a rack and spur, the revolving of the worm causing the imaginary rack to travel along, and so causing the wheel to revolve. Therefore one has a worm whose linear or axial section corresponds to a rack, that is to say, each side of the worm tooth will, on a central section, be a straight line at a predetermined pressure angle. This is the starting-point in manufacture, and it will be noted how this straight line system is used for generating, cutting and inspection, and having once established that basis on the cutters, etc., one knows that when the wheels have been developed by the hob at a specified centre distance they will correctly mesh with the worms. Fig. 3 shows a normal section of the same pair in engagement.

The precise nature of the contact between the gears naturally depends upon the details of their specification and the form of tooth used. This does not appear to have been thoroughly investigated by anyone; but in connection with it there are several important points which should have serious consideration by all interested. Worm gear, unless correctly designed, does not transmit a uniform velocity from one member to another; many gears as ordinarily designed do not give the possibility of such transmission. A close approximation is obtained with gears of comparatively fine pitches, and in those of a high lead angle any error is somewhat "covered up" by the adjacent means being in action in such a manner that by sustaining an extra proportion of the load distribution the variable velocity period is tided over.

It will be readily understood that if this uniform velocity be theoretically non-existent there will be a tendency for accelerations and retardations to occur as each tooth comes into contact. Often, however, the inertia of the parts prevents a great change in velocity taking place, but it does so at the expense of the gears. The teeth are then called upon to absorb this effect, which results in highly concentrated pressures having to be sustained by certain portions of the wheel teeth, whilst other portions are thus prevented from taking up their share of the load. The transmission of uniform velocity is therefore a most important factor in the accuracy and the utility of dividing wheels for precision work, also on the durability and life of gears when used for high duty transmission.

The usual method of considering the contact by taking a series of linear sections is very liable to give misconceptions, due to the probable absence of the effect of the functions governing the transmission of this uniform velocity.

To consider worm gearing as a kind of development from the screw is fundamentally wrong. The pitch surfaces of worm gear are cylinders lying at right angles to each other, hence they only touch in one point; thus the theoretical conditions obtaining in a screw and nut whose pitch surface coincide cannot hold good for tangential ones. It must not be overlooked, however, that the theory of the triangle of forces on an inclined plane must hold good. The resultants of the forces acting on the teeth are the resultants of a series of differently inclined planes acting in different directions. In order to obtain an adequate idea of the problem it should be tackled as a three-dimensional one, thereby embodying the rotational effect of the gears.

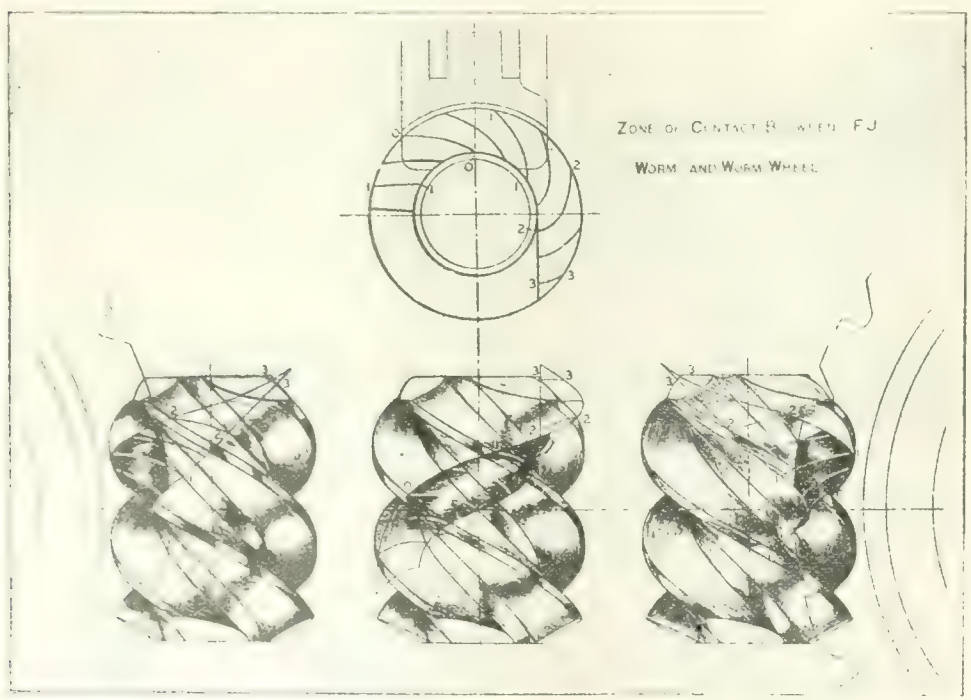



FIG. 2. FOUR VIEWS OF WORM DESIGNED FOR UNIFORM VELOCITY

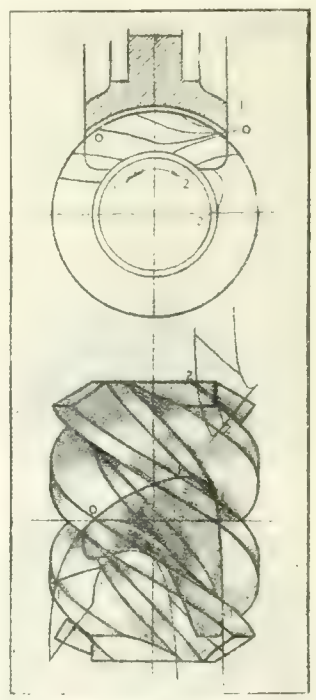


FIG. 3. WORM GEAR DESIGNED ON ORDINARY LINES.

### Fundamental Condition

To put the fundamental condition in a simple manner, one can say that, consistent with the transmission of uniform velocity, the normal to the surfaces from the point of contact must always cut the central plane, which contains the axis of the wheel, at a point on the straight line lying on the wheel-pitch cylinder, and consequently tangential to the pitch cylinder of the worm; thus for every point of intersection between a worm thread and the zone of contact there is always a definite relation between its angular and longitudinal positions. If contact takes place at any other point than this intersection it does so to the detriment of the transmission of uniform velocity.

Furthermore, the effect of the functions governing uniform velocity has a direct bearing upon the real rubbing velocity between the gear teeth. Usually this is considered as being the product of the circular pitchline velocity of the worm and the secant of the lead angle, but when uniform velocity obtains it may be only one-third of that calculated. The real action is then a combination of rolling and sliding, which means that instead of having almost wholly sliding action, the majority of it is replaced by rolling action.

Illustrating the foregoing remarks, Fig. 4 shows four views of worm and wheel of 4 : 25 ratio, designed to transmit uniform velocity. The ribbon-like area stretching across the teeth is the zone of contact between the gears when the worm is rotated in the direction indicated in the end view. The intersections of the worm threads and the zone give the lines of contact between the worm and wheel teeth, wherein it will be observed that the contact line starts on the entering side of the wheel face, where it is practically straight, radial and parallel to the wheel axis; it then travels across the face, with its outer portion gradually lagging behind, and finishes tangentially to the bottom of the tooth.

The top and end view also shows a series of intersections for every 45 deg. rotation of the worm; the alternate lines giving the intersections which correspond to 90-deg. movements, or, as one is considering a worm which has four threads, the line of contact on each thread.

### Rubbing and Rolling Actions

Following the direction of rotation, it will be noted that if the contact for one thread be on the line marked 0, the next thread will have contact on the line marked 1, the following one on 2, etc. Now the distance between 0 and 1 corresponds to one thread, and is therefore equal to a 90-deg. rotation of the worm, but when this movement takes place the actual contact also travels in the same direction as the worm through a distance of approximately 50 deg. to 60 deg., hence about two-thirds of the motion is transmitted by a rolling action, and only one-third by sliding. This means that instead of having the gear teeth rubbing against each other, say, at 1,000 ft. per minute, rolling action is so introduced that the real rubbing velocity is reduced to about 350 ft. per minute.

A further zone of contact for similar gears (4 : 25 ratio, 15-deg. pressure angle, 30-deg. lead angle), but designed upon ordinary lines (see Fig. 5), is of special interest. In this case the zone is actually interrupted near the central plane, and almost the whole of the contact consistent with uniform velocity takes place on the approaching side of the worm wheel, meaning, therefore, that if the worm be placed in engagement with the wheel, contact between their teeth takes place on the extremities of the worm, when, in many cases, the centre teeth have practically no contact. There is also a duality of the lines of contact, which, during the revolution of the gear gradually travel towards each other, meeting just beyond the central plane, where contact entirely ceases.

On account of the contact-point not travelling in the diretcion of rotation to any appreciable extent, the rubbing velocity has practically its full theoretical value, whilst rolling action is almost non-existent. The research work concerning the contact and the real action which takes place in worm gear has enabled one to account for a large number of inherent difficulties which have often been regarded as insoluble, but it is too lengthy to be further considered here; at the same time it might be well to note the comparison between the zones of these two gears, which are identical with the exception of the contours of their teeth.

A study of the zones of contact for a series of gears reveals to one not only how many teeth are in actual simultaneous contact, but also how many times the projected area may be said to be in continuous contact, thus indicating how much of the load should be proportioned to each wheel tooth; usually it varies from 1.5 to 3 times the projected area. A fine pitch gives more teeth in contact, but on a lesser projected area than a coarser pitch; the advantage, however, appears to be in favor of the latter.

### Characteristics of Standard Series

The characteristics of a standard series of worm gear are shown in Fig 6. The curves indicate the probable advantageous number of threads and teeth to sue in the composition of a required ratio, also how the lead angle, the pressure angle, and the heights of the teeth vary with the number of the threads in the worm. It also shows the average pitches in contact, and the respective load-carrying capacities, together with the gross efficiencies which, with ordinary manufacture, are obtained by the unit as a whole; this of course includes all frictional losses due to internal and external causes.

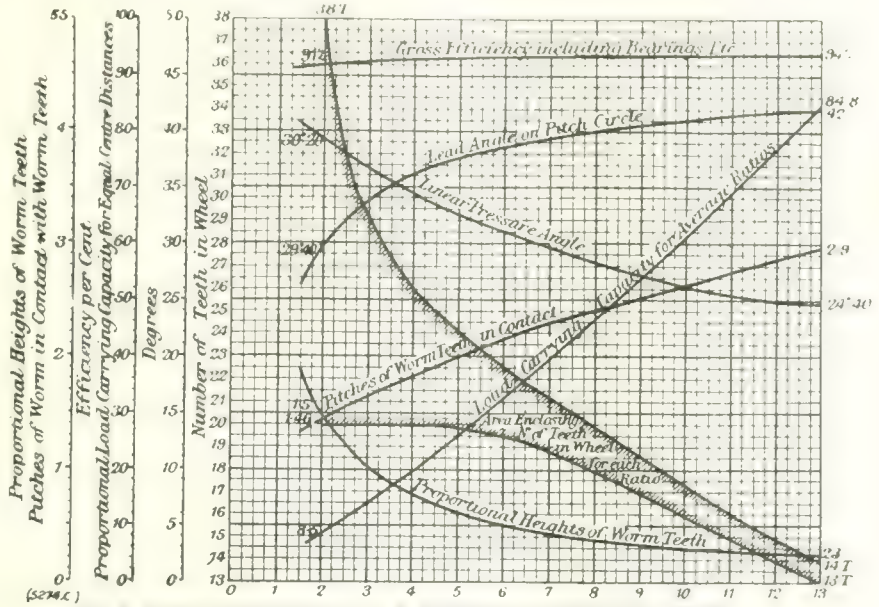



FIG. 6 CHARACTERISTIC OF 4 : 25 STANDARD SERIES OF GEARS

### Thermal Considerations

The amount of heat generated is another factor to considered. All frictional losses produce heat, and if the amount of heat generated be greater than the amount radiated, dissipated or conducted away, the temperature of the gear unit will rise. When it rises above a certain point ( about 250 deg. F.), the oil film breaks down and lubricating value ceases, but they are usually run at a nice warm temperature (150 deg. F. to 175 deg. F.).

Thus it is that the thermal characteristic has also to be considered, for which purpose one must know, in addition to the foregoing, the load factor or the proportional time the gear will run on various loads, and the thermal capacity of the case, or how many British thermal units it can radiate or conduct away at various temperatures. By these data one can predetermine the temperature rise of the gear unit at the end of any period of running under a certain load factor.

The author has known cases of gears

[illegible] transmitting only one-quarter or one-third of [illegible] capacity, solely on account of the gear cases containing them not having sufficient radiating capacity to get rid of the heat generated, and as the thermal capacity of the gear case is usually the limiting factor of the unit, the gears can often be subjected to considerable overloads for short periods without any injury. One of the great advantages of worm gear, i.e., its being able to transmit great reductions between two members only, is likely to be nullified if this thermal factor be overlooked.

(To be continued.)

## BIG INCREASE IN EXPORTS TO GREAT BRITAIN

IT is generally known that Canada's exports of war munitions and foods to the United Kingdom have increased tremendously since 1914, but the actual figures transcend anything the man in the street is likely to estimate. The customs report for the year ending March, 1917, has just been tabled in the House of Commons, Ottawa, and it shows that Canada's trade—even without taking into account the wonderful increases made in the past twelve months—has in some respects attained proportions that no one would have thought possible. This is not accounted for by the increase in prices. In volume, as well as in value, Canada's exports to Great Britain have soared astonishingly. The figures for a few familiar war munitions are here compared for the fiscal years 1913 and 1917:

| | 1913 | 1917 |
|---|---|---|
| Cartridges ... $ | 6,768 | $238,148,300 |
| Explosives ..... | 5,387 | 30,815,956 |
| Gasoline launches | 135 | 15,145,150 |
| Guns ..... | 7,667 | 2,175,618 |
| Boots ..... | 1,440 | 1,111,026 |
| Ferro-silicon .... | nil | 870,240 |
| Wire and nails ... | 543,451 | 3,138,100 |

### Mineral Exports to Britain

Canada's mines have also been working overtime furnishing metal for the outside world. For the United Kingdom alone, the exports of copper in 1917 totalled 144,613 cwt., worth $1,080,133, as compared with only 53,855 cwt., worth $403,851, in 1913. Nickel worth $1,862,796 (124,001 cwt.) was sent to the United Kingdom, as compared with 48,267 cwt., valued at $718,145, in the year before the war. The bulk of Canada's nickel still goes to the United States, and the figures for the fiscal year 1917 were 702,203 cwt., worth $7,062,758.

### Lumber, Horses, Bullion

Some forms of lumber have tended to swell Canada's war exports considerably. In 1917 the Dominion sent 50 per cent. more spruce and other deals to the United Kingdom than in 1913, but the price had so increased that the value of this form of export nearly doubled, being $8,594,803, as compared with $4,683,821.

Only 74 horses, worth $14,400, were exported to the United Kingdom in 1913. By 1916 the number had risen to 21,833, worth $3,899,822. In 1917 the number dropped again to 9,499, worth $1,898,820.

A curious feature of the customs report is that it records imports of gold bullion from the United Kingdom in 1917 worth $14,646,131, as compared with only $98,409 worth in 1916.

## AERIAL PHOTOGRAPHY HIGHLY DEVELOPED

AERIAL photography has greatly developed during the war. During the single month of September, British official reports state that 15,837 aerial photographs were taken by the British alone. No new trench can be dug, no new communication system opened up, no new batteries placed, but the ever-present and infallible camera above records it for the examination of the staff below. So piercing has been this work that camouflage has been developed as a protection, thus forcing aerial photography to even greater ingenuity.

Every sector of the front is divided into plots about half a mile square, each one numbered and entrusted to a squad of photographers who become fully familiar with it. As fast as the photographs are made they are developed, printed, reduced or enlarged to a standard scale, and then fitted into their place on the large composite photograph of the sector. This work requires a force of experts in developing, printing, and enlarging, as well as in map reading and interpretation.

Cases are on record where only 20 minutes have elapsed from the time a photographer snapped his camera over the German trenches until his batteries were playing upon the spot shown. In that time the airman had returned to his lines, the photograph been developed and printed, the discovery made, and the batteries given the range and ordered to fire.

## SAILORS OF NEW U. S. SAILING SHIPS LEARNING OLD CHANTEY SONGS

THE United States Shipping Board Recruiting Service at Boston issues the following:

Stanton H. King, of Boston, has the only war job of its kind. He is official chantey man for the American merchant marine. His work will be to revive chantey singing among merchant sailors who will join the country's new cargo ships through the United States Shipping Board Recruiting Service, national headquarters of which are at Boston.

While chantey singing has declined on all seas, owing to the change in recent years from sailing vessels to steamers—there not being much opportunity to "heave and haul" on board a steamer—its revival is considered important for two reasons.

Chanteys insure team work when a crew are pulling on ropes, even aboard steamers; while the building of large numbers of American schooners means an increased demand for men who can "reef, hand and steer" on sailing vessels, where chantey singing used to flourish.

The Shipping Board trains men to serve on steamers, but if a certain percentage ship on sailing vessels and carry with them the almost lost knack of chantey singing, they will be the better equipped for their work, according to sharps on the seafaring game.

Stanton H. King probably is the country's best known chantey singer. Chantey singing is part of a weekly entertainment he gives Jack ashore at a mission of which he is head. The programme is usually varied, and to hear Mr. King lead his sailor friends in "Shenandoah," "Bound for the Rio Grande," or "Blow the Man Down" is to understand the psychologic punch of the well-sung chantey.

Mr. King is an old salt, and learned chantey singing in its home, on deep-water vessels. He began going to sea 38 years ago.

## FORMER GERMAN MONOPOLIES

By M. M.

NOT very long ago Messrs. Elder Dempster & Co. bought from the Public Trustee under the Trading with the Enemy Act a large block of shares to the number of 185,279 in the Pacific Phosphate Company, the price paid being £575,000. This was an enemy concern which held important concessions in regard to phosphate deposits in several of the Pacific Islands.

In view of the increasing demand for fertilizers, which it is expected will become greater when normal conditions are restored, the transaction is regarded as singularly good. Recently, too, another company in which Lord Pirrie is largely interested acquired a big wolfram ore property in Burmah, the purchase price being said to be about £250,000.

From wolfram is smelted the metal tungsten which, used as an alloy, has remarkable properties in hardening steel. Although the bulk of the world's supply of wolfram is produced in the British Empire, Germany had almost a complete monopoly of it before the war, but steps have already been taken to prevent German control in future. The Bristol port authorities are preparing to deal with this industry and the expenditure necessary for the erection of works and warehouses has been sanctioned.

THE boiling points of many common metals are sufficiently high to indicate that a temperature of at least 1,500 deg. Cent. might be easily read by the aid of liquid couples. The question immediately arises as to whether metals in the molten state develop an E. M. F. suitable for pyrometric work. The results so far obtained indicate that in general the thermo-electric properties are unaffected by fusion, and that a temperature E. M. F. curve shows no diminution of continuity at the fusion point. Exceptions to this rule are furnished by bismuth and antimony, both of which show an abrupt bend in the curve at the melting point.

# Some Considerations Regarding Modern Plant Organization IV

By M. H. Potter

*The factors which enter into the successful manufacturing business of to-day are interdependent to an ever-increasing degree. Location, type of building, transportation facilities, staff organization and plant equipment are features which require to be considered both singly and as a whole in relation to the particular product to be undertaken. A clear and concise idea of such considerations is necessary before entering into the [illegible] of manufacture.*

IT is important to know the expense of manufacturing, but it is equally important to distribute it with the least chance of error. This requires a basis of distribution. Several methods may be considered:

1. A percentage on the value of material and labor.

2. A percentage on the value of the material used.

3. A percentage on the value of productive labor.

(The allocation of manufacturing expense to machines and its distribution by means of a machine rate will be referred to later.)

### Difficulties of the Various Methods

A distribution of manufacturing expense, having as its basis the value of the materials and the labor is not an equitable one by reason of more expensive material being used on one contract, or shop-work order, than that used on what may be similar production, notwithstanding that the material has been subjected in each case to the same operations, occupying the same time, and using perhaps in each instance machinery with a like expense burden of operating.

The principle chiefly involved is that the manufacturing expense is an occurence of time, and as such should be distributed over units of time.

The third method is largely used, and because it does in some instances effect the same distribution as that obtained by the fourth method they may incorectly be considered to be similar in their results. This method also appeals in application on the ground of convenience.

The proportion of manufacturing expense to be charged to a particular shop-work order under the third method is obtained by using a percentage of the value of the productive labor charged to that order. This percentage is the rate per cent. obtained by dividing the total amount of the manufacturing expense by the total amount paid for productive labor. In using this plan, the workman earning the higher wages must necessarily bear a larger amount of expense than the one earning lower wages, whereas by a more equitable distribution the reverse would be more in accordance with the facts.

The convenience of using a percentage basis at times cannot be questioned, but convenience or simplicity should not prevent the use of more accurate methods when greater accuracy is essential.

The using of the fourth method of distribution does not necessarily mean greater detail in cost keeping. The general practice is to remunerate labor at a rate per hour of time worked. The total number of hours of productive time is obtained from the time-sheets or a similar source and summarized. The entry in the cost accounts states the number of hours or fractions thereof charged to each shop order, and the charging of the item of expense is but a matter of detail when the rate has been determined, which will be the cost in expense per hour of productive time.

It should not be lost sight of that each department must bear its proper proportion of expense. Some pains may be necessary in making the first distribution, but if this is carefully done a basis is provided which reasonable observation of the department operations will either confirm or show wherein it is in error. Prompt adjustment of apportionment required by changing conditions should be made when such changes occur.

### The Machine Rate

The necessity of knowing the expense of operation and maintenance of the various machines used introduces the machine rate. The rate consists in treating each machine as a productive department and charging it with power, oil, repairs, rent, taxes, insurance, depreciation, interest and other items of manufacturing expense, and charging shop-work orders for work done by machines at a rate per hour of machine time representing the cost of machine operating.

The more obvious of the costs connected with machinery are of four classes, as follows:

1. Those based on occupancy of space which we will call space cost.

2. Those based on the cost of the machine itself, called machine cost.

3. Those based on special expense connected with the machine when in operation (but not including power), called machine use cost.

4. Power cost.

The criterion for distributing burden over production on the basis of use of machinery is clearly time; the element of the same machine (when in proper repair) will always be capable of producing the same relative results. Even if the nature of the job requires lower speed and loss is suffered it is right that the loss should be charged to the order requiring such reduced speed rather than to the machine itself, for, so to speak, the loss is the fault of the job and not of the machine.

### 1.—Space Cost

The first, or space cost, will be a certain proportion, determined by the machine's occupancy of space, of the space cost of the entire establishment. This space, however, is not determined by the mere floor dimensions of the machine, but it is the space necessary for its successful operation, with room for operatives, for light, for feeding materials and delivering product, for passageways to and from it, etc. As a result of this subdivision, then, we find on account of space a burden of general cost which this machine must bear. The elements of the cost are usually five or more.

1. Interest on investment in land and all buildings thereon.

2. Repairs to buildings which are really a part of the costs of running the machines which they are built to house.

3. Depreciation of buildings which repairs cannot prevent.

4. Taxes on land and buildings.

5. Insurance on buildings.

Allied to these but figured on a somewhat different basis are light and heat.

### 2.—Machine Cost

The second group of expenses is divided into the five normal elements:

1. Interest on the value of the machine itself.

2. Cost of repairs due to the passage of time rather than to use.

3. Depreciation that repairs cannot prevent.

4. Taxes (this machine's proportion of the taxes upon machinery).

5. Insurance (this machine's proportion of the total insurance on machinery).

### 3.—Machine-Use Cost

The third group of expenses is divided into:

1. The direct expenses in operation, such as for oil and cleaning, but not power.

2. Repairs due to wear and tear.

3. Depreciation due to use.

4. The five normal elements, interest, repairs, depreciation, insurance, and taxes—on any special tools which may be required in connection with this machine.

### 4.—Power Cost

The last group is power cost. The determination of the proportion which should be attached to each machine must be based upon figures, but in principle it is very simple. The power establishment is itself subject to three of the four groups that we have already connected with the other machines, that is, space cost, machine cost, machine-use cost, for the power plant is responsible for its share of the ground rent of the whole establishment, for the five normal elements upon its own building, for its

### Machine Total Cost

The remaining twenty-five list of things of which the cost can be applied [illegible] These four groups of cost-space cost, machine cost, machine-use cost, and power cost, are the total costs of running the machinery. This total for each machine, divided by the number of working hours in a year gives what is commonly called the "machine hour rate." Some allowance is always made, of course, for necessary idleness of all machines such as for repairs, oiling, cleaning, etc. Every machine in the shop has its symbol or number, and has attached a tag giving its hour rate. Since all work is done by the authority of a job order, it is a simple thing for the operator when reporting his own time to report also the time of machine cost to be charged to each job order, and it covers all the burden which we have been able to attach to the use of machinery.

### Idle Time

The determination of cost in connection with machinery has so far been on the assumption that all machinery is driven full time. Theoretically no machine should ever be idle except for repairs, oiling, cleaning, etc. Practically, however, this is impossible. It may chance for instance that on some work one planer can keep up with three drill presses and that on other work one drill press can keep up with three planers. It is obvious, then, that idle time is so far a matter of importance that it may throw entirely out of usefulness the calculation of the machine rate at full operating time and therefore must be introduced in many cases as a new element.

The rate charged for work done by machines should be based on the normal operating time, with a second supplementary rate representing the cost of the idle or non-operating time of machines, and items of expense which cannot be charged direct to any one machine. If, for instance, the expense of operating a particular machine is $180 for a month of 225 hours of full operating time, this would be a rate of 80 cents per hour for the work done. But if the machine was only run 200 hours, the rate charged to the shop-work order would be still 80 cents, with a second rate to provide for the distribution of the $20 representing the expense cost of the none-producing time of the machine, not allocated to the work in progress by the normal rate per hour.

A further reason for making two charges in the cost accounts for the machine operating: first, a normal rate based on the full operating time of machines, and a second rate to charge out the expense not taken up by reason of non-operating time of machines—is in knowing what excess of machine operating cost charged to work orders is caused by the various machines not being operated full time.

[illegible] operating cost barometer and should be carefully watched. The nature of the work done on certain machines admits of reports of machine time being returned daily showing the time operated and idle. It may be, if the machines require to be set up with each change of work and the changes are frequent, that too much time is being consumed in doing this. But if the idle time is known immediately, with prompt attention it may be reduced and the output increased.

## CONSUMPTION OF COMPRESSED AIR

AN easy method of determining the consumption of compressed air by air-driven machines has been recently given by a writer in *Foundry*.

Desiring to secure information regarding the amount of compressed air required per mould by different sizes of foundry vibrators, a small air compressor was used with a shut-off valve located between the compressor and the tank and in the latter the air pressure was raised to 90 pounds. The valve was closed and with a stop watch the time was noted that elapsed for the vibrator to reduce the pressure to 70 pounds. It may be assumed that for all practical purposes this would be equivalent to 80 pounds mean effective pressure, the amount in most general use in foundries. To illustrate in ever figures, it will be assumed that the tank holds exactly ten cubic feet of air and that it takes the vibrator exactly two minutes to reduce the pressure from 90 to 70 pounds. Therefore it is figured that the vibrator used 10 cubic feet of air in two minutes. By actual tests it has been found that the average time the vibrator is working while the moulder is drawing a pattern is about 15 seconds and, therefore, we get eight moulds with 10 feet of air and the vibrator uses 1¼ feet of air per mould. This same principle may be applied to any air-driven tool or moulding machine and it is believed that the results are more nearly representative of actual conditions than theoretical calculations.

## THE EFFECT OF HEAT ON COLD ROLLED ALUMINUM

IN a paper read before the Institute of Metals by H. C. H. Carpenter and L. Tavener some interesting facts were brought forth relating to the behaviour of aluminum sheets when heated.

The effect of heating cold-rolled aluminum sheet at temperatures from 550 deg. to 300 deg. Cent. inclusive is to cause a very rapid softening of the metal as measured by the tenacity and the percentage elongation. As regards tenacity, the same ultimate value is reached in all cases. Softening is complete in 96 hours, and from 550 deg. to 350 deg. inclusive nearly the whole of this occurs in the first hour of the test. The elongation figures show a tendency to rise slightly as the temperature falls from 550 deg. to 350 deg.

At 250 deg. Cent. the rate of softening, while still considerable, is much less rapid. Between 600 and 800 hours are required for complete softening, and here also the same ultimate value of tenacity is reached as at higher temperatures.

From 200 deg. to 100 deg. Cent. inclusive the rate of softening is slow, and as the temperature of 100 deg. is approached, very slow. The actual sequence of changes can be classified conveniently under three heads:

(1) A comparatively rapid drop in tenacity in the first hour.

(2) A tendency either to cease falling or actually to rise, such rise, in one case only, bringing the tenacity up to the original value. This period is in most cases completed in 100 hours.

(3) A relatively very slow fall of tenacity sets in and is maintained on the whole steadily.

These tests are still in progress. Assuming the present rate of loss of work-hardness to be maintained, assuming also that the metal ultimately reaches the same tenacity as specimens tested at the higher temperatures, periods of the order of from one to three years will be required for completion.

It follows that no object is gained by using aluminum of this particular degree of work-hardness at temperatures which are likely to exceed 200 deg. Cent. in practice.

The cold-rolled aluminum has been shown to lose a considerable proportion of its work-hardness as a result of being heated in the temperature range, 200 deg. to 100 deg., with hardly any recovery of plasticity, as judged by the elongation test.

Le Chatelier's view that annealing a hard-worked metal was an easy thing to do was not borne out by the tests given in the paper, as far as aluminum was concerned. On the contrary, there was much evidence that Howe's view that many changes were going on concurrently was the fact with aluminum as with the other metals which Howe examined.

A circumstance which merits close attention is the change in the form in which silicon is present in the hard-worked and annealed states. It appears that in a hard-worked aluminum silicon is present to the extent of about 57 per cent. as shown, whereas when the metal is annealed the silicon appears to be combined.

LEAKAGE past the valves and piston will materially reduce the intake capacity of an air compressor. If the area of the intake valves is too small the cylinder will not be filled with air at atmospheric pressure, and, if the area of the discharge valves is too small all the air compressed will not be discharged. Poppet valves depend upon a difference in pressure on the two sides of 2 to 5 oz. for their action and may reduce volumetric efficiency by as much as 2 to 4 per cent. Mechanically operated valves of the Corliss type are very satisfactory but must be maintained in correct adjustment.

# PRODUCTION METHODS AND DEVICES

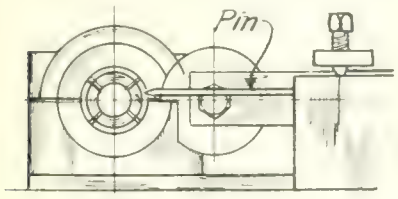
A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

## SCREW MACHINE KINKS THAT PROVED THEIR WORTH

By D. A. Hampson

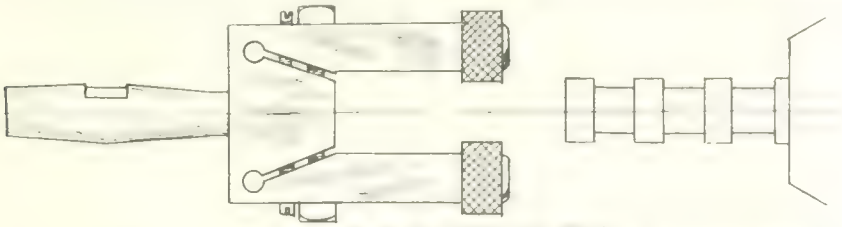
### A Chip Remover

IN a set-up on a Hartford screw machine, a gooseneck holder carried a turning tool and a 3-32 in. drill. The diameter of the work piece was 7-32 in. and the drill was set to a depth equal to the length of the turned part, so it will be seen that there was very little chip space. With the tool and the drill both in good condition the long, stringy chips curled up into a bunch and every so often would break the drill.




CHIP REMOVER

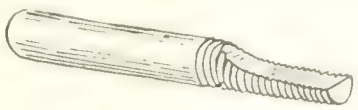
A chip remover of the simplest nature proved the remedy. Referring to the drawing, a pin is seen sticking out in front of the tool holder on the rear slide. This slide advances for its work just before the drill is withdrawn and in time for the pointed end of the pin to catch in the ball of curlings. The withdrawal of the drill and tool pulls them free from the chips which are held by the pin and fall as soon as the support of the former is gone. While this does not take away all of the chips the majority are cleared out—enough so there is no danger of the drill being pushed to one side and broken and enough so the machine can be styled "self-cleaning."



TOP VIEW OF KNURLING TOOL
NOTE TAPER OF SHANK IS SHOWN VERY MUCH EXAGGERATED

### A Knurling Kink

The knurling of the head of a brass nut of special form gave some trouble. The nuts were made three at a time on an Acme automatic and cut off with multiple tools, but we are here concerned with the knurling only, which, because of other operations, had to be done by a tool in the second position on the turret slide. The tool holder is shown. Two knurling wheels were used to produce the diamond knurl required, but the results were unsatisfactory no matter how they were adjusted, either too light an impression or a turning action, or erratic effects. By reducing the shank of the holder tapering away from the full size part directly under the set screw, the holder was permitted to swivel a few thousandths, and perfect work was produced without any further fussing. A



A TAP OF AN UNUSUAL FORM

notch for the set screw kept the holder from pulling out when withdrawn over the three heads and allowed the floating action that had improved the work.

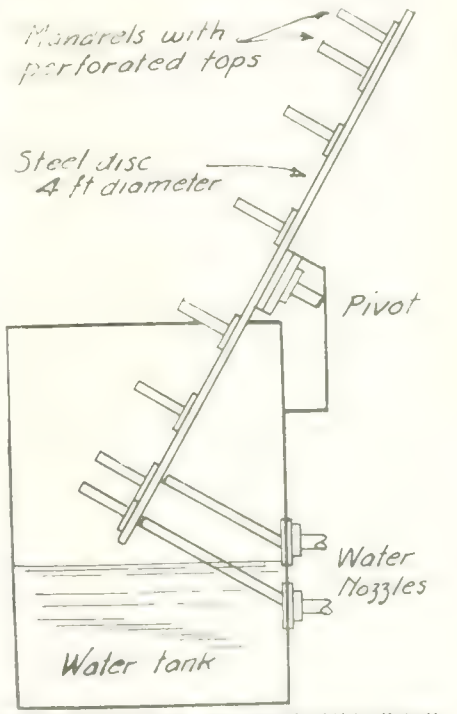
### Tap of Unconventional Form

A 5-16 in. 24-thread tap was run at the rate of 1,400 r.p.m. on a brass job in the automatic. The drilled hole could be only ⅜ in. deep for the work length of 5-16 in., and with the tapping attachment of the Acme automatic a good deal of breakage resulted if the tap was run at the full depth. Ordinary machinists' hand taps were used. The tap shown was tried out successfully and several were made up in the shop to complete the run of thirty thousand pieces. No flutes are cut in the tap but a liberal flat is ground toward the end after hardening. For brass work this tap will give interesting results.

## PROJECTILE WASHING

By R. C. White

WASHING the shell is a necessary evil which must nevertheless be done carefully and efficiently. Large quantities must be handled and a [illegible]




APPARATUS USED IN PROJECTILE WASHING

are surged up and down with a rope through a pulley conveniently located overhead. Others use a chain conveyor, and I have heard of a shop where an appliance similar to the one shown was used. The revolving table was about 4 feet diameter, and the tank holding the solution was about 5 feet by 2 ft. 6 in. deep. The mandrels over which the shell are placed are hollow and perforated at the tip so that the hot solution could be pumped to the interior of the projectile. The temperature of the solution whatever it may be should be slightly under 200 degrees Fah. The controlling mechanism under the spouts was so arranged that a cam permitted the 2-inch discharged pump to force the solution to the interior of the shell with sufficient force to remove chips, etc.

This arrangement necessitated the use of three men. One put the shell on the mandrels at one side of the disc and another man removed them at the other side, and the third man assisted in the handling. The results derived were entirely satisfactory in that the shells were thoroughly cleaned and the time consumed compared more favorably with other methods, the production being around 700 shells per hour with the pump discharging 75 gallons per minute.

removed in order that the varnish or rust preventative coating may stick. The shells are therefore put through an alkaline solution to remove the grease and then through a hot water tank to remove the alkali. Alkali as we all know promotes rust, so that all traces must removed. There are many compounds for this purpose, but a solution of 25 lbs. of common washing soda to 100 gallons of water is as efficient and as cheap as any

To handle these shells various methods are used. Some people use a wire basket [illegible]

## COMPARATIVE AREAS

By J. H. R.

WITHOUT duly considering the changes effected by the variation in the shapes [illegible]

first realize by experience that a surface bounded by the same length of perimeter, or circumference, would necessarily enclose the same space or area. Unless one is reasonably familiar with the general methods of calculating the areas of plain figures, it is frequently difficult to have them understand the relative wide range between the areas of regular geometrical

ticed that the formula for finding the area of the circle is .7854 $D^2$, but as the diameter is not yet known we must determine this from the formula D=.3183C, or 24×.3183=7.639 inches. It might be here stated that the constant .3183 is the reciprocal of the constant 3.1416. (The reciprocal of a number is the quotient of 1 divided by the number.)

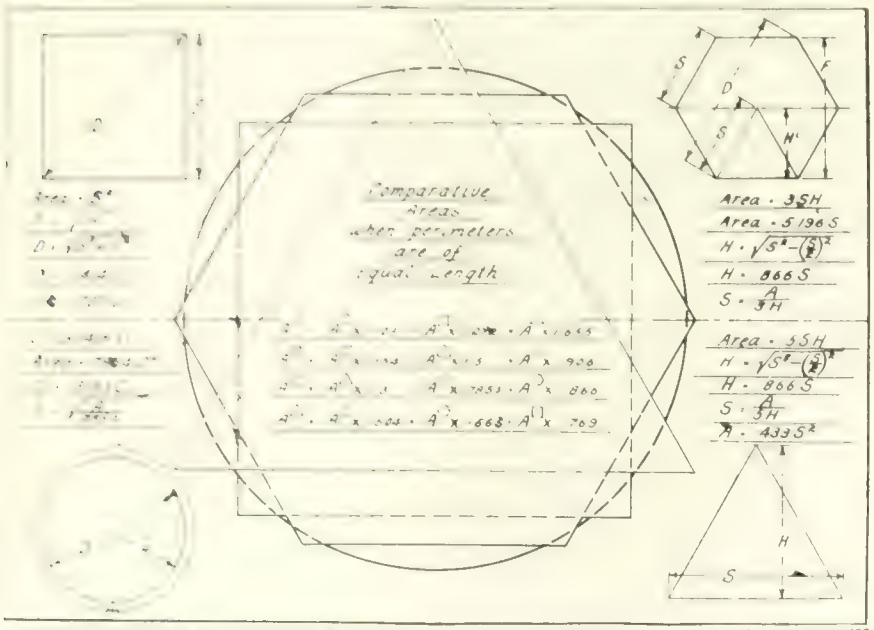



CHART SHOWING COMPARITIVE AREAS WHEN PERIMETERS ARE OF EQUAL LENGTH

surfaces that have for their perimeter lines of equal length. In order that a flat surface may be properly defined it is necessary that the space involved should be bounded by at least three lines, as it is quite obvious that it is impossible to develop a surface having one or two bounding lines.. It might be argued that in the case of a circle the perimeter or circumference is only one continuous line, but a brief study of this figure will demonstrate that it is composed of a line that is changing its direction at every point in its length.

The accompanying sketch illustrates, diagramatically, the relative or comparative areas of the four principal regular geometric figures, where the perimeters are of equal length, together with the necessary constants and formulae for calculating the areas of the different surfaces. As a circle is the greatest area that can be enclosed with a perimeter of a given length, it follows that the surface of any pologon, with given length of perimeter, will be greatest when the figure is regular in character. It is also evident from the foregoing that a triangle is the figure that must have the least area for a given circumscribing outline.

To illustrate this point more clearly we will suppose that in the accompanying sketch the perimeters of the various geometric figures have a common length of 24 inches. The circumference of the circle will be 24 inches, the side of the hexagon 24 divided by 6 equal 4 inches, the side of the square 24 divided by 4 equal 6 inches, and the triangle 24 di-

The area of the circle would be .7854 $D^2$ = .7854×$7.639^2$ = 45.83 inches. The area of the square is found by multiplying one side by the other, and as the side in this particular case is 6 inches the area will be $6^2$=36 square inches. The area of the triangle is found by multiplying the base S by one-half the altitude H, or vice versa. To find the area of the triangle, therefore, it is first necessary to find the altitude H. With a perimeter of 24 inches the side H will be 8 inches, and the height H can be found by the solution of triangles or using the formula

$$\sqrt{\left[S^2 - \left(\frac{S}{2}\right)^2\right]} \quad \sqrt{\left[8^2 - \left(\frac{8}{2}\right)^2\right]}$$

$\sqrt{(8^2 - 4^2)}$ = 6.928 inches.

Then the area = .5 SH = .5×8×6.928 = 27.712 sq. ins.

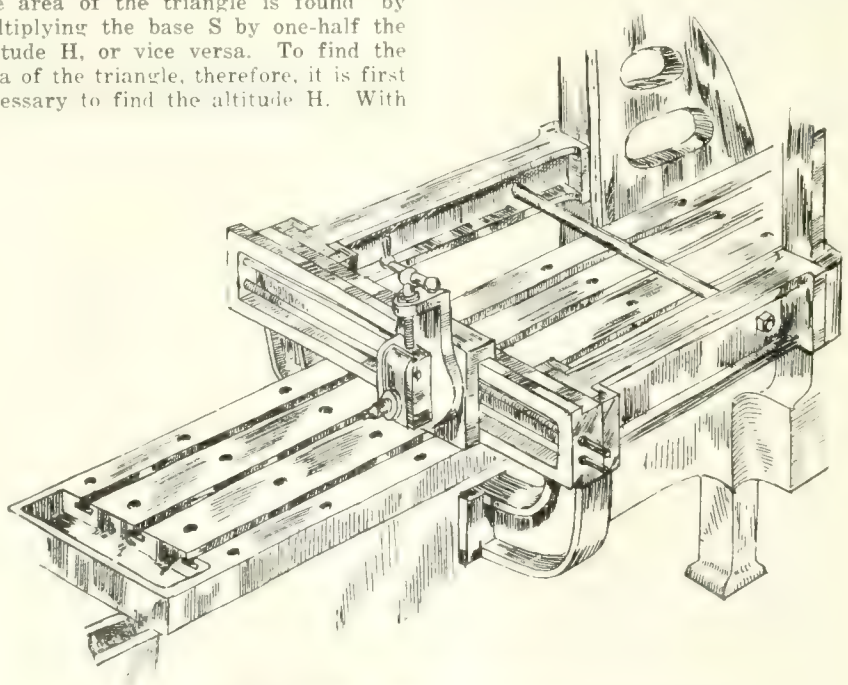
The side of the hexagon with a perimeter of 24 inches is 4 inches, therefore the area can be determined from the formula 3 S H. H will be $\sqrt{\left[S^2 - \left(\frac{S}{2}\right)^2\right]}$ or .866 S=3.464, and the area will be 3×4×3.464=41.568 sq. in. The other formulae on the chart will be found useful for reverse calculations. Within the center sketch is shown a number of constants by which the comparative areas can readily be found when the perimeters are of equal length.

## ONE WAY OF WIDENING A PLANER

By D. A. Hampson

THERE was a 40 x 15 ft. planer in the shop which was amply large for our regular work and for the odd jobs that came along until we took on the job of planing the bases of two thousand machines used for a munition job. These were castings approximately 60 in. square and 6 in. thick and the work was rough planing the under side and then finishing off pads and bosses on the top.

Planers are usually widened by setting out the housing on the side away from the operator. In our case this was not as practical for the machine was driven by a belt on each side and in fact, except for the feed gears, the planer was symmetrical so that the widening would have to be done on both sides to make any kind of a job of it. A layout of



VIEW OF PLANER SHOWING METHOD OF WIDENING.

both ways and a cost estimate was made but both were rejected for the scheme which is shown in the drawing.

Instead of spreading the housings and

disturbing the alignment and rigidity of the machine, the cross rail was removed and placed on brackets six feet ahead of its regular position. This was possible because of the long table and consequent range of stroke adjustment and because the cross rail was as long, wide, as on most 60 in. machines. By means of loose pieces on the patterns, two patterns were made to do for all four castings used in the change.

Two of these castings were the brackets proper. They were fitted to the bed of the machine, bolted and dowelled. The thrust of the cut was born by two columns which were fitted on one end to the front face of the housings and on the other to the back of the cross rail—they spaced the rail just so far ahead and were secured by the same means as the rail in its regular position. With the rail in the new position, there was plenty of room to plane the castings which had been too large for us. The cuts were not heavy, but at that the rig was substantial and good for heavier work. In place of the two gears driving the feed, two sprockets were supplied and these connected by a link belt (not shown).

When the job was over, we had the 40 in. machine as good as ever. We had not spent $200 for the change. We had a widening rig that two men could change in an hour, and a good one. For work that does not require an up and down movement of the cross rail, this is an arrangement worthy of notice. Another thought, it is a mistake to get a long planer without proportionate width between housings.

## PATTERN POINTERS

By D. A. Middleton

"One reason why I always like to mould the Duplex Co's work is because they round all the corners on their patterns," said a moulder. "You know if you are going to machine a casting, is takes anywhere from an eighth to a quarter to clean it up even the smallest ones have to have a sixteenth, and that means that you could round the corner to a radius of from one-sixteenth to one-quarter depending on whether only one surface is machined or two adjacent ones at right angles." Then again if there is no machining to be done, you can't expect iron to fill up a sharp corner nor the average moulder to do his work that way—he'll make the little fillet in there if you don't—so you might as well round the pattern to begin with and have a better looking pattern, better wearing corners on it, and make the moulder a lot less trouble in drawing it. And where you are depending on an outside foundry for your iron, it pays to get the good will of the moulders in it."

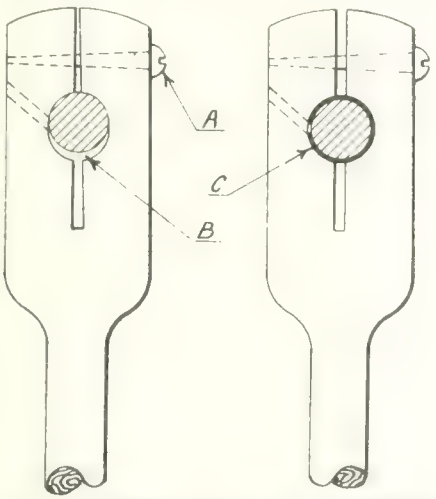
Before sending core boxes to the foundry, it is a good plan to try them out by filling with plaster of Paris and making a core for measuring and inspection purposes. This applies more particularly to small work—manufacturing where a little difference in the cored piece causes a big expense item in unnecessary shop work.

In some lines of manufacturing and in experimental work, steel parts are set in cast iron sockets or handles by running the iron around the steel. The pattern practice for this kind of work is to make the pattern as usual, adding to it an extension of the size of the steel part which is exposed when the article is completed. For instance, the heads of vise screws are sometimes cast on the screw and the pattern, besides the head part has a cylindrical part as big and as long as the screw is to be—but without threads. Then the screw is laid in the mould in the space made by the round just as if it was a core. And the iron is poured around it. It helps to make a tight construction if the steel pieces are heated before placing—the relative shrinkage is less. It is also imperative to notch or square or bend the steel pieces so the iron can get a more positive grip than by its contraction alone—the reason for this in the case of a vise screw is evident, the screw requiring not only something positive to drive it but a resistance to keep it from pulling out of the head.

## REPAIRS TO A CONNECTING ROD

By R. Hamilton

NOTHING is more annoying than pounding in a connecting rod, and this is particularly emphasized where noise is of special interest when it is absent. For a sewing machine to do efficient work it is necessary that no lost motion should exist in the various joints. One that is most likely to wear is the hole in either end of the wooden connecting rod, from the treadle to the crank on the main driving wheel. How one of these was repaired is shown in the accompanying sketch. On the left is the worn hole; when the clamping screw A was tightened there was an end play of over 1-32 inch, as shown at B. The repair is shown in the sketch on the right. The rod was taken off and the screw A backed away so that the slot was parallel; the sides of the worn hole were scraped out to round up the hole. A small narrow strip of [illegible] was cut and bent [illegible], and afterwards fitted into the hole so that when the pin was inserted and the screw adjusted the pin revolved freely but without side play, and when again placed in the machine ran perfectly free and without the slightest knock. To facilitate the lubrication of the pin the joint of the tin bush was placed adjacent to the oil hole.




METHOD OF REPAIRING WOODEN CONNECTING ROD.

## GRINDING ALLOWANCES

A QUESTION often asked is the amount that should be left on turned or bored work which is to be finished to size by grinding.

The answer is that this depends on certain factors which must be ascertained before the correct allowance can be determined. The object aimed at should be to so proportion the work between the lathe and the grinding machine that the total time taken by both in producing the desired degree of finish and accuracy is reduced to a minimum.

In many shops a great deal of time is wasted in turning too close to finished size and with too fine a traverse work which is to be afterwards ground.

In his desire to turn out a "good lathe job" the turner sometimes overlooks the fact that a smooth piece of work having only a small allowance may take as long to finish in the grinding machine as a rough-turned job on which more metal is left.

A good deal will depend on the grinding machines used. If these are heavy up-to-date machines, supplied with the right wheels, the speed with which a really rough-turned shaft or spindle can be reduced to size will be a revelation to many.

The chart printed on the opposite page shows the grinding allowances which are recommended for turned or bored work up to 12-in. dia. Although the amounts specified may, to some, appear excessive, they may be allowed with confidence in establishments possessing a grinding department run according to modern ideas of efficiency and lathes sufficiently powerful to take the coarse feeds recommended.

The following explanatory notes will serve to show the theory on which this article is based, and will assist in determining allowances for the exceptional jobs which will occasionally present themselves.

Taking first external work as being the more common, it will be noted that a larger allowance is made on articles which exceed twelve diameters in length than in the case of shorter jobs. This is to save lathe work.

A job over twelve diameters long will spring considerably under a good cut, and there is a possibility of bends making their appearance. The largest possible allowance is therefore made on this work, so that the turner need not waste time which would be taken in producing articles more nearly parallel and straight.

Then again, a distinction is made between rough-turned work and that which is produced by a fine feed or made on turret lathes with a box tool.

smooth finish so as to allow regular penetration of the casing compound, therefore the allowance specified for smooth work over twelve diameters long should be used for care-hardened work whatever its length. If such work is hollow it may distort after quenching, therefore great care must be exercised in hardening, as the allowance above specified cannot be exceeded or the hard skin would be entirely removed in grinding to size.

The allowance for carbon and high-speed steel work which is hardened will be the same as that provided for soft work, as any distortion which occurs must be corrected in the straightening press before grinding.

Internal work, which is dealt with by the lower portion of the chart is divided into three classes as follows:

1. Mild steel case-hardened.
2. Carbon or high-speed steel hardened.
3. Soft work, whether steel, cast iron or bronze.

Hardened and case-hardened work in which the hole is less than half an inch in diameter should, as shown in the chart, be bored or reamed to standard size, as there will be a sufficient shrinkage when the quenching takes place to provide a grinding allowance. It will be noted that the amount allowed in case-hardened work increases very rapidly up to 6-in. dia.; this is to allow for distortion in hardening. Above this size the increase is slow, and care should be taken to avoid excessive distortion as no larger allowance can be made, otherwise the hard skin would be removed by the grinding operation. In determining the allowance for soft work it should be remembered that the class of finish given to the hole will decide whether the high or low limit should be worked to. Thus, in holes which are rough drilled or bored the allowance should approach the maximum, whilst in reamed holes the minimum allowance should be left.—"Herbert's Monthly."

EXTERNAL GRINDING.

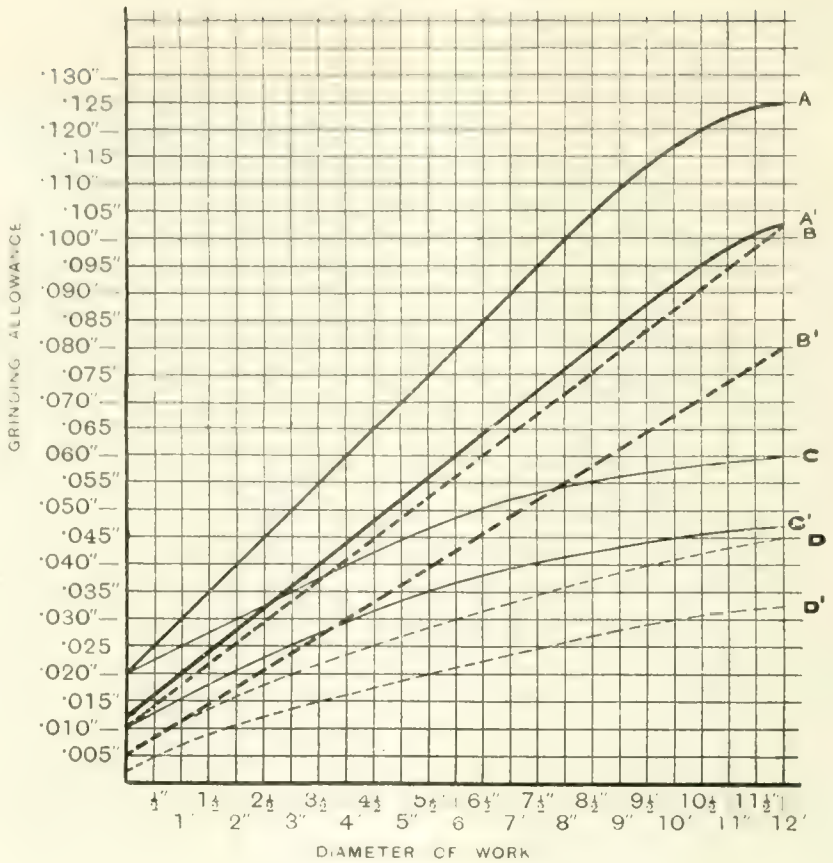



CHART FOR EXTERNAL GRINDING ALLOWANCE.

Curves A & A¹ show maximum and minimum amounts to be left on the diameter of rough turned work over 12 diameters long.

Curves B & B¹ show maximum and minimum amounts to be left on the diameter of rough turned work under 12 diameters long.

Curves C & C¹ show maximum and minimum amounts to be left on diameter of smooth turned and bar lathe work over 12 diameters long.

Curves D & D¹ show maximum and minimum amounts to be left on diameters of smooth turned and bar lathe work under 12 diameters long.

By rough turned is meant work having coarse traverse marks, the measurements being taken on the top of the ridges. The following are the finest feeds which should be employed:—

| | |
|---|---|
| For work up to 2 in. dia. | 30 per inch |
| For work from 2 in. to 4 in. dia. | 20 per inch |
| For work from 4 in. to 8 in. dia. | 16 per inch |
| For work from 8 in. to 12 in. dia. | 8 per inch |

INTERNAL GRINDING.

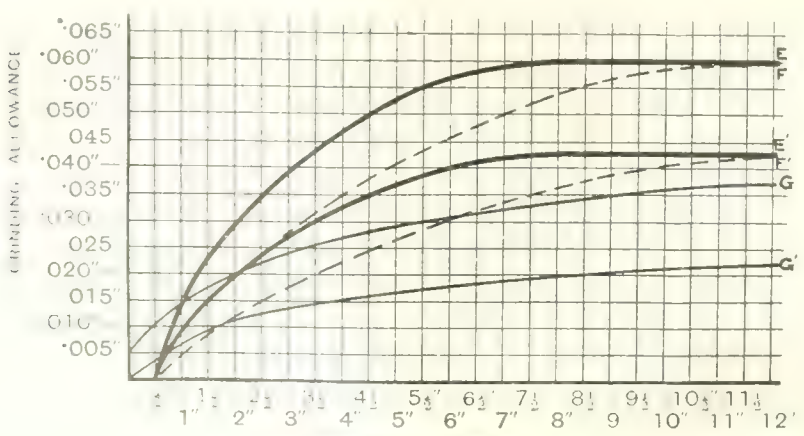



CHART FOR INTERNAL GRINDING ALLOWANCE

Case hardened work is an exception, because the finish must be fairly smooth to allow regular penetration of the casing compound. Use Curves C & C¹ for all such work.

Curves E & E¹ show maximum and minimum amounts to be left in the bore of mild steel work that is to be case hardened before grinding.

Curves F & F¹ show maximum and minimum amounts to be left in the bore or carbon or high-speed steel work that is to be hardened before grinding.

Curves G & G¹ show maximum and minimum amounts to be left in the bore of soft work, whether steel, cast iron, or brass.

# Heat Treatment of Large Forgings: Methods and Apparatus-I

By H. H. Ashdown.*

*Some [illegible] into the paper on [illegible] heat treating, and [illegible] the methods employed and the [illegible] on the subject with particular [illegible] problems in itself and must be [illegible] in the order. The present [illegible] with the [illegible] methods [illegible] the [illegible] of the [illegible] to [illegible]*

So much has already been said and written concerning the heat treatment of steels, and one finds in all works, where any form of treatment is practised, so many authorities on this subject, that the lay mind would think that perfection in every possible way had been achieved. Further, with the perfect system of pyrometric control now installed in most of our steel works, the impression gained is the impossibility of failures to occur due to incorrect treatment.

The heat treatment of steel may cover a very wide field, but the heat treatment of steel forgings suggests at once the impression of handling materials both in quantity and in the mass. To give a broad sense of comparison, one might compare the treatment of a piece of a piece of 1-inch round steel with a forging weighing some 60 tons, or a furnace full of forgings in the aggregate weighing 200 tons—this being on a parallel with the vastly different conditions ruling when casting ingots of a few cwts. in weight and those weighing 100 tons. From experimental evidence and casual observation it is quite evident that there is still much wanting in this direction, in spite of our greatly advanced knowledge and high attainments in research on this subject of recent years.

The author has been closely associated with the investigation, manufacture, and treatment of steels in all their phases for the past twenty-five years, and for the greater part of that period has dealt with them in a commercial sense. His proposal therefore is to treat this matter in as practical a way as possible, dealing with the subject from a commercial or works point of view rather than approaching it as a subject of research. Having thus mapped out the course of the paper, it has been decided to exclude, as far as possible, technical terms relative to structural conditions, and in the subsequent discussion to evade such technical references, the nomenclature of metallography being, generally speaking, more confusing than helpful to the practical man.

In order to introduce and prove the value of metallography in the works, it is expedient to submit photomicrographs together with some form of practical illustration, an example of which is shown in Fig. 1, which shows at sight the fundamental principles underlying a moderately careful treatment, and then to compare their relative comparative strengths with that of bricks and mortar and concrete. It will, of course, be appreciated that these protomicrographs are strictly comparative, each being of 100 magnifications. At the outset it is suggested that the greater percentage of failures occurring is not so much due to the lack of necessary scientific knowledge, but from the want of knowing how to apply that knowledge in works practice, and also in a large measure from the lack of observation generally, when forgings are subjected to heat treatment.

FIG. 1.—TENSILE AND BENDING TESTS OF STEEL FORGINGS WITH PHOTO MICROGRAPHS MAGNIFIED 100 DIAMETERS.

A. Forged and oil treated tensile, 51.5; elongation 16.6; reduction 17; bending 10.
B. After correct heat treatment. Tensile 50.6; elongation 16.6; reduction 24.1; bending 180°.

FIG. 2.—MISCELLANEOUS FORGINGS IN THE FURNACE ILLUSTRATING THE USE OF PYROMETERS.

The rough outline sketch of a furnace about 8 feet by 10 feet by 100 feet long, Fig. 2, contains miscellaneous forgings such as are now comparatively common in big commercial steel works. These furnaces are periodically charged up with forgings of all descriptions, say, for example, heavy gun forgings, marine shafting, turbine shafting, and the like, possibly amounting to 150 tons in the aggregate. In the first place they are heated to a predetermined temperature. Annealing temperatures vary greatly, from anything between 650 deg. C (1,200 deg. F.), and 927 deg. C. (1,700 deg. F.), and the results obtained from the forging naturally vary accordingly. These temperatures are questioned at times, and one is told that there is little need to trouble, as the forgings as a rule pass test. That may be so, but unfortunately one hears from time to time of forgings, machine parts of all descriptions, breaking down prematurely, due to fatigue. Fatigue compares very favorably with a medical practitioner's "influenza"; it temporarily covers a very wide field of inherent troubles. The cause of the so-called fatigue could often be located at the manufacturer's works before such forgings were put into service.

In Figs. 3 and 4, are seen various types of structures from similar steels in the so-called annealed condition. The author prefers not to suggest anything that might be embraced in already stringent specifications, but this condition of things is doubtless a matter that must receive closer attention in the immediate future. The temperature of 650 deg. C. (1,200 deg. F.) is, as all know, well under the change-point of steels in general, and unless that critical temperature is exceeded comparatively little change is effected in the structural condition. A forging which has been finished at a high temperature, or parts which have been raised to a forging heat and have received little or no subsequent work, on cooling retain a very coarse structure.

To make this point more clear, an example of two operations in the forging of a marine shaft, Fig. 5, is submitted

*A paper read before the Institute of Mechanical Engineers.

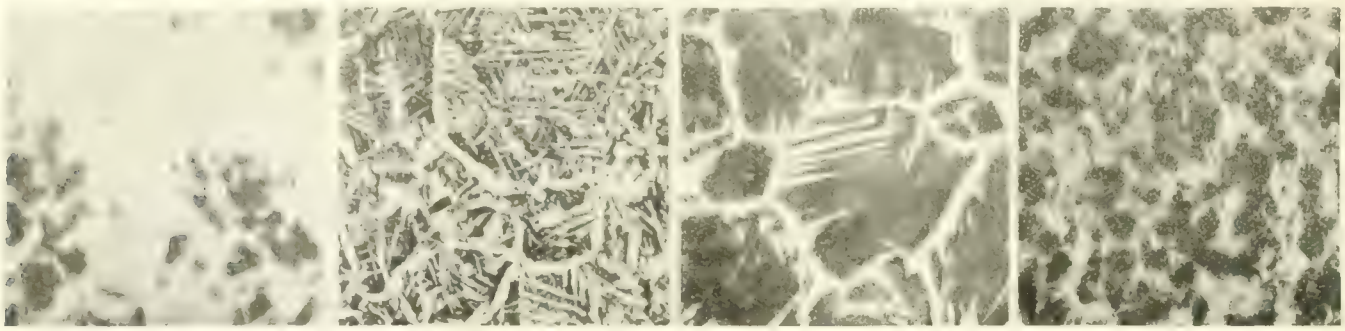
**Sir W. G. Armstrong Whitworth & Co., Newcastle-on-Tyne, England.

...withdrawing the already forged billet A from the furnace, the amount of work done on B is performed. Portion B is overheated, but in order to heat up portion $B_1$ for the subsequent forging operation, portion of $B_1$ must also be included in the furnace, and this naturally ...subjected to a prolonged forging heat, subsequently receiving little or no work upon it. The structural condition of this portion of such a shaft may not be unlike that of an unannealed steel casting, an example of the structure be-...description came before the author's notice some little time ago. The forging in question was a double intermediate shaft which actually cracked in the lathe during the turning operation; and, within the writer's knowledge, this is by no means an isolated case. The shaft in question was cut through this defective area, and tests taken in the immediate neighborhood gave the results shown in the illustration.

The shaft was then subjected to a prescribed heat treatment, and the results of the test, together with the microstructure, are given side by side for comparison in Fig. 8. This regrettable feature applies not only to large forgings, but equally so the whole way down the scale, even to drop stampings. It is not the intention to name any particular forgings of which examples are given, nor their source of manufacture; suffice it to be said that it has been my privilege to visit many large steel works both at home and abroad.

By way of an example of a comparatively small forging, a special type of heavy bolt was made by heating to forging temperature for their full length pieces of round bars and "upsetting" a portion to form the head as shown in Fig. 7. These forgings were subsequently normalized (this in the the author's opinion is a very vague term), at 677 deg. C. (1,250 deg. F.); but when such bolts were subjected to a shock test, it was by no means uncommon for the head to shell off. The reason for this will be readily understood when one examines what had taken place in the forging operation; the only portion which had received any work was the material forming the head, and where this adjoined the body one had two entirely different structures.

Although Fig. 9 was not taken from this particular type of forging, it will show the great contrast in adjoining structures when forgings are finished at high temperatures and are not correctly subsequently heat-treated. Now, after these forgings received a proper heat



Drastically overheated — Well annealed
HEAVY STEEL FORGINGS. MEDIUM CARBON STEEL.

FIG. PHOTO MICROGRAPHS MAGNIFIED 100 DIAMETERS SHOWING THE EFFECTS OF HEAT TREATMENT ON STEEL FORGINGS.

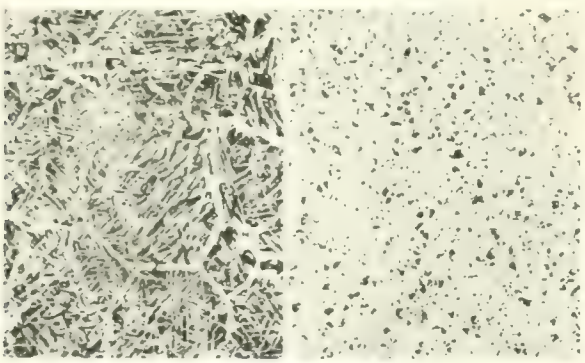


FIG. 4. BAD AND GOOD ANNEALING OF LOW CARBON STEEL. MAGNIFICATION 100 DIAMETERS.

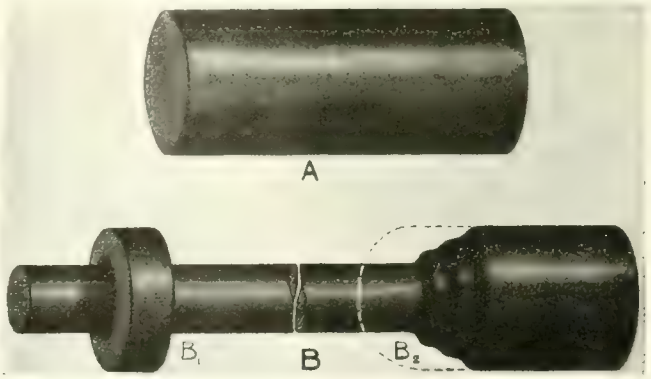



FIG. 5. DIAGRAM SHOWING FORGING OPERATIONS ON MARINE SHAFT

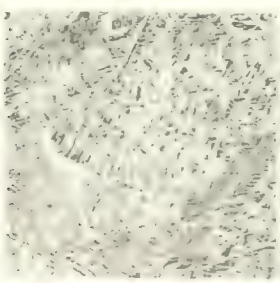


FIG. 6. ANNEALED STEEL CASTING. MAGNIFICATION 25 DIAMETERS

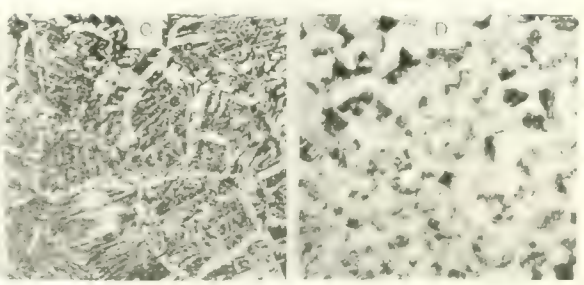


FIG. 8. MAGNIFICATION 100 DIAMETERS
C ...overheated. Yield 16.8 ..., tensile 31 ..., elongation ... reduction 24; bend 70°.
D Subsequently normalized. Yield 18.5; tensile 32.8; elonga... reduction 52.3; bend 180°.

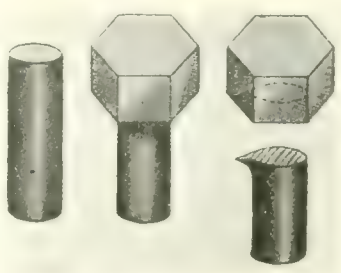


FIG. 7. HEAVY BOLT BROKEN UNDER SHOCK TEST

treatment, a uniformity in structure was obtained together with the disappearance of any further shelling of the head when subjected to the same repeated shock stresses.

A misconception more or less common in heat treatment of steels is that full advantage can be taken of the initial forging heat, and that forgings or stampings finished at a high temperature will, on cooling, regain a fine structural condition. This is entirely wrong, and if it is desired to obtain the best normal structural condition, the heat in such forgings must be allowed first to fall below its recalescence temperature and then reheated somewhat above its calescence temperature and preferably cooled in air.

Actual size. Photo-micrograph on junction line. Magnified less than 100 diameters.

FIG. 1. ETCHED PIECE OF STEEL.

With regard to high-temperature annealing and high-temperature quenching for hardening, it is generally known that as soon as one has reasonably passed the calescence temperature of the particular steel under observation, a refining in the structure will result therefrom, and also that, practically speaking, the maximum hardness of the steel can be effected by quenching from this temperature. It is also known that after exceeding reasonable limits of this temperature, in conjunction with the time factor, the coarse structure redevelops, and develops more rapidly the higher the temperature. A most important point often overlooked is the comparatively long time taken to raise forgings of appreciable size or in quantity to these elevated temperatures, and it is during this unnecessary period, which is costly in both fuel and labor, that the forgings are caused to deteriorate rapidly. Some of the big industrial institutions are favorable to high-temperature quenching, and it would be interesting to learn their reasons for this. The author has never found it necessary to exceed, either for annealing or quenching, when treating forgings in the mass, a temperature of 843 deg. C. (1,550 deg. F.), and has had no reason to regret the results obtained.

Reference has already been made to the lack of observation during the process of annealing. Let us return once again to the annealing furnace, and give it a few moments' attention whilst the small sections have attained this heat, heat is being gradually taken up by the forgings. What does one notice? Naturally, the smaller or projecting sections become heated long before the larger or depressed portions. Assuming now, for the sake of argument, that the predetermined temperature is to be 870 deg. C. (1,600 deg. F.), it is easy to understand that if in a short time the it will be a considerable period before the larger sections acquire this same temperature, and, whilst the process of uniformity is being obtained, the smaller sections have been most unduly heated. Such points as these are often the fruitful cause of many failures, and they, unfortunately, are points which are frequently overlooked, and it is here where a good furnaceman becomes invaluable. The author has found it an exceedingly good plan first to get a good initial soaking heat through the forgings, just under the "change-point," say about 704 deg. C. (1,300 deg. F.), where, if at all, little harm is done by a long heating, and then gradually to raise the whole of the forgings to the predetermined temperature.

(To be continued.)

## SCIENCE AND INDUSTRY

By M. L.

THE formation in Sheffield of the first Association of Metallurgists and the Metallurgical Chemists means more than appears on the surface. It is perfectly true that the importance of applied science in the national organization has long been recognized by all thinking men in the industrial world, and that the alliance of the two has achieved notable triumphs, but whilst one of the primary objects of the new association is, very naturally, to make that alliance more effective and to lead to a broadened outlook and a freshening of ideas, it stands, if we mistake not, for something more.

The metallurgist and the metallurgical chemist should be inseparable allies. The path they together tread is broadening to a degree little anticipated, probably, before the war, and the return of peace will quicken not retard this development —a fact that is every day becoming better understood. There are great possibilities in front of the iron and steel and kindred industries, but a full realization of them may only be secured by the maintenance of a high scientific standard and more intimate contact between the scientist and the official responsible for the actual operations in the works.

Never before has the importance of the work's laboratory been so generally recognized, with the result that the number of firms adding a staff of chemists to their establishments is rapidly increasing. But those laboratories cannot be staffed at will, especially in these days of military demands. Metallurgical chemists are not kept hanging on pegs behind the door of a labor exchange The danger is, therefore, that through the present urgent request for such men there may be a lowering of the standard of efficiency demanded in normal times, with consequent injury to the reputation of a profession that ranks high in the list. This, we fancy, is where the association seeks to come in. The only entry to it is ability, but that condition is to be insisted upon. Nevertheless, provision is to be made for a student section, which apparently will be open to every young fellow of the right stamp. The aim of the association is to lift up, to encourage study and healthy ambition, and to assist in the development of the application of science to the industries with which its members are associated.

The association will work in harmony with the Institute of Chemistry, five Fellows of which, we observe, have accepted seats on its council, and with the recently-constituted British Association of Chemists. We regard it as one of the most important developments of the Sheffield iron and steel industry and look for the formation of similar associations in other steel centres with a federation of the whole.

## MANY VOLUNTEER SHIPBUILDERS REGISTER IN UNITED STATES

WITH figures for many States missing, returns received by the United States Public Service Reserve of the Department of Labor show that 200,000 mechanics have registered as shipyard volunteers for future service in the shipyards of the country. Several States have exceeded their quotas, but they are continuing enrollments. Illinois, which more than a week ago reached its quota of 23,662, is continuing to register men suitable for work in the yards and now has more than 29,000 enrolled. New York City has passed the 20,000 mark, which was its quota, and is enrolling at an uninterrupted rate. Through the New York City office of the United States Employment Service, of which the Public Service Reserve is the "recruiting" division, has sent a number of the volunteers to yards in that section and to Hog Island, at Philadelphia.

California last week passed its quota of 11,310, the reserve officials said. Oregon went more than 400 above its quota of 3,204, and the District of Columbia has recruited more shipbuilders than were expected of it. Minnesota, Nebraska, Iowa, and New Hampshire are enrolling at a rapid rate.

# EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions Your Co-operation is Invited

## CONSERVATION OF FUEL

[illegible] that the Canadian factories economize. They [illegible] intelligent people are wondering where it will all end and at the same time these people are doing everything they can in their own homes to try and save coal. It is not a question of how many tons can be saved but of how many shovelfuls each individual householder can conserve. A few small details such as keeping the building at a temperature just warm enough and no warmer, say 65 degrees Fah., which will be suffcient, and will result in better health. Double windows, etc., can be fitted better and the furnace fittings can be made tighter and the pipes insulated, while the flues and chimneys should be kept clean.

Are the manufacturers paying as much attention to details as they might?

It seems that there are many ways of effecting economies such as selecting the firemen with a view of obtaining conscientious, intelligent men who will follow instructions and not fire irregularly—light and heavy—and who will distribute the coal evenly. Railway officials, who have spent considerable time on the general fuel situation have found that firing a boiler is a job which requires intelligence if the maximum efficiency is to be maintained because, at best, burning coal is wasteful. The boiler settings should be checked, the draft and grate area considered and the flues should be thoroughly cleaned and made free from scale without waiting for the boiler inspector to come around as these details are just as important as shovelling in the coal. How many of the manufacturers have been asked by the fuel controller to have these details attended to? Not very many. It is not the average householder who is wasteful but it is the factories and hotels.

### Plant Economies

It is a good idea to have a recording thermometer showing the room temperatures at all times and it will be noticed how soon the firemen will become interested and the fuel consumption will drop. Conditions have existed where a recording thermometer reduced the fuel consumption over 30 per cent. and this plant was an average factory. It should be borne in mind that sudden changes in the firing should not be made if the maximum results are to be obtained but any changes should be foreseen and gradually made.

Formerly it was possible to specify the brand of coal and to see that the quality was kept up by checking the various ingredients but now the consumer is obliged to take anything he can get, with the result that there is little economy obtained from selecting the different grades.

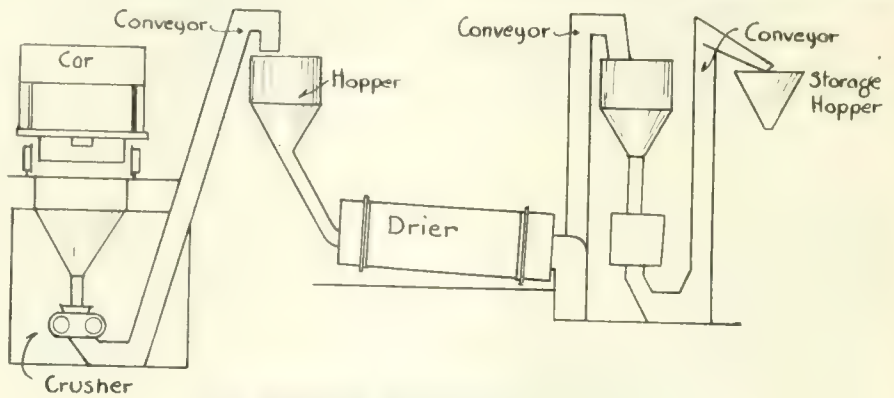
For the small plant, fuel oil is probably cheaper as it possible to control the heat with such ease that slight variations in atmospheric temperature can be allowed for and advantage taken of the mild spells by shutting down periodically or altogether. This flexibility or operation has made it possible to effect considerable saving and on account of the possibility of regulating the fuel and air with precision more perfect combustion is obtained.

The first cost of the oil compares favorably with the increased price of coal, and actual results have shown it is preferable for the small plant. No very radical changes are necessary to alter the equipment except in the drafts and brick work. The only change to the grates is the reducing of the volume of air coming down through by making a checker work of brick. A little experimenting with the different types of furnaces will very easily establish the correct area of combustion chamber, etc. The extra cost for piping tanks, etc., is quite within reason.

### Powdered Coal

The use of powdered coal has many advantages over the ordinary method of burning coal and is far more economical as every particle of coal is surrounded with the necessary amount of air to insure complete combustion.

Formerly the specifications for the quality of the coal to be used in pulverizing coal plants were rather exacting but up-to-date practice shows that if due care is given to the operation of a powdered coal plant quite a lot of latitude may be given and the results will not be impaired. Coal containing 28 per cent. volatile combustible matter is being used successfully and even poorer grades may be used. Except in the case of open hearth, puddling of bushelling furnaces, where the composition of the material being worked would be affected sulphur is of little importance, and even in these cases it is a debatable point as to whether the composition would be affected enough to matter. Moisture is absorbed very rapidly by powdered coal; it may amount to 0.01 per cent. per minute for a definite period, after which the absorption rate will diminish. Like fuel oil, if the air is preheated to say 500 degrees Fah., a saving of 20 per cent. may be effected. A simple way of accomplishing this is to pass a few lengths of blast pipe through a chamber heated by waste gases. The feed control and burner sizes are important factors in burning powdered coal. A few typical analyses of coal used in the powdered form are given:




COAL HANDLING AND PULVERIZING PLANT.

| | % | % | % |
|---|---|---|---|
| Volatile combustible matter | 33.2 | 23.55 | 35.50 |
| Fixed carbon | 56.07 | 67.3 | 55.15 |
| Water | 1.12 | 0.35 | 0.40 |
| Ash | 9.61 | 8.08 | 8.95 |
| Sulphur | 1.00 | 2.04 | 1.51 |

An idea of what a pulverized coal plant is like may be gained from the accompanying illustration which shows a permanent installation.

The total equipment necessary for pulverizing, handling, drying and milling 2½ tons per hour, which is sufficient for five forge furnaces, would cost around $60,000.

### Equipment Necessary

The coal is dumped from the car into a steel car hopper located at the end of the milling building and in a concrete pit under the track. The hopper is made of ⅜-inch steel plates, and is 8x8x6 ft. deep, with sides sloping to a square opening where the feeding conveyor is located. A slide gate can be used to control the feed. The conveyor is a 6-inch standard horizontal, U shape, and conveys the coal from the hopper to the milling room. A crusher 20 x 24 in., with two cast iron toothed rolls is capable of crushing lumps from 8 inches

to a suitable size for the pulverizer, which is about ¾ inch. The rolls are provided with a spring release in case some foreign substance should get into the crusher. From the crusher there is a boot-legged conveyor to the crushed coal bin. This conveyor is of the bucket type with 35 ft. centers and is covered to make it dust proof.

An arrangement is provided to distribute the coal uniformly in the coal bin which has a capacity of 60 tons and is reinforced 5-16 in. steel plates. The bottom is hoppered and arranged to connect to a conveyor which feeds the drier. The drier should be in a separate building on account of the liability of explosions. The drier reduces the moisture from 7½ per cent. to 1 per cent. It is composed of two shells made of heavy steel plate and having butt joints with inside lapping strips. The outer shell rotates at a speed of 6 r.p.m. and the inner shell connects with the furnace, the hot gases passing through it and at the end are carried away by a fan. The discharge goes to a dust collector which catches the finely divided particles of coal taken up during the passage through the drier. The shell of the drier is 48 in. x 20 ft. long, supported by rollers operated by spur gearing. The whole is placed at an angle and the outer shell contains helical vanes which convey the coal from one end to the other. At the firing end grate bars and ash pit doors for hand firing are arranged. The combustion chamber is lined with fire brick as is also the steel flue which connects with the drier shell.

The exhauster is belt-driven and of the centrifugal type. Provision can be made to deflect the hot gases from the drier when it is not in use by providing an auxiliary pipe connected to the fire box. The dust collector can be of the cyclone type. From the drier the coal is taken to a bin which is connected to the pulverizing mill by a conveyor. A 33-inch belt-driven vertical type with automatic feed and with a screen separator will take care of 2½ tons per hour. The pulverized coal is conveyed to a storage. Coal is taken as required to the furnaces by screw conveyors which lubricate themselves with the coal.

It is important that the pulverizing be fine enough so that the product will have at least 90 to 95 per cent. passing through a 100 mesh sieve. A relatively small air pressure is used by most people, this varies from 1 to 6 ounces, but some use as high as 10 to 15 ounces and have the mixture rotated in a mixing drum which tends to make a more thorough mixture instead of throwing the suspended coal across the furnace, and in some cases having it unburned. Some concerns use slack coal, and by first passing over a trommel the large material is segregated and the small coal sent to the pulverizer. The large coal is sent to the power house and consumed.

## WATERPROOF WHITEWASH

By B. M.

A NEW mixture has been recently introduced producing a waterproof whitewash. The influence of bichromate of potash on glue, rendering it insoluble when once dry, is made use of as follows: Dissolve 1 pound of glue in 3½ pints of water. Dissolve 3 ounces of bichromate of potash in ½ pint of hot water, and mix the two solutions. Then add enough of whiting to produce the right consistency, and apply in the usual manner. The action of the sun on the potash and glue render them insoluble and waterproof. The mixture adheres firmly to slate, glass, metal, masonry and plaster. Authorities seem to vary on the subject of the amount of bichromate of potash required to make glue insoluble; one-fortieth by weight is considered by many to suffice, in which case one ounce would suffice for 2½ pounds of glue. Again, the weight of whiting that the above amount would hold together and bind to any surface should not be more than could be carried in 4 pints or 2 quarts of water. This is a matter that the experimenter must ascertain for himself, on a small scale preferably.

Glue dissolved in skim milk becomes insoluble when dry and might serve the purpose, and 1½ pounds of the cheapest sweet oil added to 8½ pounds of quicklime while slaking makes a well known insoluble coating that is available everywhere in India. The pores of the most porous plaster are readily filled with good limewash, and, if it is waterproof, one coat well applied should protect the plaster against saturation. A thick porous wall takes a little longer to penetrate than a thin one, but it also takes so much longer to dry. An impervious outer coating renders them both equal.

The need for cheap waterproof coatings in India is brought to mind in each succeeding rainy season when the monsoon wind drives the water through our very porous walls. Although a damp atmosphere at a temperature of about 80 degrees has no bad effect on public health it is most injurious to household goods and to merchandise of many kinds, besides being destructive to buildings.

## PRODUCTION, OPERATION AND DESIGN

By M. M.

THE two main divisions in engineering activity may be described as production and operation. It is, perhaps difficult to say where one ends and the other begins sometimes, but the classification and recognition of the division is convenient. The two sections are independent in a very real sense; an engineer concerned mainly with operation must be qualified, have experience of production, although numbers of first class men engaged in production have had but scant experience of operation. The complementary division making a trinity of the engineering world is that of design. Lacking experience in any single division the individual cannot expect to be an all-round man. There are draughtsmen, for instance, lacking experience in either of the other fields, operators and producers without knowledge of the problems of design.

There is this fact certain that the severest critic of design is the operating engineer. The producer is quick to point out the difficulties of production, while the designer and operator both are concerned with the utility of the finished mechanism. It is operation, the one test of fitness, durability and purpose, which influences design in the long run. The accumulated evidence of experience which time alone affords alters details proved troublesome, and sometimes condemns product, leading to eventual redesign.

The older school of mechanics, whose output was smaller, were reared upon the finished purpose of the job; to-day production is apart from purpose and is sometimes at the sacrifice of ease of operation. It is certainly a temptation to get output at the expense of the finished job. Assembly has taken the place of erection and the small adjustments once needed, which often meant much to the individual job, are out of date.

There should be a co-ordinator of divided activity or, more properly a works tribunal, which should return a member from each division to thrash out differences. One firm leaves the adjustments to the tester, another makes limits coarser to cut out any individual adjustment needed. Manufacture and engineering skill are apart from each other although the former depends initially upon the latter.

Certainly the designer should have had previous experience in production and operation; if he has it cuts out lots of trouble in the shop. Failing this there is the expedient of the production man, with unspecified duties and the power of unlimited criticism to co-ordinate the departmental activity. Neither the designer nor the operating engineer can ever be a specialist in any narrow sense, still there is yet room for closer co-ordination in many large concerns. Whatever the system of organization, one live man is worth many card indexes, and a referee with power to settle each case as it arises, who can, with tact and firmness, bring production, operation and design into line, seems advisable. Obviously the selected individual must have had experience in all three capacities.

## METHODS OF METAL FUSION

By O. C.

DURING the progress of the world-war the scientific welder has risen to the heights of fame, for he has grasped with both hands the opportunities given him to make good in a profession which hitherto had never come fully into its own. The making of permanent metallic joints had been practised in one form or another from the remote days when the ancient craftsman pursued his task by hammering pieces of metal together which had been previously raised to welding heat. The success of the method depended largely on the skill of the mechanic, particularly as to the exactness of his observations of temperature and the conditions of the surfaces of the metal to be joined.

higher form known by the name of the oxy-acetylene process, which is the last word in this industry. The tensile strength of soft solder is extremely low; it has a much lower strength than the metals to be joined and is principally used for tin-plates, zinc, lead and sometimes brass or copper, wherever no serious strain is encountered. Riveting, brazing welding by water-gas, electric welding and thermit welding are all more or less in practice in various directions, whilst all have their respective uses. These systems are not in general use to anything like the extent of the oxy-acteylene method.

### Processes

Thermit-welding is a process specially applicable for the joining of iron and mild steel of great thickness, and has been much used for the welding of rails and the repair of large steel castings. Perhaps its greatest use has been in connection with the welding of tramway joints; but there can be little doubt that this process is destined to be much more largely utilized than heretofore.

The term "autogenous" is usually applied to welding joints by the fusion of metal in action by the flames of the blowpipe. Generally speaking, however, it is more particularly applied to the oxy-acetylene process—most commonly employed in the use of oxy-acetylene welding, which is of comparative recent date. The first blowpipes working with acetylene under pressure were made in 1901 by MM. Fouche and Picard, but since then the process has been subject to extremely rapid strides of progress and its great success has given rise to birth of other processes.

In starting to weld, the operator has one main object—to succeed in uniting metal in such a manner that its properties are not weakened or destroyed. In constructional work certain joints can only be satisfactorily made by autogenous welding, from the industrial point of view, such as in the case of certain branches to tubes, pieces for machines, aeroplanes and other special devices.

### Limitations

Considered in the light of a process whose chief function is to restore to use machinery which has broken down under the stress or strain of use or in accident there is nothing in sight to approach it either in efficiency or in economy. It is a process which, used by capable well-trained workmen with a good knowledge of the principles involved, has no rival for the perfect repair of broken metal. There are cases where the application of autogenous welding does not give results, as in the joining of a thick portion to a thin piece where it is impossible to avoid the effects of expansion; but, obviously, no expert would ever set out to achieve results which he knew from the first were unattainable. For the repair of articles in cast iron, bronze and alloys of aluminum it is often indispensable to have the pre-heating of the article followed, after welding, by a slow-cooling in order to avoid the effects of expansion and contraction.

The successful welder should naturally understand the physical and chemical properties of the products which he uses, and which can leave such effects that the strength and solidity of the joint he makes are seriously compromised. It is necessary that he should know the value of the different metals and alloys which he may have to join and the melting point of each. It is of prime importance that he study fully the questions of expansion and contraction. If the temperature of a metallic body is raised progressively throughout the mass, or is lowered in the same way, the phenomena of expansion generally has no bad effects such as breaking or deformation, since its action is uniform. This is not so when the heat is applied at one point or part of the body. The metal tries to expand at this place, and since no force can stop it, it breaks or deforms from that which opposes it. It is necessary to obviate these effects, and in autogenous welding there are numerous devices at the disposal of the experienced operator such as allow for free play in preparing the work of warming the whole piece simultaneously, heating opposing parts, artificial breaking, and the sprinkling of common water in parts to create a force of contraction to counterbalance that of expansion. The method of treatment varies with each metal, and each piece according to shape and dimensions. The effects of expansion are now more or less due to the inferior character of the metal.

It is important to note that the tenacity of various metals, however strong, becomes practically nil when raised to a temperature which is still below the melting point. Breaks on cooling are much more common in these matters than in others, and one is able to avoid them on knowing that at a certain temperature their tenacity diminishes very rapidly. The texture of the metal considerably influences the mechanical properties.

### Material Used

Another point which cannot safely be overlooked is the necessity of adding special metals in order to produce the perfect weld. The principal quality which one should require of the metal to be added is that it should be as pure as possible. Metal of the same nature could be added when there is no risk of lowering the quality of the parts to be joined, but this is not generally the case, and the addition to the line of welding a metal which is purer and better improves the holding power of the joint.

Autogenous welding can be applied advantageously in multitudes of repairs in iron and steel. It is often the only process by which fractured, deformed or worn-out parts can be re-created. The application of the process to the manufacture of material for war purposes and to the reconstruction of derelict plants during these last years of abnormal activity in Britain has been on an abnormal scale, and it has nowhere as yet been possible to form even an approximate idea of the extent to which the process has been tried. One may, however, glimpse something of the utility of autogenous welding when it is learned that one firm alone is reported to have dealt with something like ten thousand fractured machines per annum. Great strides have been made by British engineers in this industry, some branches of which Germany had made particularly her own, principally in the method of early apprenticing her youth and specially training them for a long period for the work involved.

There is nothing mechanical or slipshod about the process. It demands the very highest skill and a special course of study if the operator is ever to become a master craftsman whose work can be depended upon. Such is the nature of the business that the repaired part may be made to appear to the eye a perfect model of the original machine and yet prove wholly illusory in operation and fail to stand up to its work. Thus, it need hardly be said, it is not necessarily due to design or a desire to deceive. It simply means that the operator, in his ignorance, has failed to take account of one or other of the vital factors essential to complete success. Firms of the highest repute in the trade, knowing how deceptive outside appearances may prove, enforce the most rigid tests, and no repaired unit is allowed to leave the works until it emerges successfully from the ordeal. It not infrequently happens that the weld proves stronger than the rest of the machine, so much so that ordinary cutting tools altogether fail to make an impression upon the superfluous metal.

As the art of welding becomes better known, so its uses extend. To-day thousands of welders are engaged in helping to turn out wonderful machines and devices, from which perhaps other yet more wonderful things may be evolved.

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THERE has recently appeared on the commercial market an anti-friction alloy which is made by impregnating praphite with molten metal under hydraulic pressure. By this method the high lubricating nature of graphite is combined with the mechanical strength of the metal used, and the resulting alloy has been found to possess many desirable properties which tend to give a very promising future in the realm of mechanics. Whilst bearings made of this substance must of necessity be restricted to a limited size their manufacture forms a practical and noteworthy achievement in the great field of scientific endeavor. This substance has become known as graphalloy.

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A NEW high-speed steel has been patented by a German company. The patent specification states that the steel shall contain carbon, 1.2 per cent.; manganese, 1.2 per cent.; silicon, from 0.1 to 0.3 per cent.; chromium, from 3 to 10 per cent., and cobalt, 1.5 per cent. This material is said by the inventors to be an improvement upon a similar steel which they patented last year containing molybdenum. In its manufacture the molybdenum is omitted, and the percentage of manganese and chromium is increased.

# PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

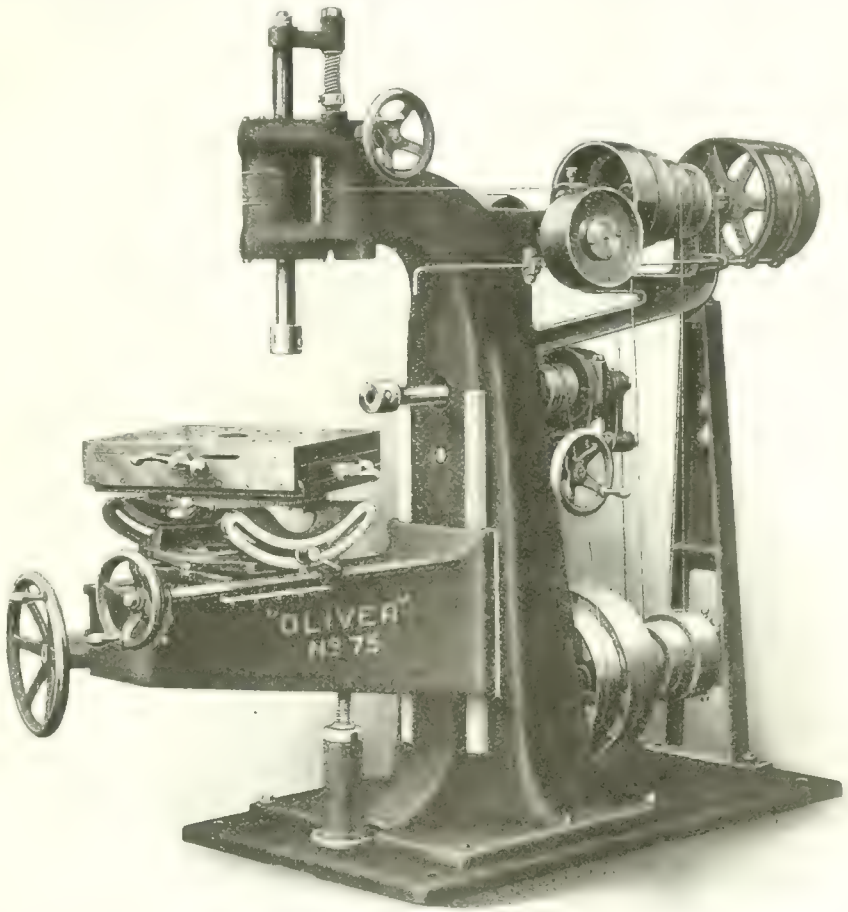
## WOOD MILLING MACHINE FOR THE PATTERN SHOP

THE machine illustrated in the accompanying engravings has been developed by the Oliver Machinery Co. of Grand Rapids, Mich., to eliminate much of the tedious pattern shop work formerly done by hand, and it is capable of as wide a range of operations as the milling machine forming a part of every tool room.

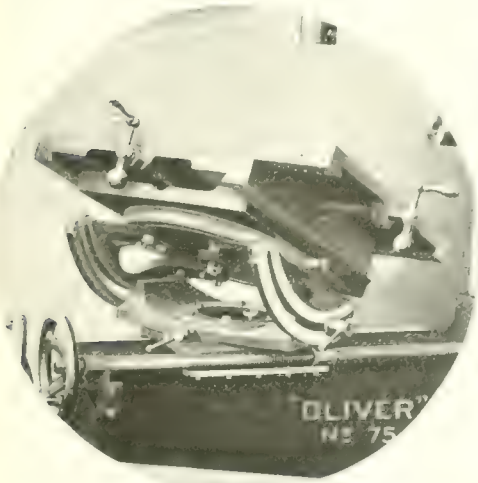
By the use of a similar dividing head gear teeth may be cut and work accurately indexed in any desired manner. Core boxes of any section may be routed out.

The table is 20 ins. square and is divided accurately in 1 in. squares by etched lines and tapped at convenient locations for attaching general purpose clamps. A 3-in. removable centering disk permits boring below the line of table without injury to boring tools. For circular work where the work revolves, two centering plugs ½ in. and 1 in. diameter respectively are furnished. The table swivels on ball bearings, full 360 degrees and at 90 degree points a positive lock operates to locate these important table positions correctly. The table tilts 45 degrees in either direction and cross-feed of table is secured by screw and ball crank lever, which may be operated from either side of table. A positive centering device locates center directly over the ball-bearing swivel center for circular work. The cross feed travel is 12 inches.

The spindles are made from high-grade high carbon stock and are accurately ground. The spindle diameter is 1⅞ ins. in sleeve with a 3 in. head for receiving cutters with No. 4 Morse taper. Both the vertical and horizontal spindles are hollow to allow the draw in rods to safely hold the fly cutter holders in place. The vertical travel of spindle is 10 in., while the horizontal spindle has 11½ in. travel. Both spindles are controlled by handwheel and spiral gear acting on a double square thread screw of large diameter. A micrometer adjustment to both handwheels permits of very accurate control of the cutting tool. Each spindle control screw is provided with a knurled brass positive stop lock nut to insure cutting to given depth. The spindles slide easily in accurately bored pulley sleeves, the construction of which is such that no belt strain whatever is transmitted to the spindle. Distance of center of vertical spindle to the face of column is 18 in., and when in the highest position it is 24 ins. above the table. Center line of horizontal spindle is 14 ins. above table at the lowest position.




WOOD MILLING MACHINE—VIEW SHOWING FOUR SPEED COUNTERSHAFT BELT DRIVE




VIEW OF TABLE SHOWING COMPOUND CROSS SLIDES, DOUBLE SWIVEL AND METHOD OF TILTING

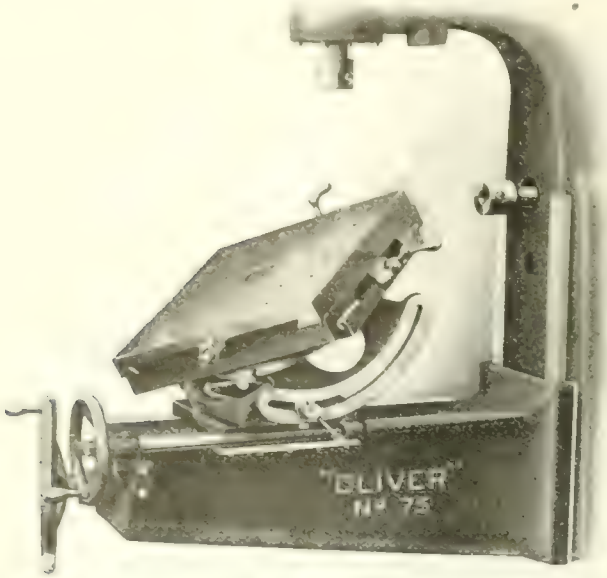
### Bearings

Both the vertical and horizontal spindles run on ball bearings of large diameter, allowing a maximum speed of 5,000 R. P. M. if desirable on certain work. The regular speeds of each spindle are 1,250, 2,000, 3,000 and 4,300 revs. per min. Idler pulleys are 10 in. diameter and 4 in. face, and are provided with ball bearings, thus eliminating all lubrication troubles of high speed loose pulleys. The countershaft bearings are of genuine babbitt as the slower speeds render ball bearings needless, and the loose driving pulley has a die cast white bronze bushing.

A box type knee is provided, closed on top to prevent chips interfering with the raising mechanism. Horizontal planed ways permit the table to travel to and from column a distance of 17 ins., a large square thread screw and handwheel giving rapid traverse. Additional support to the knee is rendered by a centrally located telescoping screw. An extra large handwheel operating this screw lowers and raises the knee for its 21 in. of vertical travel.

By using the vertical spindle work up to 19 ins. diameter may be turned by means of the revolving table. By centering the work on the table center plugs, work up to 28 ins. diameter may be turned by revolving work on table. By using horizontal spindle and revolving table, work up to 48 ins. diameter may be turned.

[illegible] spindle is used and the dividing head is tilted to suit. Two cutters are used, [illegible] front and one for the correct shape at the smaller end or back.




VIEW SHOWING TOP OF TABLE IN A TILTED ANGULAR POSITION

For spur gears one cutter only is necessary and no hand work is needed.

The machine may also be used upon soft white metal patterns in which case slower spindle speeds and proper cutters are required.

A very complete equipment of cutters is supplied and additional ones may readily be made or purchased at any time.

The scope of the work possible is realized when it is used for recessing [illegible] turning and boring, mortising and tenoning, and other pattern shop operations.

The machine can be fitted for either countershaft or motor drive and in the latter case a 5 h. p. motor is required.

## HIGH-DUTY 25-INCH LATHE

THE illustration shows a 25 in. double back-geared lathe fitted with semi quick change gears, built on a 10 ft. bed. This lathe is also built in the quick-change gear style and beds are available in from 10 to 20 ft. lengths.

The bed is made with heavy double wall cross girts, spaced two feet apart, forming a rigid construction. One large way is cast on the bed in front, and one small way on the back. The ways of the bed are cast with a 20 per cent. steel mixture, providing a very hard metal for the carriage bearing, thus the wear which takes place will largely be confined to the carriage where it will not imperil the accuracy of the alignment.

Large bearing surfaces are provided for the carriage, the front V being 3 ins. in width and the rear one 2½ ins. The carriage bridge is also of ample depth and is 10 ins. wide; the length of the carriage is 3 ft.

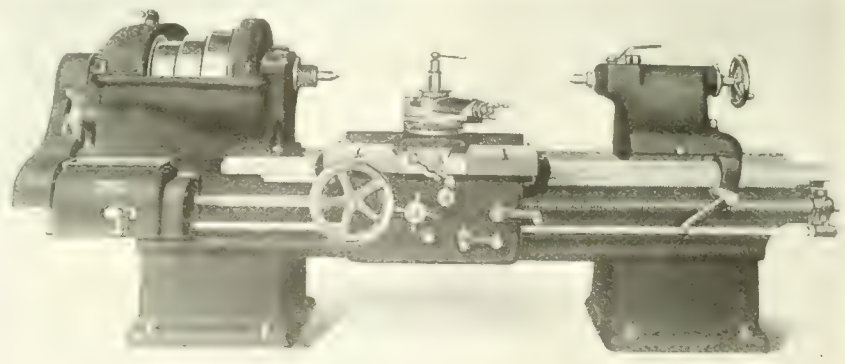
The compound rest is of a rigid design and the swivel is made completely circular. Full length tapered gibs are provided on both the cross and compound rest slides and are placed on the negative side where they will not receive the thrust due to tool pressure. The compound rest travel is 5 ins.

The tail stock spindle is 3 ins. in diameter and is provided with a positive clamping bolt.

The head stock is of the closed type with ample phosphor bronze boxes carrying the main spindle which is provided with a 2 3-16 in. hole.

A double apron is provided for the carriage giving double bearing to the gears and is grooved, pinned and bolted to the carriage. All the gears in the apron as well as those in the gear box are of steel.

The lead screw is made of 40 point carbon steel and is 1 11-16 ins. diameter. It is turned from ground shafting and is fitted with a two pitch thread. The quick change gear mechanism forms a complete unit mounted on the front of the machine. It provides a wide range of threads and feeds, all of which are listed on a reading index plate above the tumbler lever.



25-INCH DOUBLE BACK GEARED LATHE FITTED WITH SEMI-QUICK CHANGE GEARS

## A NEW END SUCTION CENTRIFUGAL PUMP

A NEW design of pump manufactured by the Wheeler Condenser and Engineering Co., Carteret, N.J., is illustrated herewith. This pump is of unusual interest because of the unusual position of the suction opening which is directly beneath and parallel to the end bearing. In this position it is out of the way, yet in a convenient place for the erection man for inspection and for upkeep.

This arrangement makes it possible to place a pumping unit in a room of small ground area—considerably smaller than where the suction end is opposite the outlet end as is the most common practice. In many cases this also facilitates the making of pipe connections, sometimes saving elbows and reducing the length of piping more or less.

The capacity of the particular pump shown is 45,000 gals. per min. against a head of 20 ft. The diameter of the outlet pipe is 36 inches. The speed of the pump is 240 r.p.m., and it is coupled by a 10 to 1 reduction gear to a steam turbine whose speed is 2,400 r.p.m.

## GAS FROM STRAW

THREE Prairie Provinces in Canada produce every year 20,000,000 tons of straw. This straw is at present regarded as having no commercial value and is burned. A retort has recently been invented in which the straw is carbonized and thus decomposed into combustible gases, tar, and ammonia. A number of experimental plants have been made, and it is hoped to get them installed on a certain number of farms during the present winter. The gas thus obtained will be utilized by the farmer for purposes of lighting, heating and power, thus producing useful fuels from hitherto waste material.

The retort is made out of highly refined steel and is designed in such a shape that the gases are removable in a very short time; it is also designed for individual use on the farm and is of small dimensions. It consists of three oval cylinders 7½ feet long, with a major axis of 24 inches and a minor axis of 6½ inches, the retort being enclosed in a metal or fire-brick casing with a fire box below. With a scrubber and a gasometer the total cost including installation is expected to be $500.

The straw, compressed into bales the size and shape of the retort, is placed in it, the doors are shut by a clasp, and straw burnt in the fireplace below. After the operation when straw is used as a fuel, a certain proportion of the gas given off is used for the purpose of the carbonizing process, about 30 per cent. of the total volume of the gas being

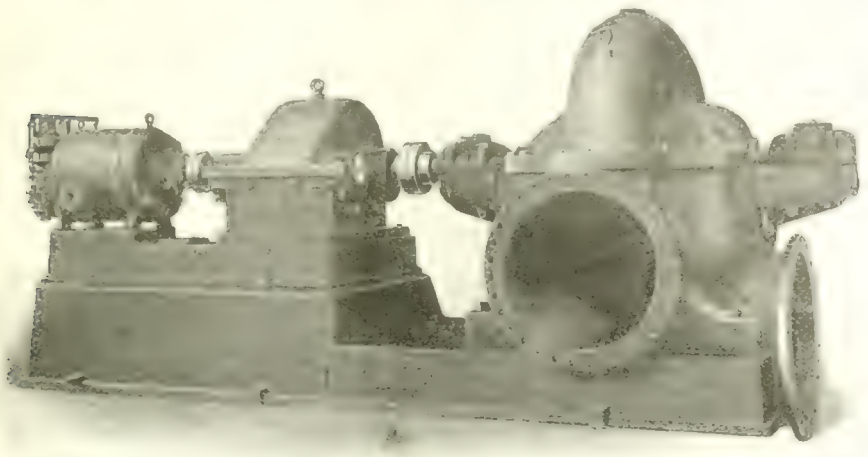
...ized in this way. The gas begins to come off at a temperature of 200 deg. C. and reaches its maximum between 500 and 600 deg. C. All the gas may be removed from the straw in about 30-45 minutes, rapidity of operation being an important factor from a commercial standpoint.

Each ton of straw produces between 11,000 and 12,000 cubic feet of gas, the quantity and the quality of gas varying slightly from different kinds of straw. The gas after generation in a retort passes into a scrubber (this being a metal cylinder 4 ft. long, by 18 or 20 ins. diameter), and thence into the gas container or flexible bag. If the gas is washed and purified so that the volume is reduced to 10,000 cubic feet, and, as stated above, 30 per cent. be utilized in carbonizing a ton of straw, there would be a surplus of 7,000 cubic feet for every ton of straw carbonized. The calorific value of straw gas is approximately 400 B. T. U.'s per cubic foot, so that one ton of straw would contain 1,000,000 B. T. U's. In this country we reckon that about 250 feet of coal gas is equal to one gallon of petrol, and the thermal value in B. T. U's of a gallon of petrol is calculated in the States at approximately 114,000. In this country we give it a higher value. Taking 7,000 cubic feet as the net output from a ton of straw, the heating value of the gas from that quantity of straw would be 2,800,000 B. T. U's, which can be taken as equivalent to 25 gallons of petrol.

From every ton of straw there is obtained between six to eight gallons of tar and ammoniacal liquors. This tar in its crude state would pay for the cost of baling the straw, which may be approximately put down as 4s. 6d. a ton, so that the farmer would have his fuel prepared ready for use at the cost of hauling it from the field to his retort. The carbon residue, of which there is about 600 pounds to a ton of straw, would find a ready sale as lamp-black.

As indicative of the importance of the scheme in the U. S. A. or Canada it may be mentioned that on the 20,000,000 acres which are cropped annually in the three Prairie Provinces of Western Canada only, assuming a yield of one ton of straw per acre, there is a total yield of straw of 20,000,000 tons. Allowing for washing and purifying and for the use of about 30 per cent. of the gas for the purpose of carbonizing the straw, there would be procurable 140,000,000,000 (one hundred and forty thousand million) cubic feet of gas, which may be taken to be equal to 22,000,000,000,000 (twenty-two million million) h.p. hours.

V. R. O.



STEAM TURBINE DRIVEN CENTRIFUGAL PUMP WITH END SUCTION ADAPTED TO CONDENSER PRACTICE

## MAKING MATERIALS PAY

THERE seem to be solid grounds for believing that the German Government has selected its expedient for raising revenue to pay for the war. Without foregoing hopes of indemnities, it has accepted the certainty that large obligations will have to be met by taxation. Desperate diseases justify desperate remedies, and the Germans are not counting upon profits tax, income tax, or Customs duty to get them out of their difficulty. The favored remedy is more heroic, being nothing less than 30 per cent. impost upon raw materials. Metals, coal, oil and textile fibres of home production will be made to yield one-third of their value upon the average to the State, and in this way it is hoped to raise towards $500,000,000 a year.

The decision, when it is finally ratified, will have interest in relation to international trade, for we may assume that the burden cannot by any means be confined to goods for home consumption. The system adopted will severely handicap German industry in foreign competition for a few years, but it will provide for a fairly early release, when it is no doubt hoped that German export business will leap ahead.

Britain, for instance, will have a dragging financial burden to impede its trade movements, however the weight be distributed and irrespectively of whether one means or another is taken to discharge it. The British have a better ...than the Germans if ... the weight by imposing taxes upon raw products, if that course should seem best, and it is manifest that German action in that regard ought to influence their decision.

Nobody likes taxes upon the raw products of his industry, but the choice lies between evils, and a great deal is to be said for any system that promises to be severe but short as against systems nearly as onerous which are interminably long. The enemy's action lends a decided impetus to proposals for putting the cost of the war upon the price of raw materials.—M. L.

IN a paper read before the Society of Automobile Engineers by E. H. Sherbondy some interesting facts relating to the design of aeroplane engines were brought forth. The number of cubic feet of mixture which they will handle per minute is recognized as being one of the most important features of design. The mean effective pressure arrived at in the Sunbeam engines is within 15 per cent. of the theoretical maximum that is possible, while there may be some improvement secured in the future in the matter of horse-power weight efficiency by further refinement in the mechanical construction. The author believes that it is now necessary to make some change in the cycle of operation. This should be a splendid opportunity to try out supercompression and super-charging schemes of one sort or another. Possibly the two-stroke cycle engine, with its maze of new problems, stands as an opportunity, says the author.

THE Bessemer process for the making of steel was the starting point of the steel industry of the United States, according to Mr. J. G. Butler in an address before the American Iron and Steel Institute. The idea of removing carbon and silicon from blast-furnace iron in this way was undoubtedly first conceived by an American, although he failed to develop the machinery for its use, and, as a consequence, reaped very little benefit from it. When William Kelly, who first decarbonized iron by means of an air blast in a furnace he had erected for that purpose at Eddyville, Kentucky, about 1850, came to file his claim for a patent in 1856 he found that Henry Bessemer had filed similar claims, and had been granted patents a few days previously. Kelly had worked for years on his scheme, which was identical in principle, but he had not yet made it a commercial success, and did not attempt to make steel in that manner. Nevertheless, his use of the pneumatic process first was not disputed, and he was granted an interference as against the Bessemer patent.

ALLOYS of from 57 to 63 parts of copper and the balance of zinc are used in the extruding process for making rods, tubes and shapes and a mixture of approximately 50 parts of copper and 50 parts of zinc has the highest content of zinc the alloy may contain and be workable.

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## WHY NOT INDUSTRIAL CONSCRIPTION, TOO?

IF it is right and proper that an administrative order-in-council should be passed "to prevent persons capable of useful work from remaining in idleness at a time when the country most urgently requires the services of all human energy possible," then it should not be a difficult matter to develop the principle involved to a point where not only idle energy but energy already engaged in more or less selfish pursuits will also be harnessed to the war team of the country.

The embargo which is at present under consideration might very well turn out to be a bird of a different feather and in addition to being a remedy for disturbed financial equilibrium, it may easily become a means of directing much industrial effort toward winning the war instead of piling up private profits.

If there is really need of "all human energy possible" the country should be willing to forego much in the way of private and public habits involving ostentatious display or the gratification of personal pleasures.

The cry will no doubt go up from some quarters that preparedness for future conditions necessitates the continuance and development, if possible, of numerous lines of manufacture which are not essentially war winners.

In this respect some neutrals have suffered much and gained nothing. With their food supply controlled and regulated in proportion to their least possible requirements, with embargoes on much of their distinctive national products, markets gone, raw materials vanished and tonnage pre-empted, these world waifs have felt, to a degree unthought of here, the buffetings of fortune.

How, therefore, can there be any valid reason for not controlling industry in addition to individuals?

There are many firms who, all things considered, are better off now than they expected they would be, whose products are not essential to the winning of the war, but who by reason of war-time prosperity are reaping large profits. Much of their profit is from trade due to the disbursement of war funds, and a considerable proportion of these same profits is finding escape from war taxation by expenditure on plant.

The individuals aimed at by the order-in-council are, most of them, doubtless subsisting on resources which existed before the war. They have to pay their income tax and cannot evade it by changing their profits into plant. They are not making profits from other people's labors and if their personal expenditure is at a minimum it is probable that government loans already have a large proportion of their surplus.

If the man who fails to work voluntarily is to be called to work under compulsion, why should not the firm which thrives on war-time extravagance also have its efforts directed to more necessary work?

## A DESIRABLE DEVELOPMENT FOR CANADIAN INDUSTRY

THE extent to which Great Britain's industrial awakening may develop is indicated by the announcement that Manchester School of Technology is to have a lecturer in Industrial Management. It is stated that through the beneficence of several large public-spirited firms in the district sufficient funds have become available to maintain the position for a period of five years.

The salary mentioned for the position, viz., $3,000 a year, should be ample to secure, in England at least, a party of suitable experience who is to organize a department of industrial management, conduct research work, lecture and assist business houses in the solution of management problems.

A significant feature of the development is the intention to offer sufficient remuneration to managers, directors and scientific experts to induce them to lecture on their experiences so that the department will maintain a healthy contact with actual practice.

The reputation of Manchester as a centre of export activity will cause the development to receive close attention in all parts of the world. Much of the efficiency effort and management discussion available at present to the anxious student is the product of personal specialization in restricted lines. The views, opinions, advice and ideas of men who have kept Britain's trade in its present unique state will be awaited with more than ordinary interest.

## COUNTERING THE ALIEN MENACE

AT the invitation of the Secretary of the Interior a national conference has been held at Washington for the purpose of considering the national plan of Americanization projected by the Department of the Interior.

The activity of the department is aimed directly at the anti-American propaganda among aliens which is mostly conducted in industrial plants.

Those present at the conference included the governors of the States, the chairmen of the State defense councils and about three hundred presidents of corporations and chambers of commerce along with other industrial leaders.

"English, the language of the United States," is the encouraging slogan adopted by the authorities and an appropriation is asked on behalf of the United States Bureau of Education for the purpose of rendering financial aid and other assistance to the States joining in a concerted plan to Americanize the many millions of foreign birth who are engaged in the industrial and commercial activities of that country.

The presence of prominent industrial men at the conference should give the event special importance in the eyes of our Canadian manufacturers. The manner in which alien labor has been allowed to fatten on war contracts is already notorious and the subtle influence of Teutonism may well have future trouble in store for Canadian firms if counteractant steps are delayed beyond the present favorable moment.

Alien exclusion after the war may become a fact, but that will not alter the point of view of present aliens who have prospered as never before and whose presence here in the future may not be desirable, let alone conducive to stable labor conditions.

ONE of the biggest difficulties connected with the quantity production of ships is the question of rivet driving. An idea of the task may be obtained when it is said that if a concern were to build one ship a week, a weekly number of 650,000 rivets must be driven. When we consider that the best rivet drive is by a company which drives 250,000 per week, and the next best is by the three largest shipyards on the Atlantic coast, the magnitude of the task involved in driving 650,000 rivets in one week may well be imagined.

# MAN'S OWN EXPERIENCE IS WORTH A LOT TO HIM

**H. L. Treat is Production Superintendent for T. McAvity & Sons, Ltd., of St. John, N.B.—His ideas are worth considering.**

THE shipbuilding industry is pulling men east and west. It is also pulling them from the south. That's how it happened that Harry Lee Treat is connected with the T. McAvity & Sons, Ltd., of St. John, N.B. He has made a success of the munitions business, and was early in it at a time when a great deal that is now accepted fact was in the experimental stage.

Mr. Treat graduated from the Middletown High School, in which town he was born. He started as an apprentice with Messrs. Pratt & Whitney Co., of Hartford, Conn. Soon after he completed his training he developed a special aptitude for tool and experimental work, holding a series of positions with the Royal Typewriter, Noiseless Typewriter, and Bryant Electric Co. He also spent some time designing tools and fixtures with the Singer Mfg. Co.

HARRY LEE TREAT

### In the Munitions Business

Mr. Treat was called on by the Ansonia Mfg. Co. when they started the manufacture of munitions. There was little or no precedent to go by in those early days, neither had the technical papers started in with their splendid work of explaining the making of shells and fuses. It was a case where individual initiative alone could solve the problem. To this work of laying out and designing special machinery and tools, Mr. Treat devoted his best energy and training, and he succeeded.

It was about two years ago, early in 1916, that Mr. Treat came to Canada, joining the McAvity Co. staff as production superintendent, which position he still holds. He has always taken a keen interest in sports, holding city championships several times as a bowler. Baseball owns him as an ardent supporter, and basketball is also a favorite. Much of his interest in sport has been in connection with the Y.M.C.A. in the various centres in which he has lived.

The McAvity people have consistently developed along sane and legitimate lines. They followed the increased demand with increased facilities for turning out the work.

Mr. Treat has very pronounced views of his own regarding the chances of the mechanic for advancement to the better positions in the industrial world. "A young man," said the St. John man, "has simply got to gather his own experience. That sort of training is, after all, the most valuable. He must, as he goes along, sift out the worthless—for after all, one is bound to meet with considerable of that. After a man gets his start and experience he can decide what line is his channel. Let him take the work that interests him, and then go ahead and stick to it. Jumping around from one line to another seldom gets a man anywhere. A man is never educated," continued Mr. Treat, "in fact life is a perpetual education to the man who will keep his mind open, and never allow himself to get to the point where he thinks he can learn no more. Keep in touch with the technical and trade papers. There are excellent opportunities presented in them. If mechanics would use the staffs of the technical papers more they would find many problems easy of solution. It is a good thing for a mechanic to get a problem of his own under discussion in these papers. In that way he can bring to bear on it the experience and opinions of other mechanics who may have encountered and mastered the same point. In brief," concluded Mr. Treat, "the man who succeeds can never quit picking up new points. They are coming out all the time, and there are lots of good ones in the list."

# INSURANCE COMMITTEE WILL DISCUSS THE RATES

**C.M.A. Insurance Department Will Consider Best Methods Of Dealing With Situation Caused By Increased Rates**

The insurance committee of the Canadian Manufacturers' Association will be called together soon, probably this week, to see what attitude they will take toward the increase in insurance rates which have been announced. They apply most directly toward the munitions plants, especially those that are working overtime on their orders, and the longer the period of overtime the higher the proposed increase in the rates will be. John A. Robertson, secretary of the Canadian Fire Underwriters' Association, claims that war conditions, increased cost of labor and conditions, the consequent spread of losses and the decrease of reasonable profit on the business have all worked toward making the higher rates necessary. Dwelling places, risks protected by automatic sprinkler devices and a few other special classes will not be affected by the increases. Factories working through the full 24 hours will be most severely fined by the new schedules as an additional charge of 50 per cent. of the basis rate will be imposed in all such cases. Shell factories will suffer the most severe increase, according to Mr. Robertson, as the basis rate has been increased from 2 per cent. to 2.25 per cent., with 1.12 per cent. added if they are operated all night, making a total premium of 3.37 per cent.

A representative of the insurance department of the Canadian Manufacturers' Association in speaking of the matter to CANADIAN MACHINERY stated that it was certain there would be little change in the rates announced. Much of the business done now is restricted to the operations of Canadian and English companies. This came into effect some time before the United States entered the war, the idea probably being at that time to prevent information leaking out about what was going on in the munition plants of Canada. The insurance men have picked out the class of risks that have not been paying their way, and the added assessment goes to them. There is apparently no chance of trying to raise sprinkler or fireproof risks, as according to the C.M.A. official, the independent companies would be too keen to come in and bid for this preferred class of business. Of course, he concluded, the insurance men are in the position of being able to sell insurance or let it slide. You can't force them to take a risk at anything but their own figures.

CANADIAN MACHINERY discussed the matter with several large munition men in Toronto but in very few cases will the rates be operative, as the plants are well protected by sprinklers, hydrants and other appliances. They have worked in close touch with the underwriters and consider that there is a very low risk in their plants, considering that the danger from the malice of foreigners has been reduced to the minimum. Despite any ruling, there is considerable United States mutual insurance on many of these plants.

# Dealers Announce Ten Per Cent Drop In Prices of Steel Plate--U.S. Speeds Programme

Pittsburgh Reports Improvement in the Production of Coke and Ore—U.S. to Turn Out Tankers to Store Oil to Fleet—Some Fluctuations Noticed in the Price of Non-Ferrous Metals.

The [illegible] have been looked for in prices of steel plates. Canadian buyers have taken definite [illegible]. Plates ¼ to ½ inch, are now listed at $5 per hundred pounds, a drop from the $10 mark. Heads and tank plates have also followed this lead and are selling at a range of [illegible]. Slight fluctuations are also noted in some of the non-ferrous lines, and as a result slightly lower prices are given. Supplies are not arriving in any faster order. This refers especially to the tin situation. Although certain prices are quoted for tin they are not adhered to, for the reason that the seller of tin is almost in a position to name his own price and pick the sale he desires.

United States mills are covered with orders apart from the government work, which has precedence over everything else. An estimate places this volume of business at twelve million tons. Just what amount of it is still to be regarded as real business is problematical, as much of it has been on the books at the rolling mills for months. Indications are for an improvement in the supply of the basic metals as outputs by actual performance of iron ore and coke are showing a steady improvement.

United States is preparing to turn to the concrete oil tanker to solve the problem of dealing with the carrying of oil for supplying its merchant and war fleet, and work is under way on the construction of a number of these poured-to-order boats.

Business is brisk in the machine tool trade. There are some Ontario inquiries about equipment for plants that will handle the larger shells, the 9.2. Dealers in machine tools are not keen to take on any more stock just now as their sheds are well filled. Unless they see a ready sale they are not quick to buy. Business remains good in supplies, there having been an exceptionally heavy run on high speed goods.

## CONDITIONS NOT FAVORABLE FOR SPEEDY COMPLETION OF STEEL MILL

Special to CANADIAN MACHINERY

MONTREAL, Que., April 8, 1918.—Industrial conditions have become more settled following the announcement that the steel situation will remain practically unchanged during the ensuing three months and possibly longer. The near approach of spring and the opening of navigation promises to relieve the transportation problem, but the requisition of many lake boats for ocean service will undoubtedly disorganize the inland tonnage to some extent. Montreal harbor officials intimate that the port will likely be open on or about the 27th of the present month, as prospects look good for the clearing of the river by that time. Some difficulty is expected in obtaining ample tonnage for maximum requirements. Future fuel supply has been under consideration by the Government, and on recommendation of the Advisory Council for Scientific and Industrial Research the Federal Government, in conjunction with the Provincial Government, has decided to erect a plant in the Province of Saskatchewan for the production of high grade domestic fuel from the lignite in that locality. Steps are also being taken to develop the peat bogs of Ontario for use as merchantable fuel. Steel conditions have become more stable following the reaffirming of fixed prices. Metals are unchanged, with tin developing an acute tone. Demand for machinery is comparatively light, but general business is steady.

### Steel

Despite the fact that some sections of the trade were looking forward to lower levels in the prices of steel products, the situation at the present time would appear to indicate that existing conditions will prevail for at least three months, if not longer. The relative stability of the market, particularly in the States, was manifest recently in the attitude of the American Government in renewing the prices that have governed the transactions during the winter months. With few exceptions these quotations have been recognized as a fair basis for present operations. The changes that were effected were made more to balance up the general situation than to alter the tendency in any particular commodity. While lower prices are not unlikely on the Canadian market, it must be remembered that conditions here are governed very largely by those prevailing in the States, especially in those lines that are not extensively manufactured in Canada. The greater volume of present business is for steel for munitions; Allied Government demands for shell steel are exceedingly heavy and British inquiries for upwards of 300,000 tons of steel plates has recently been reported. Some curtailment of domestic business in rails and structural materials is anticipated to meet the export requirements for shell bars. The steel situation has become increasingly acute owing to the recent heavy contracts placed by the American Government for freight cars, involving 1,000,000 tons of plates and 25,000 tons of shapes, so that ordinary contracts are incidental to present developments. Standardization in car construction is a feature of present activities; this, while tending to maximum output, has the tendency to disturb the market in certain car specialties. War needs are the dominating factor, and Government requirements are approximately 75 per cent. of total mill production. Although the establishment of a Canadian plate mill has been definitely settled, it will have little bearing on the existing market, as it will be impossible to have this plant on an operating basis inside of eighteen months. Every facility will be supplied for the securing of the necessary structural material and equipment, but present market conditions are anything but favorable for the speedy production of such a large undertaking. Dealers report a little easier situation and state that shipments are coming more regularly owing to the freer movement on the railroads; freight congestion is less pronounced, but in some instances difficulty is still experienced in tracing material in transit. Quotations generally are very firm and no changes are reported.

### Metals

The market in general is featureless, and with the exception of tin no developments of special interest are reported. Shipments from source to destination are more regular, and plants are suffering from non-delivery of material. Copper maintains its steady tone, with interest centred in the possible attitude of the War Industries Board towards prices for the ensuing period. Tin is still the dominating factor in metals owing to the continued difficulty in getting shipments through from England. Spelter is firmer. Lead is dull and inclined to weaken. Antimony and aluminum are firm and unchanged.

**Copper.**—The copper situation is undisturbed by the general trend in other markets, and is less affected than any

other. The present fixed price appears to operate with entire satisfaction, although reports from certain quarters would indicate that a higher price should prevail. One point that apparently favors higher prices is the gradual increase in the cost of production since the establishing of the existing set price. It is anticipated that when readjustment is considered prior to June 1st that small refineries at least will be given additional inducement for greater output at reasonable profit. Dealers here report a fair business at the quotation of 29c and 30c per lb.

**Tin.**—Recent developments have not been conducive to the relieving of the tension that has been so pronounced in the tin situation during the past couple of months. The shortage of metal has become additionally acute owing to the cutting off of much of the metal through Dutch sources. The seizure of Dutch vessels by the American Government has been a factor closely allied to the tin situation, as Holland is reluctant to permit steamers to leave Batavia for the United States. The danger is not so much in the further seizure of the vessels as to the possibility that Germany may exercise particular care in sinking these boats. This action has, therefore, added to the difficulties of getting ample supply for early future operations, and the situation at the present time is none too encouraging. The market in the States is very strong, and the situation here is very firm and likewise uncertain. Last week's prices are, however, maintained, and selling is confined as far as possible to essential requirements. Dealers are asking 98c per lb.

**Spelter.**—A little better tone has developed in spelter, and those dealers who were so anxious to sell last week are less prominent on the market. The undertone is undoubtedly stronger, and it is not unlikely that a little strength may develop from the present activity. New York prices, while lower than those of a week ago, are firmer than during the past few days, and further strength is indicated by present interest. The market here is unchanged at the quotation of 10½c per lb.

**Lead.**—Slightly lower levels are reported on the New York market owing to the light demand for home consumption. Concessions offered by producers create little additional interest. Government consumption is very heavy and shipment to England has recently been excessive. The weaker New York market has had a similar effect locally, but prices so far are unchanged; dealers quoting 10c per lb. on a quiet but steady market.

**Antimony.**—The situation is firm and prices are unchanged at 17½c per lb.

**Aluminum.**—The market is steady and with a slight undertone of strength. Prices asked are firm at 55c per lb.

### Machine Tools and Supplies

Another quiet week has been experienced in the machine tool industry here in Canada, although the abnormal activity still continues in the States; so much so that dealers here requiring equipment from American centres are uncertain of obtaining delivery within specified period, owing to the possibility of the American Government prohibiting shipment of machinery that is urgently needed for home use. Canadian manufacturers are fairly active and orders for general equipment, thought light, are comparatively steady. Business in small tools and supplies is reported good and prices on all lines are firm and unchanged.

## POINTS IN WEEK'S MARKETING NOTES

**The tendency toward a lower price for steel plate in Canada has this week found evidence in the listed prices showing a drop of 10 per cent. Lower levels are also asked for spelter, lead, antimony and aluminum.**

—

**The transportation condition continues to show improvement, although there are many evidences still in existence of the serious blockade during the past few months.**

—

**United States steel mills have orders to roll over 12,000,000 tons apart from war business. It is hard to say how much of this remains as real business, as much of it has been on the books for some time.**

—

**Reports from industrial centres in U. S. and Canada show a better feeling than for some time. Several embryonic strikes have failed to take form.**

—

**Pittsburgh reports indicate a decided improvement in supplies of coke, pig iron and finished steel, the change in condition, it is claimed, being quite noticeable.**

—

**The output of U. S. tonnage for the month of March fell below the outlined programme to the extent of 31,000 tons. Builders are urged to speed their work, regardless of expense.**

—

**Experiments will be made with concrete tankers for oil carrying, to serve the U. S. merchant and fighting fleet. On completion, the concrete ships will haul the Mexican oil output.**

—

**More regulations, aimed at restricting the supply of steel and steel products to war industries, are expected. President Wilson has been considering this matter for some days.**

—

**The output of steel in U. S. increases, but it does not keep pace with the rapidly-increasing demand.**

### Scrap

Activity in scrap materials is less pronounced than last week, and the market is inclined to dullness. This development has arisen from the want of unity between the holders, the dealers and the consumers. With the dealers' commission removed they are operating under difficulties that do not tend to the betterment of existing conditions. Under the circumstances many consumers are covering their immediate requirements only in the expectation that the situation will become more stable in the near future. Dealers report an easier tone in machine composition, but last week's quotations are still in force. A little heavier demand for brass scrap has added strength to this particular line, but prices asked are unchanged.

## PRICES OF PLATE REACH LOWER LEVEL

**Jobbers Able to Strike New Average by Better Buying at the U. S. Mills**

TORONTO.—It has been intimated in these columns for two weeks past that there was a decided tendency toward an easier price on steel plates and kindred lines for the Canadian buyer. This has now become an accomplished fact. For several weeks past dealers have been willing to accept what they termed desirable business at about ten per cent. off the price that was accepted at list. They did not come to the point though where they would put the figures down on the list until to-day. Plates, ¼ to ½-inch, eased off from $10 to $9. About the same thing happened in several other lines. Heads went from $10.25 to $9.25, while tank plates, 3-16, are quoted at $9.10, as against the old price of $10.10, which has stood for some time.

Local dealers explain the situation this way: Some months ago the Canadian jobbers stocked up at prices much in advance of what prevails in U. S. at present. Orders were rolled for them while the U. S. was contemplating the setting of prices. When the announcement was made of the new scale of prices it was [illegible] with high price material. The present downward tendency is really a relaxation on the part of the jobbers, and cannot be accepted as indicative of a similar move on a wider scale or for more basic reasons. Stocks that are being brought into the Canadian yards at present have been secured at a lower level, and this is having the effect of allowing the jobbers to strike a lower average scale. They have realized for some time that it was necessary to work toward a lower level for the sake of the Canadian consumer. The only way that this end could have been arrived at more quickly would have been for the Government to take arbitrary action that would have had the effect of breaking the jobbers.

Boiler tubes are short, and it is expected that there will be very little improvement in the situation. The Government of course has first call on all the stock that is produced. It is expected that it will be well on into May before there

[illegible] in the outlook, and [illegible] will only be very gradual.

Slightly lower tendencies are noticed [illegible] non-ferrous metal markets. No [illegible] reason can be ascribed for this. Spelter, lead, antimony and aluminum are all breaking away from the level of [illegible] weeks, aluminum going from $52 to $50, antimony and spelter each a dollar off, and lead 50 cents.

### Iron and Steel

With the easing in prices for Canadian trade now an accomplished fact it is expected that business will move more rapidly. The plate market is an interesting one, and the new avenues that open for business are interesting. "Whether from the increase in the amount of war bonds or other securities of a similar kind being held in the country," stated one dealer to CANADIAN MACHINERY to-day, "there is a bigger demand than ever for safety deposit boxes. Of course this means that there is a corresponding demand for the steel plate to make them. This refers to several of the smaller sizes, and it looks as though the demand would go on increasing."

### Machine Tools and Supplies

Business is brisk, deliveries better and trade generally satisfactory. The fire in the shipbuilding plant in Toronto caused a big demand for certain lines in replacement. High speed drills were bought in large quantities. Certain lines of tool holders are scarce, and the demand for B. & S. oil pumps is so persistent that deliveries now range from three to four weeks off. Shell plants keep the supply houses busy. There has been a stronger demand than usual for nose threading hobs. As a result certain sizes in these are getting to be scarce. The larger sizes, those that would be used for the 9-inch shell, are nearer the bargain counter than any others at present. Rumors of 9.2 orders are current on the street to-day, and some of the machine tool houses reported that there had been Ontario inquiries concerning the placing of the necessary equipment for the manufacture of this line. Local dealers are pretty well stocked up with second-hand machinery, and unless there are prospects in sight for a quick sale they are not keen on taking in much of this class of equipment. There is plenty of second-hand machinery offering at present, one dealer saying that it had been a long time since such an amount and range had been placed at their disposal.

High speed cutters seem due for a rise, possibly the usual ten per cent. The advanced price has not been actually listed yet, but it has been charged on several orders that were delivered in Toronto to-day, and it seems likely that this indication will be confirmed on the quotations.

The warehouse business has bright spots and dull ones, too, at present. Trade in bars and small shapes is good. Deliveries for this class of work are also showing an improvement, but such a thing as rolling plates for warehouses is out of the question at the present time, with the result that this section of the business can be said to be almost at a standstill.

### Non-Ferrous Metals

TIN. Tin prices are uncertain, even though quoted. There is virtually no such thing as an asking price for tin, as the values named are either bid prices or a mere appraisal. "The man who has tin to sell does not need to pay much attention to any price that is quoted in the market reports." That view, the opinion of a leading Toronto dealer, seems to sum up the situation pretty well at the present, and it is not risking much of a guess to believe that the same thing will apply for some time to come. Prices are quoted, but they are not adhered to. It comes right down to a point of bargaining between the man who has the tin and the man who wants it, and between them there is always present the man from the Government who has the right to step in and take the article.

LEAD.—There are no features of outstanding importance in the lead market. Business moves a little more slowly, the demand being less keen. Toronto prices to-day showed a drop from $9.50 to $9.

ANTIMONY.—Local dealers quote a lower level to-day, placing the mark at $16, which is a dollar off the price that has stood for some weeks.

ALUMINUM AND SPELTER.—Both these metals have felt the downward trend, and the latter is quoted to-day at $10, while for aluminum $50 is asked, against a previous fifty-two mark.

Little credence is given to the report published some days ago that nickel prices had been fixed. The whole output is well in the hands of the Government, as the International Nickel Co. is working in close harmony with the Allies. There is no need for a fixed price.

TUNGSTEN.— Increasing output is promised. Near Falcon Lake, east of Winnipeg, deposits of tungsten are reported. Denver reports point to one big mine yielding more than 100 one-ton tram cars of crude per day. Other mines are opening and showing satisfactory results.

### Scrap Metals

No price changes are recorded in the scrap metal market this week. Business remains within the smaller scope brought about by reason of the embargo remaining in force. Dealers in Toronto declare that they see no chance of a change in the situation. It may be that the American situation is being reflected in the Canadian trade. In U. S. centres the complaint is that users of scrap are buying too close. They are using only what they have to and buying accordingly. The dealers, with their customers in this frame of mind, find it a hard matter to properly interpret the future possibilities of the market. Locally trade is normal with a fair volume of business moving.

## WHAT HAMILTON MEN THINK OF THE PROPOSAL ABOUT AN EMBARGO

The Hamilton *Herald* interviewed a number of manufacturers regarding the probable effect of the proposed embargo on products coming from United States to Canada. The *Herald* says:

J. J. Greene, managing director of the Sanford Manufacturing Company, says that he thinks the law, although it would be hard on some dealers, would eventually serve as an incentive for increased production, and as a war-time measure be beneficial.

The manager of the McLaughlin Carriage Company is also in favor of the proposal. He states that it would be the best thing for the automobile business on the whole, and that it would certainly stimulate trade in Canada and help home production by keeping Canadian money in Canada.

John Lennox, of the Lennox Company said: "I am in favor of an embargo upon American goods. I am sure that, with the incentive such an embargo would create, the Canadian manufacturers would be able to produce goods quite as efficiently as the Americans do."

C. H. Martin is bitterly opposed to the embargo. He declared that it would put many automobile dealers out of business, as Canadian manufacturers could never, at such short notice, hope to produce as much or manufacture cars as efficiently as the Americans.

## SPEED BUILDING IN SPITE OF THE COST

### Orders for This Have Been Issued to Contractors in United States on Government Work

Special to CANADIAN MACHINERY

WASHINGTON, April 8.—Drastic regulation of the steel supply of the United States is in sight. Reports coming from shipyards of a serious steel shortage have aroused officials to action and it appears now that some strict orders will be issued by the President regarding the sale of steel and the output. The first regulation will undoubtedly be aimed at the non-war industries.

There is at present an argument going on among steel manufacturers as to the advisability of any such action. Some steel men maintain that there is a sufficient supply of steel in the United States whereas others take the stand that the country is confronted with a serious shortage.

### Shortage is a Fact

J. Leonard Replogle, director of steel supplies of the War Industries Board, and one of the leading steel men of the United States, maintains that there is a steel shortage. He declares that the output of steel in the United States is the greatest in history at the present time but that the demands have grown faster than the output. He urges that the closest co-ordination be adopted in the use of steel by all in order that there

may be no hindrance of the war program of the United States because of a lack of steel.

### Blame the Rails

Other manufacturers are inclined to place the blame for the apparent shortage of steel upon the transportation situation. It has been shown that in the instance of the Hog Island yard there exists a shortage of some twenty thousand tons of steel plates. At the same time the records show that 60 per cent. of the total tonnage of steel ordered for the Hog Island plant has been turned out by the mills. But about three per cent. has been delivered. The remainder is caught in traffic congestion somewhere between the mills, the fabricating plants and the shipyard. To remedy this an absolute priority on all steel for shipyards will probably be issued. This will give a priority to steel over everything else except supplies urgently needed for the army and navy.

### Speeding Up the Work

During the past week the United States Shipping Board has taken steps to speed up the shipping program. Builders have been urged to take all steps, regardless of expense, in order that time may be saved. Chairman Hurley after a most optimistic statement last week, issued a statement this week showing that the output of vessels during March fell below schedule. During March, according to Mr. Hurley, but twenty-one steel vessels were completed. This gave a tonnage of 166,700 tons and the minimum tonnage for March on the program of the Shipping Board was 197,075 in steel vessels. Eleven wooden ships with a tonnage of approximately 40,000 tons were launched.

### Building Tankers

The problem of tankers is giving the Shipping Board some trouble now. Chairman Hurley declares that the steel program is coming along in such shape that it faces the problem now of a number of steel vessels without sufficient tank vessels to keep these ships supplied with oil. To relieve this situation as far as possible the Shipping Board is to attempt the experiment of concrete tankers. Contracts are being prepared for seven concrete tankers, four of a large tonnage and three of a small tonnage. These vessels will be under construction within sixty days and it is expected that it will take approximately sixty days for their completion. They will be placed in the Mexican oil trade.

### Has Wide Powers

Wide extension of the powers of the Federal Government over shipping, shipping rates, and shipbuilding are being asked. Legislation has been offered to Congress, which gives the President the power, through the Shipping Board, to charter and take over ships, docks, wharves and terminal facilities. Another bill would widen the powers of the Shipping Board to grant it authority over the ownerships and transfer of vessels, existing or under construction.

In order to man the merchant marine fleet which is now in building the United States Shipping Board has secured the use of several vessels to be used as training ships for boys between the ages of 17 and 27 as seamen.

### Some Big Orders

The United States Navy is about to ask for bids on a large amount of hand tools and hardware. Specifications may be secured from the Bureau of Supplies, United States Navy Department, Washington, D.C., by calling for schedules 1755, 1758, 1759, 1760 and 1761.

According to reports of the United States Shipping Board 182 vessels have been launched in the United States since the creation of the Shipping Board. To a large extent this represents vessels which have been requisitioned.

Reports show the production of bituminous coal has been increased. The week of March 31 shows that the total production is estimated at 10,972,000. This shows an increase over the last weekly report, which showed a decrease.

There is a serious shortage of chromite in the United States. Officials have decided that this Government will have to call upon the Canadian Government for relief. The chromite secured from Canada last year approximated 20,000 tons. It is estimated that nearly double this amount will be needed during the year 1918.

Labor conditions in the United States are in better condition at present than they have been for some months past. Embryo strikes in shipyards have been stalled and there is a better feeling existing between labor and capital than there has been since the war began.

## MACHINE TOOLS ON UPWARD TENDENCY

### Great Demand is Having Effect of Making the Price go Even Higher

Special to CANADIAN MACHINERY

NEW YORK, April 6th.—The U. S. Shipping Board is making a strong effort to expedite the building of merchant boats at various yards. The delay in the shipbuilding program has been almost entirely due to the breakdown in transportation service during January and February, but with a better movement of steel and other raw material by the railroads, and the assembling of fuel and other needed supplies at the plants of the steel companies, more active operations at shipbuilding plants are insured in the next two months. The steel companies are now producing plates and shapes designed for shipbuilding purposes as never before. Some important launchings of merchant boats for the Government will be made the latter part of this month and early in May.

### The Emergency Fleet

Another contract for 60 8,300-ton cargo boats has been placed by the Emergency Fleet Corporation with the American International Shipbuilding Corporation, which is building and operating the Government owned plant at Hog Island. These boats will require about 168,000 tons of steel plates and shapes, but the boats will not be con-

## ALREADY DISCUSSING HOW TO MEET GERMAN AFTER-WAR COMPETITION

A London, Eng., correspondent, discussing the future marketing conditions in the competition for after-war trade, says:

"On the other hand, Germany's organizing genius is such—the co-operation between manufacturers, merchants, bankers and the Government is so complete and thorough—that unless there is something like corresponding unity of action among our people and between our trades and the State, we may find ourselves beaten even more seriously by the Germans after the war than we were before. Although hampered by certain great disadvantages, including a late start in the race, less favorable assemblage, manufacturing and shipping facilities, a much smaller colonial Empire needing iron and steel, smaller capital investments abroad in steel-consuming countries, and a less economic dependence on manufactured exports to balance food imports, Germany was actually exporting iron and steel goods at the rate of nearly 7,000,000 tons a year on the eve of the war, against our 5,000,000 tons. Organization was the chief factor in German success. Lack of organization was the chief cause of our failure.

"The German trade syndicates intend to renew, in an intensified form, if possible, their bounty-fed 'dumping' policy, and the German Government has promised to subsidize shipping, which means a more liberal exportation of German goods in the future than in the past. Obviously, organization is one of the essentials of success, alike in our defensive and offensive trade compaigns. The only debatable point is that of the principle, or method, of our organization. Much of the evidence given before the Iron and Steel Trades Committee dealt, naturally enough, with the methods of the German steel cartels, or syndicates, for it is chiefly to meet the highly-organized competition of these German unions that combination is so imperatively needed on our side. German competition is not only highly organized by associations of manufacturers, but it is bounty-fed by the syndicates and subsidized by the Government. It is too much to expect individual British firms, unorganized among themselves and unsupported by Government, always to compete successfully against the State-supported syndicates of Germany."

[illegible] contracts for 180 [illegible]

Another contract for 12 all-steel freight boats has been awarded to the Carolina Shipbuilding Corporation by the [illegible] Fuel Corporation. The Carolina [illegible] recently incorporated under the laws of Delaware and will build yards at Charleston, South Carolina. Lorenzo Dilkes, formerly president of Miliken Bros., Inc., is president, and Eads Johnson, naval architect, of New York, is also interested in the new company. Cranes, tools and other [illegible] to be purchased in the near future.

### Needing Equipment

Several other shipbuilding companies on the Atlantic coast, including the Federal Shipbuilding in the Hackensack Meadows and the Tank Shipbuilding Corp., a subsidiary of the Southern Oil and Transport Corporation, which is extending its shipyard at Newburgh, N.Y., are buying machine shop equipment and other machinery, including steam hammers and cranes.

Several small machine tool shops in the vicinity of New York that have received orders from the Ordnance Bureau of the War Department for gauges and other munition parts, have been buying machine tools in this market. The Harroun Motors Corporation, Wayne, Mich,. has also been buying shop equipment for fulfilling a large Government contract for projectiles.

### Prices on High Level

The higher wages paid labor, both skilled and unskilled, and the higher prices paid for material are held responsible for additional advances in prices of machine tools that became effective April 1st. Manufacturers of precision lathes have advanced selling prices 10 per cent. and one maker of hand screy machines has announced an advance of 15 per cent. to be effective April 15th.

Another small list of tools put out by the Watervliet arsenal has reached the New York trade in the last week. Other Government orders for tools are pending.

Railroads, generally, are quiet, but the Chicago, Burlington & Quincy is asking for prices on 100 machine tools from manufacturers in the Chicago district. Eastern roads are more interested in structural work, the Lackawanna having put out an inquiry for a coal breaker requiring 2,000 tons of structural shapes. The Chesapeake & Ohio and the Southern Railway are asking for prices on several thousand tons of bridge work.

The Standard Oil Co. and the American Tobacco Co. have each issued lists of tools for repair shops. The oil company asks for prices on drill presses, drilling machines and one planer, one shaper, and one lathe and for one milling machine.

Orders for about 60,000 tons of special barbed wire for export to Italy have been distributed among the wire mills. The U. S. Government has also placed additional orders for wire nails for domestic shipment.

## LOOKING FOR MUCH GREATED PRODUCTION

### Shipments of Coke, Pig Iron and Finished Steel Are Showing Improvement

Special to CANADIAN MACHINERY

PITTSBURG, Pa., April 8.—All the news has suddenly become very favorable as to there being in the near future ample supplies of coke, pig iron and finished steel. The reversal in conditions, that has appeared from theoretical considerations to be likely at some time in the future, is now becoming possible of actual apprehension by the development of concrete facts. These facts are, in brief, heavier shipments of Connellsville coke actually recorded, the nearing completion of many new by-product coke ovens, a large increase in pig iron production actually recorded in March, the completion of three new blast furnaces and the blowing in of several blast furnaces that were kept out of blast during the period of extreme coke shortage.

As to Connellsville coke shipments, which are reported weekly by the *Connellsville Courier*, there were shipments reported for last week of no less than 383,708 net tons, against about 334,000 tons a week in the three weeks preceding, and an average of only 250,000 tons a week in the first five weeks of the year.

As to pig iron production, there was a reflection in the March output not only of the increased supplies from the Connellsville region, but also of better working of beehive ovens in other districts and of practically full operation of the various by-product ovens. Pig iron output during March was at the average rate of 38,250,000 tons a year, while during the latter part of January and the early part of February output was at but little if any over 25,000,000 tons a year.

### Railroads Improving

The heavier operations of the past few weeks are a reflection of the better conditions that are gradually coming to obtain on the railroads. While the progress appears to be slow, when there is still congestion and car shortage after two full months of favorable weather, fresh evidence has appeared as to the seriousness of the situation early in the year. A partial report of railroad operations in January, just issued by the Interstate Commerce Commission, shows that the railroads actually had a deficit in January, following their very large earnings in preceding months. It is assured that traffic conditions, as relate to the iron and steel industry, will continue to improve. After the extremely bad weather disappeared, the first week in February, there was for several weeks a particularly heavy movement of foodstuffs to seaboard, at the instance of Washington, and this retarded the improvement in the movement of other commodities.

A general survey of the situation shows that there is capacity for making much more pig iron than was produced, and consumed, in 1916, when the output was 39,400,000 tons, the 1917 output having been 800,000 tons less because while some new furnaces had been completed there was not enough coke to operate all furnaces. Four new blast furnaces were completed in 1916 and 14 in 1917, while last month three additional new stacks were blown in, making a total of 21. On the basis of the actual performance in 1916, the capacity at present, with the additions, is easily 43,000,000 tons.

As to coke making capacity, it is clear that there is an excess over the entire requirements of the existing blast furnaces, and this is in keeping with the fact that the beehive process is rapidly yielding to the by-product process. If there had been full transportation facilities the large excess of coking capacity would have been visible during the past year. The by-product ovens completed in 1917 represented 3,500,000 tons of coking capacity, while by-product ovens now nearing completion, and likely to be put in operation in the next few months, represent 6,500,000 tons in addition, making a total of 10,000,000 tons new capacity over the capacity that was active in 1916, and supplied fully the blast furnaces then in existence. The furnaces since completed, however, would require not more than about 5,000,000 tons of coke a year.

The most important of the by-product plants nearing completion is that at Clairton, near Pittsburgh, 640 ovens. It will probably be making some coke before July 1, and should be producing its full output, some 2,700,000 tons a year, within a short time thereafter. It will receive its coal entirely by water, and will deliver coke to the attendant blast furnaces (of the Carnegie Steel Company) over the interplant railroad, so that the whole operation will be entirely independent of the railroads. It would have meant tens of millions of dollars additional earnings for the Carnegie Steel Company if this plant had been completed on schedule time, six months ago.

### Dull Market

The markets are extremely dull, in pig iron and practically all finished products. This is a reflection of the fact that there are no new projects coming up except in connection with the war, and the trade does not consider allotments for the war as part of the market. The requirements of jobbers and manufacturing consumers, in connection with commercial or peace work, are fully covered, in many cases more than covered, by engagements already on books. The steel mills have more than 12,000,000 tons of obligations on books, entirely apart from the war. How much of this is to be real business remains to be seen. At the rate at which shipments have been made in the past two or three weeks it will not be long until customers assure mills they are well supplied, ending the steel scarcity that has now prevailed for two years and a half.

### Ship and Car Requirements

Actual facts as to shipbuilding, not shipbuilding plans or prospects, are now beginning to come out. It appears that a monthly statement of ship deliveries

(Continued on page 71.)

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago | 37 50 |
| Standard low phos., Philadelphia | ..... |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 32 00 |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | | ..... |
| Victoria | | 50 00 |

## FINISHED IRON AND STEEL

| Per lb. to Large Buyers. | Cents |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 5 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 5 75 |
| Chequered floor plate, 3-16 in. | 12 20 |
| Chequered floor plate, ¼ in. | 12 00 |
| Staybolt iron | 8 50 |
| Bessemer rails, heavy, at mill | ..... |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | *3 50 |
| F.O.B., Toronto Warehouse | |
| Steel bars | 5 50 |
| Small shapes | 5 75 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

## FREIGHT RATES

Pittsburgh to Following Points

| | Per 100 lbs. C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 38.1 | 50.5 |
| Halifax | 39.1 | 51.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

## METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $30 00 | $28 00 |
| Electro copper | 30 00 | 28 50 |
| Castings, copper | 29 00 | 28 00 |
| Tin | 98 00 | 99 00 |
| Spelter | 10 50 | 10 00 |
| Lead | 10 00 | 9 00 |
| Antimony | 17 50 | 16 00 |
| Aluminum | 55 00 | 50 00 |

Prices per 100 lbs.

## PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¾ to ½ | $10 00 | $ 9 00 |
| Heads | 10 30 | 9 25 |
| Tank plates, 3-16 in. | 10 10 | 9 10 |

## WROUGHT PIPE

Effective Feb. 5, 1918.

| | Per 100 feet | |
|---|---|---|
| **Standard Buttweld** | | |
| ⅛ in. | $ 6 00 | $ 8 00 |
| ¼ in. | 5 16 | 7 29 |
| ⅜ in. | 5 16 | 7 29 |
| ½ in. | 6 55 | 8 12 |
| ¾ in. | 8 28 | 10 41 |
| 1 in. | 12 24 | 15 39 |
| 1¼ in. | 16 56 | 20 82 |
| 1½ in. | 19 80 | 24 89 |
| 2 in. | 26 64 | 33 49 |
| 2½ in. | 42 72 | 53 53 |
| 3 in. | 55 85 | 70 00 |
| 3½ in. | 70 84 | 87 86 |
| 4 in. | 83 93 | 104 10 |
| **Standard Lapweld** | | |
| 2 in. | $ 29 60 | $ 36 08 |
| 2½ in. | 44 46 | 54 70 |
| 3 in. | 58 14 | 71 53 |
| 3½ in. | 72 68 | 90 62 |
| 4 in. | 86 11 | 107 37 |
| 4½ in. | 97 79 | 122 56 |
| 5 in. | 114 00 | 142 82 |
| 6 in. | 147 80 | 185 28 |
| 7 in. | 192 80 | 241 57 |
| 8 L in. | 202 50 | 253 75 |
| 8 in. | 233 30 | 292 32 |
| 9 in. | 279 50 | 350 18 |
| 10 L in. | 259 20 | 324 80 |
| 10 in. | 333 70 | 418 18 |

Prices—Ontario, Quebec and Maritime Provinces.

## WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%
4½" and larger, 15%.

## OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 22 50 |
| Copper, heavy | 22 50 | 22 50 |
| Copper wire | 22 50 | 22 50 |
| No. 1 machine composition | 22 00 | 21 50 |
| New brass cuttings | 16 00 | 14 00 |
| Red brass turnings | 18 00 | 17 00 |
| Yellow brass turnings | 12 50 | 12 50 |
| Light brass | 10 00 | 9 50 |
| Medium brass | 12 00 | 12 00 |
| Heavy brass | 15 00 | 14 00 |
| Heavy melting steel | 24 00 | 21 00 |
| Steel turnings | 12 00 | 12 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 27 00 | 18 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 23 00 |
| No. 1 machine cast iron | 31 00 | 25 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 20 00 | 13 00 |
| Car wheels, iron | 26 00 | 25 00 |
| Steel axles | 38 00 | 35 00 |
| Mach. shop turn'gs | 9 00 | 8 50 |
| Cast borings | 12 00 | 12 00 |
| Stove plate | 19 00 | 19 00 |
| Scrap zinc | 6 50 | 6 50 |
| Heavy lead | 7 50 | 7 00 |
| Tea lead | 5 00 | 5 75 |
| Aluminum | 21 00 | 20 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent |
|---|---|
| Carriage bolts, ⅜" and less | 10 |
| Carriage bolts, 7-16 and up | net |
| Coach and lag screws | 25 |
| Stove bolts | 55 |
| Plate washers | List plus 20 |
| Elevator bolts | 5 |
| Machine bolts, 7-16 and over | net |
| Machine bolts, ⅜ and less | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd. steel | 27½ |
| Machine screws, o. and fil. hd., steel | 10 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | add 25 |
| Nuts, square blank | add $1 50 |
| Nuts, square, tapped | add 1 75 |
| Nuts, hex., blank | add 1 75 |
| Nuts, hex., tapped | add 2 00 |
| Copper rivets and burrs, list plus | 30 |
| Burrs only, list plus | 50 |
| Iron rivets and burrs | 25 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 37½ |
| Wood screws, O. & R., brass | 32½ |
| Wood screws, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

## MILLED PRODUCTS

| | Per Cent |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil. Head Cap Screws | net |
| Flat But. Hd. Cap Screws | plus net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. & Semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2 in. | plus 10 |
| Studs | net |
| Taper pins | 40 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | list plus 20 |
| Collar screws | list plus 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | 65 |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add 7 00 |

## BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $47 50 |
| Open-hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.

F.O.B. Pittsburgh.

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails | $5 25 |
| Cut nails | 5 70 |
| Miscellaneous wire nails | 60% |
| Spikes, ⅜ in. and larger | $7 50 |
| Spikes, ¼ and 5-16 in. | 8 00 |

| | $5 20 |
|---|---|
| | 5 65 |

## ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 41 |
| Plumbers' oakum, per lb. | 0 09 |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila rope | 0 33 |
| New Zealand hemp | 0 33 |
| Transmission rope, Manila | 0 45 |
| Cotton rope, ¼-in. and up | 0 47 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | net |

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | 0 47 |
| Solder, guaranteed | 0 50 |
| Babbitt metals | 18 to 70 |
| Soldering coppers, lb. | 0 53 |
| Lead wool, per lb. | 0 16 |
| Putty, 100-lb. drums | 4 75 |
| White lead, pure, cwt. | 16 05 |
| Red dry lead, 100-lb. kegs, per cwt. | 15 50 |
| Glue, English | 0 35 |
| Tarred slater's paper, roll | 0 95 |
| Gasoline, per gal., bulk | 0 31½ |
| Benzine, per gal., bulk | 0 30½ |
| Pure turpentine, single bbls., gal. | 0 71 |
| Linseed oil, raw, single bbls. | 1 95 |
| Linseed oil, boiled, single bbls. | 1 98 |
| Plaster of Paris, per bbl. | 2 50 |
| Sandpaper, B. & A. | list plus 20 |
| Emery cloth | list plus 20 |
| Sal Soda | 0 03½ |
| Sulphur, rolls | 0 05 |
| Sulphur, commercial | 0 04½ |
| Rosin "D," per lb. | 0 03 |
| Rosin "G," per lb. | 0 03½ |
| Borax crystal and granular | 0 12 |
| Wood alcohol, per gallon | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

### CARBON DRILLS AND REAMERS

| | Per Cent. |
|---|---|
| S.S. drills, wire sizes up to 52 | 40 |
| S.S. drills, wire sizes, No. 53 to 80 | 40 |
| Standard drills to 1½ in. | 40 |
| Standard drills, over 1½ in. | 40 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 |
| Bit stock | 40 |
| Ratchet drills | 15 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 40 |
| Sleeves | 40 |
| Taper pin reamers | net |
| Drills and countersinks | list plus 40 |
| Bridge reamers | 50 |
| Centre reamers | 10 |
| Chucking reamers | net |
| Hand reamers | 10 |

### COLD ROLLED SHAFTING

| | |
|---|---|
| At mill | list plus 40% |
| At warehouse | list plus 50% |

**Discounts off new list. Warehouse price at Montreal and Toronto**

### IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 8 00 | $ 8 25 |
| Sheets, black, No. 10 | 10 00 | 9 50 |
| Canada plates, dull, 52 sheets | 9 00 | 8 65 |
| Can. plates, all bright | 9 50 | 9 50 |
| Apollo brand, 10¾ oz. galvanized | .... | .... |
| Queen's Head, 28 B.W.G. | .... | .... |
| Fleur-de-Lis, 28 B.W.G. | .... | .... |
| Gorbal's Best, No. 28 | .... | .... |
| Colborne Crown, No. 28 | .... | .... |
| Premier, No. 28 U.S. | .... | 8 95 |
| Premier, 10¾ oz. | .... | 9 25 |
| Zinc sheets | 20 00 | 20 00 |

### PROOF COIL CHAIN

B

¼ in., $12.35; 5-16 in., $11.85; ⅜ in., $11.50; 7-16 in., $10.90; ½ in., $11.20; 9-16 in., $11.20; ⅝ in., $11.10; ¾ in., $11.00; ⅞ in., $10.90; 1 inch, $10.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $15.50; 3-16 in., $11.70; ¼ in., $8.40; 5-16 in., $7.40; ⅜ in., $6.35; 7-16 in., $6.35; ½ in., $6.35; ⅝ in., $6.35; ¾ in., $6.35.

**Prices per 100 lbs.**

### FILES AND RASPS.

| | Per cent |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 40 |
| Black Diamond | 40 |
| J. Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 37½ |
| Disston | 50 |
| Whitman & Barnes | 50 |

### BOILER TUBES.

| Size | Seamless | Lapwelded |
|---|---|---|
| 1 in. | $36 00 | $..... |
| 1¼ in. | 40 00 | ..... |
| 1½ in. | 43 00 | 36 00 |
| 1¾ in. | 43 00 | 36 00 |
| 2 in. | 50 00 | 36 00 |
| 2¼ in. | 53 00 | 38 00 |
| 2½ in. | 55 00 | 42 00 |
| 3 in. | 64 00 | 50 00 |
| 3¼ in. | ..... | 58 00 |
| 3½ in. | 77 00 | 60 00 |
| 4 in. | 90 00 | 75 00 |

Prices per 100 ft., Montreal and Toronto.

### OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | |
| Royalite, per gal., bulk | 18 |
| Palacine | 21 |
| Machine oil, per gal. | 26½ |
| Black oil, per gal. | 15 |
| Cylinder oil, Capital | 45½ |
| Cylinder oil, Acme | 36½ |
| Standard cutting compound, per lb. | 0 06 |
| Lard oil, per gal. | $2 50 |
| Union thread cutting oil antiseptic | 88 |
| Acme cutting oil, antiseptic | 37½ |
| Imperial quenching oil | 39½ |
| Petroleum fuel oil | 13½ |

### BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30-5% |
| Standard | 40% |
| Cut leather lacing, No. 1 | 1 95 |
| Leather in sides | 1 75 |

### TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 06 |
| Emery glue | 15 to 20 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 35 |

**Prices Per Lb.**

### BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 38 |
| Brass sheets, 24 gauge and heavier, base | 0 43 |
| Brass tubing, seamless | 0 46 |
| Copper tubing, seamless | 0 48 |

### WASTE.

| White. | Cts. per lb. | | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 18½ |
| Peerless | 21 | X Empire | 17¼ |
| Grand | 19¾ | Ideal | 17¼ |
| Superior | 19¾ | X press | 16 |
| X L C R | 18½ | | |

**Colored.**

| | | | |
|---|---|---|---|
| Lion | 15 | Popular | 12 |
| Standard | 13½ | Keen | 10½ |
| No. 1 | 13½ | | |

**Wool Packing.**

| | | | |
|---|---|---|---|
| Arrow | 25 | Anvil | 15 |
| Axle | 20 | Anchor | 11 |

**Washed Wipers.**

| | | | |
|---|---|---|---|
| Select White | 11 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING.

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

### ANODES.

| | |
|---|---|
| Nickel | .50 to .54 |
| Cobalt | 1.75 to 2.00 |
| Copper | .44 to .46 |
| Tin | .49 to .56 |
| Zinc | .23 to .25 |

**Prices Per Lb.**

### COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | 42 50 | 43 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 46 00 | 44 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 48 00 | 48 00 |
| Copper sheet, planished, 16 oz. base | 57 00 | 45 00 |
| Braziers,' in sheets, 6x4 base | 45 00 | 44 00 |

### LEAD SHEETS.

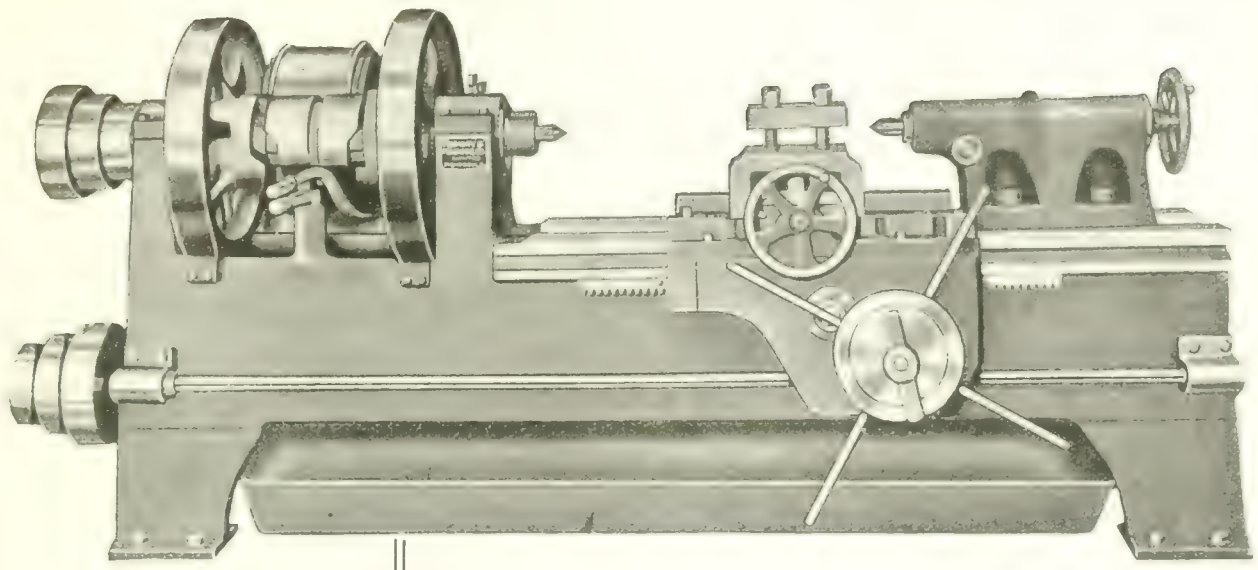
| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $13 25 | $13 25 |
| Sheets, 3½ lbs. sq. ft. | 13 25 | 13 25 |
| Sheets, 4 to 6 lbs. sq. ft. | 12 50 | 12 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS.

| | |
|---|---|
| Acid, boracic | $ .15 |
| Acid, hydrochloric | .05 |
| Acid, hydrofluoric | .14½ |
| Acid, nitric | .10 |
| Acid, sulphuric | .05 |
| Ammonia, aqua | .08 |
| Ammonium carbonate | .15 |
| Ammonium, chloride | .11 |
| Ammonium hydrosulphuret | .40 |
| Ammonium sulphate | .07 |
| Arsenic, white | .12 |
| Copper, carbonate, anhy | .35 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .70 |
| Iron perchloride | .20 |
| Lead acetate | .16 |
| Nickel ammonium sulphate | .12 |
| Nickel carbonate | .35 |
| Nickel sulphate | .15 |
| Potassium carbonate | .75 |
| Potassium sulphide (substitute) | .20 |
| Silver chloride (per oz.) | .65 |
| Silver nitrate (per oz.) | .55 |
| Sodium bisulphite | .10 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .41 |
| Sodium hydrate | .04 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | .14 |
| Tin chloride | .60 |
| Zinc chloride | .60 |
| Zinc sulphate | .09 |

**Prices per lb. unless otherwise stated.**



# Here are the Specifications

## (TURRET LATHE)

| | |
|---|---|
| Swings over bed | 20" |
| Bed—length | 9' 4" |
| width | 18" |
| Front bearing—length | 8½" |
| diameter | 10" |
| Drive pulley—width | 8" |
| diameter | 19" |
| Feeds | 1/16", 5/64", 3/32" |
| Turret, diameter | 18" |
| Height floor to centre | 40" |
| Weight | 7800 lbs. |

**Built both as Turning and Boring Lathe**

## Special Features

Headstock integral with bed.

Broad flat ways

Long carriage

Large turret

Unbreakable apron

# THE "MONTREAL" LATHE

Designed and built specially to stand continuous operation and the abusive treatment given in boring and turning shells.

The success with which it has met this condition in shell plants throughout Canada fully justifies us in asserting that it is

## The Lathe with a Big Reputation

**Its production capabilities will astonish you**

*Early Delivery—Write for Prices*

**The A. R. Williams Machinery Co.**
**Limited**

**64 WEST FRONT ST. TORONTO, CAN.**

# INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

## ENGINEERING

Yorkton, Sask.—Yorkton Board of Trade is a result of advice from John T. Reid, M.P. for Mackenzie, that the Minister of Railways has definitely promised that steel will be laid on the Hudson Bay Railway this season, connecting The Pas with tidewater at Port Nelson. Steel will also be laid for distances of approximately 25 miles westward from Preeceville, on the Thunder Hill branch of the C. N. R.

Peace River, Alta.—The last yard of concrete was placed in the last pier to be constructed for the Central Canada railway bridge over the Peace River on March 27, the steam whistle of the hoisting plant joyously blowing the signal at 3.55 o'clock. Men and boys, officials and employees, to the humblest laborer on the plant threw their caps high in air and cheered this, the epoch-making moment in the history of Peace River country development. When completed, the Peace River railway bridge will be one of the largest in Western Canada, being 1,735 feet long from abutment to abutment, and 77 feet above low-water level. The three central piers in mid-channel were built in 40 feet of rapidly-running water, this depth being low-water mark.

## MUNICIPAL

**Needs New Car.**—Hamilton Board of Control consider purchasing new car for the fire chief and one for the health department.

**Kingston Civic Plants.**—The Public Utilities Commission at the present time are installing a 5,000,000 gallon De Laval motor-driven pump at the local water works pump house. This will give the commission two independent sources of supply—5,000,000 gallons electrically, and 7,000,000 gallons in the steam pumps, there being one Inglis engine of 4,000,000 gallon capacity and one Killey engine of 3,000,000 gallons. The power for the new electric pump will be furnished by an independent three phase feeder line over a separate line of poles running from the main power house, which is used jointly with the Hydro-Electric Power Commission as their new sub-station. In addition to the alterations at the pump house the commission have purchased a 300 k.w. and one 150 k.w. motor generator set to operate the local street railway; these machines to replace the present 350 k.w. engine-driven generator now in operation. The main power house at the corner of King and Queen streets has been completely overhauled. Transformers capable of looking after 1,000 h.p. have already been installed and in addition to the above a supply of power is furnished by the Canadian Electric Light & Water Supply Company at Kingston Mills, over a 13,200 volt transmission line. The local commission are considering extensive alterations to the different plants during the present year, among them being the erection of a 300,000 cub. ft. gas holder recently purchased from the Davis & Farnum Manufacturing Co., Waltham, Mass

## PERSONAL

**John M. Taylor, Jr.,** assistant to J. M. Taylor, Sr., president of the Taylor-Forbes Co., Guelph, has returned to his office after a month's illness. Mr. Taylor underwent an operation of some seriousness at the Guelph General Hospital, from which he has now fully recovered.

**James M. Smith** has arrived at Fort William to take charge of the shipbuilding and of the plant of the Canadian Car and Foundry Company, which is under contract to turn out twelve trawlers for the French Government before the close of navigation. Most of the steel for their construction has been assembled at the works, and the building in which they will be built is almost completed.

**C. N. Schrag,** of the Bawden Machine Co., is leaving there the 1st of May, to go into partnership with O. W. Meissner, manufacturers' agent, Montreal, handling a line of railroad, pulp mill, marine and engineering supplies. Mr. Schrag will open a Toronto office in the Royal Bank Building.

**J. B. Brophy, C.E.,** who was chief engineer of Cape Breton section of the Intercolonial Railway from Grand Narrows to Sydney during the construction in 1889 and 1900, and who was resident engineer for the past two years of reconstruction of St. Peter's Canal, and lately engineer of railways and canals at Cornwall, died after a short illness of pneumonia at Ottawa. The late Mr Brophy was married at Sydney to Ella, eldest daughter of the late J. H. Hearn, K.C., who predeceased him four years ago. He leaves two daughters. The late Mr. Brophy never fully recovered from the loss of his son, Lieut. "Don" Brophy, of the Royal Flying Corps, who was killed while on duty on the east coast of England at Christmas in 1916. Col. Bob Low is a brother-in-law of the late Mr. Brophy.

**W. H. Winterrowd,** formerly assistant chief mechanical engineer of the Canadian Pacific Railway, has been appointed chief mechanical engineer in place of W. E. Woodhouse, who has asked to be relieved of that position. Mr. Winterrowd had a university training in addition to practical experience in the shops and in various branches of the mechnical departments of the Pennsylvania and New York Central railroads before he joined the Canadian Pacific Railway six years ago. He was brought to Montreal by H. H. Vaughan, now vice-president and general manager of the Dominion Bridge Co. It is an interesting coincidence that Mr. Vaughan was exactly the same age, namely, thirty-six, when he himself was appointed chief mechanical engineer of the Canadian Pacific Railway.

## TRADE GOSSIP

**Changing Location.**—The H. W. Johns-Manville Co., New York, announce that their Youngstown, Ohio, office will be located at number 20 Market Street after April 1.

**Airplane Spruce.**—The department of Indian Affairs has decided to allow the Indians to sell spruce timber for airplane purposes on the Tscheacton reserve. O. Bowman of Chilliwack has completed a shipment of two cars of spruce for this purpose.

**New Line of Torches.**—The Canadian Welding Works, Montreal, P.Q., are placing a new line of cutting and welding torches on the market. The torches are of special design and incorporate a number of special features that increase the efficiency of the appliance.

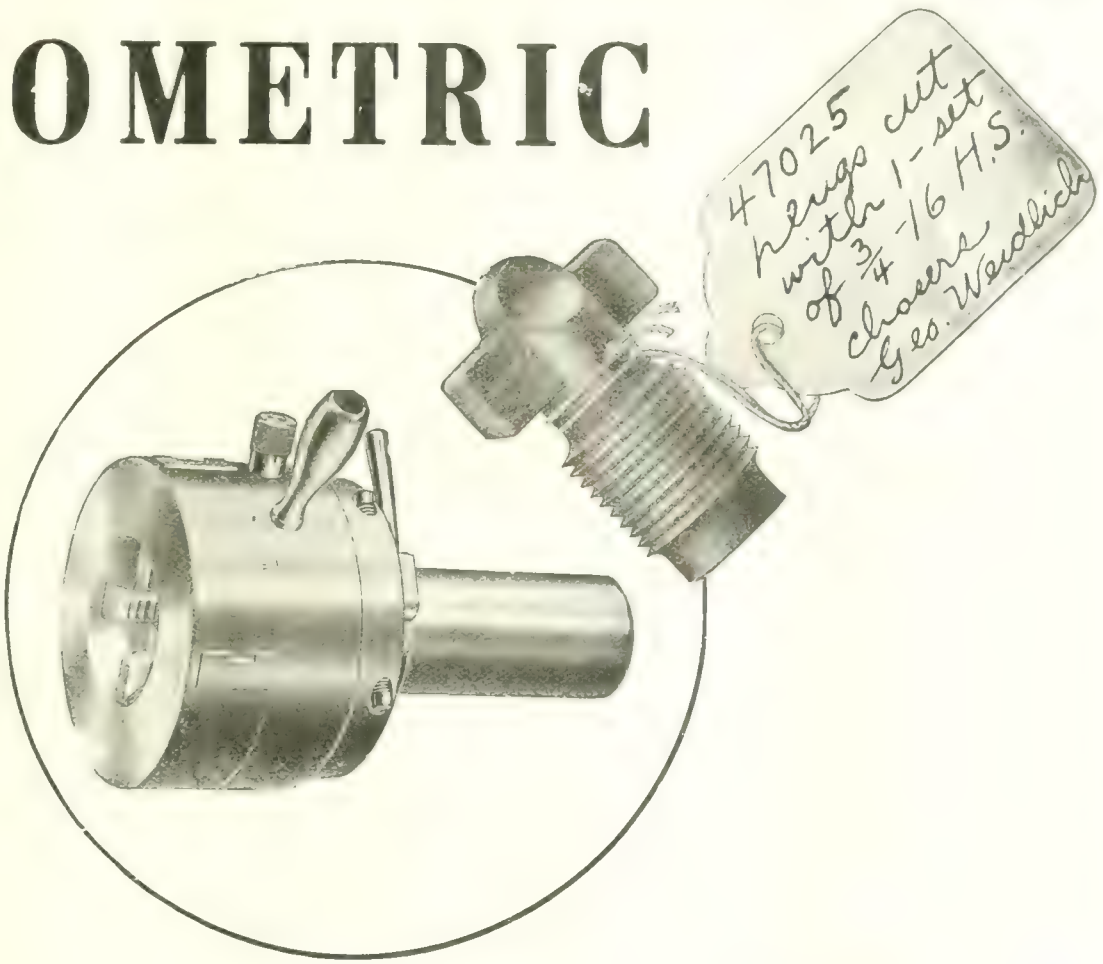
**Look For Fair Price.**—Equipment interests feel assured that the U. S. Government orders for freight cars, which are to be placed shortly, will include a good price. American Car & Foundry Company will get the biggest slice of the business. In all probability Standard Steel Car Company will come second on the list, Pressed Steel Car Company third, and Haskell & Barker fourth.

**To Make Steel.**—Canada Western Steel Co., Calgary, are putting in an open hearth plant at Redcliffe, Alta. This is a unit plant of 220 tons capacity and is being built so that other units may be added in order to make a battery. They will make all grades of open hearth steel. It is expected the plant will be ready for operation in July or August. George A. MacKenzie is the managing director.

**Accepts Lake Freight.**—The Canadian Manufacturers' Association has just been advised that the Canadian Pacific Railway expects to accept lake and rail freight for points Fort William, Port Arthur and west, on April 20, and that the first sailing will leave Port McNicoll on May 1, and to accept traffic on the same date at Owen Sound for intermediate lake ports.

**Ottawa Rumors.**—While the outlook for a continued flow of munitions orders to Canada this year is still somewhat indefinite, pending further negotiation with the British authorities and more explicit instructions to the Imperial

# GEOMETRIC




## One Set of Chasers in a Geometric Die Head has cut 47,025 of these Plugs

The man who has operated the Geometric Die Head says: "In all my twenty-five years' experience I have never known a die to cut as many threads as this set has cut on cast iron."

A quarter of a century of specializing in one line has brought Geometric Thread Cutting Tools up to the high water mark.

Arrange to do your threading with a Geometric. Let our catalogue tell you about it.

## THE GEOMETRIC TOOL COMPANY

NEW HAVEN, CONN., U.S.A.

*Canadian Agents:*

Williams & Wilson, Ltd., Montreal; The A.R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.

Munitions Board as to estimated requirements, the board expects that the combination of British and American orders from now until the end of the year will represent a combined output of from twenty-five to thirty-five millions per month.

**Will Open Early.**—Because the ice is moving so satisfactorily, it is expected that navigation through the Welland Canal will be opened earlier than usual this year, and this is the desire of the government. Lock tenders all along the canal have been instructed to be ready to go on duty soon. The ice has left the canal and it is hoped that conditions at Port Colborne harbor will allow an early start. The usual opening is April 15.

**Electro Galvanising.**—T. Scott Anderson of Sheffield has issued an interesting little book on electro galvanising, cleaning and welding, dealing with each of these matters in an interesting manner. In referring to electro-cleaning of iron and steel he points out there is no loss of iron, no limit to the dimensions of the work, the structure of the metal is not injured and the process is harmless and economical.

**Laying Men Off.**—The Canadian Aeroplanes, Ltd., Toronto, laid off a considerable number of men—more than a third of their total staff—last week. On the other hand the Curtiss Aeroplanes, Ltd., have just moved from the premises they occupied in Pearl Street to the much more spacious and excellently-equipped factory of the Toronto Furniture Co., on Dufferin Street, near Exhibition Camp. There was a procession of men laid off at Canadian Aeroplanes visiting the employment offices at Curtiss Aeroplanes trying to get jobs. The Curtiss firm is taking on new help, but it could not handle all the applicants who came from Canadian Aeroplanes.

**Coal Prices Firm.**—While there has been a reduction in United States points on coal during the past few days, values in Canada for the most part remain the same as during the past winter. Toronto dealers are asking $9.75 and $10 for egg and nut. They claim that the freight and lake rates have been increased and that it is costing them more to take care of the business. Under the new regulations a person who burns over six tons of coal during a winter comes under the restrictions. Such a person can get seventy per cent. of the amount he requires. That means that a person who burned ten tons could purchase seven until such time as the order is rescinded by the provincial fuel controller.

**A Nine-Hour Day.**—The Frost & Wood Co. inaugurated a sweeping change this week in the regulations governing labor in their shops at Smiths Falls, Ont., when they instituted a nine-hour day in all departments except the munitions shop. The working hours will now be from seven in the morning to five in the afternoon and on Friday the whistle blew at five o'clock for the first time. The same scale of wages will be in effect for the nine-hour day that has prevailed on the ten-hour day, and piece work men and shell workers will receive a corresponding increase in pay. It is one of the most important changes in the regulations covering labor that has ever been put into effect voluntarily by any large Canadian industry.

**To Make Fuel.**—The Dominion Government has fallen in with the recommendation of the Advisory Council for Scientific and Industrial Research for the manufacture of a domestic fuel from Saskatchewan's supply of lignite. A sum of $400,000 has been provided for this purpose. In this undertaking the Dominion Government is acting in cooperation with the governments of the provinces of Saskatchewan and Manitoba. The council has received a request from the Ontario Government asking that that R. A. Ross, C.E., one of the members of the council, be appointed to act with Arthur Cole, C.E., as a committee to take immediate steps for the development of the peat bogs of Ontario, and the production from them of a merchantable fuel. The Research Council has concurred in these appointments and the investigation will be proceeded with.

**Garbage Fuel.**—"When the coal shortage was most acute and manufactured fuel was being advocated," says the Hamilton "Times," a good deal was said about the success of a garbage fuel plant in Colorado City, which was said to be a great success. To-day the "Times" received a letter from E. F. McGowan, of Denver, Col., president of the Minequa Coal Company, who writes as one of those who went into the garbage fuel project. Mr. McGowan says he has read in the "Times," the report of the proceedings in Hamilton, and the account of the success of the plant referred to. He adds: "We have spent over $51,000 on this plant. It is first class in every way, as near automatic as possible. We have shut down everything and have boarded up the windows. A little later we are going to sell the machinery for what we can get for it." He declares that the project is not a success and advises any city which contemplates going into it to go and see the plant or get in touch with him.

**Open Toronto Office.**—For the convenience of their customers in Toronto and vicinity and in Eastern Ontario, the Dominion Forge & Stamping Co., Limited, Walkerville, have opened an office in Toronto at 510 Lumsden Building. This office has been opened particularly with a view to looking after the interests of manufacturers of munitions and other war materials who are using forge component parts such as base plates, etc., made by the Dominion Forge & Stamping Co., Limited. Mr. J. C. Armer, who has recently been appointed sales manager for the company, will spend a good deal of his time at the Toronto office. Mr. Armer is known to manufacturers in Canada because of the position he held until about eighteen months ago as vice-president and manager of the *Canadian Manufacturer* and other technical papers. Since then he has been on active service in Canada as an officer in the Canadian Engineers, his retirement from the service being occasioned by the decision of a medical board at headquarters that he could not go overseas.

# TENDERS

**McMasterville, Vercheres Co.**—Tenders received up to April 13 for construction of concrete road and two bridges. J. N. Page is secretary-treasurer of the village.

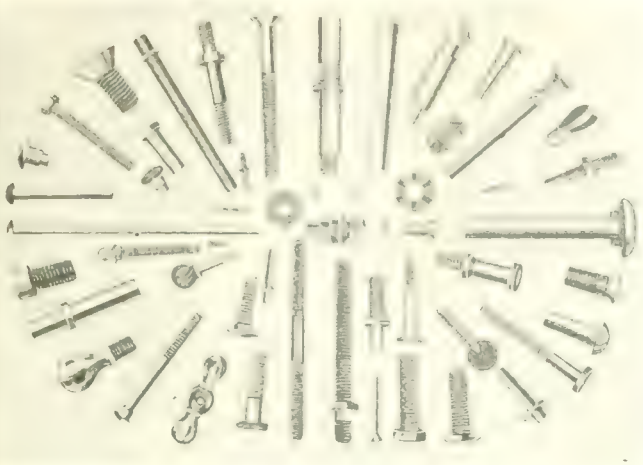
**Ottawa.**—Sealed tenders will be received at this office until 4 p.m. on Monday, April 22, 1918, for the charter of tug Hercules. This is a steel tug, Official Registry No. 122,217, length 105 ft., beam 24 ft. 6 in., draft 10 ft. 6 in., triple expansion engine of 14¼ in., 22 in. and 36 in. by 21 in. stroke. The tug is in Midland Harbor, Ont., and can be inspected by appointment with the district engineer of the department at that place. Apply district engineers, Midland, Equity Building, Toronto, and office of assistant chief engineer, Birks Building, Ottawa.

**Toronto.**—Tenders will be received by registered post only, addressed to the Chairman, Board of Control, City Hall, Toronto, up to 12 o'clock noon, on Tuesday, April 16th, 1918, for the construction and delivery of: Tender No. 35—Air chambers and cast iron special castings. Tender No. 36—Feed water heaters for main and high level pumping stations. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall. T. L. Church (Mayor), Chairman, Board of Control.

**Toronto.**—Tenders will be received, through registered post only, up to noon, Tuesday, April 16th, 1918, for the construction of the following work, viz.:—Asphalt pavement—Danforth Avenue, from 28 rt. 3 in. west of the w.s. Broadview Avenue (running south produced), to 511 ft. farther west. Tenders must be addressed to the Chairman, Board of Control, City Hall, Toronto. Specifications and forms of tender may be obtained at the Department of Works, City Hall. T. L. Church (Mayor), Chairman Board of Control.

Tenders for steam heating barn construction will be received until Thursday, April 11, in connection with the Horticultural Fruit Experimental Station at Jordan Harbor, Vineland Station, and for the construction of a barn, to be erected at the Ontario Agricultural School, Kemptville, Ontario. Plans and specifications can be seen for the steam heating plant at the office of the director of the station, Jordan Harbor, and at the department, and for the barn at the office of the Department of Agriculture, Kemptville, and at this department. Address, H. F. McNaughten, Secretary Public Works, Ontario.

Tenders are being called by J. W. Pugsley, secretary, Department of Railways and Canals, Ottawa, for the Halifax, ocean terminals as follows: Transit sheds Nos. 21 and 22, Pleasant Street subway, water and sewer systems and grading and



**Automatic Screw Machine Products**

ACCURACY QUALITY

Our Mechanical Engineers are at the service of our Clients.

**United Brass & Lead, Limited**

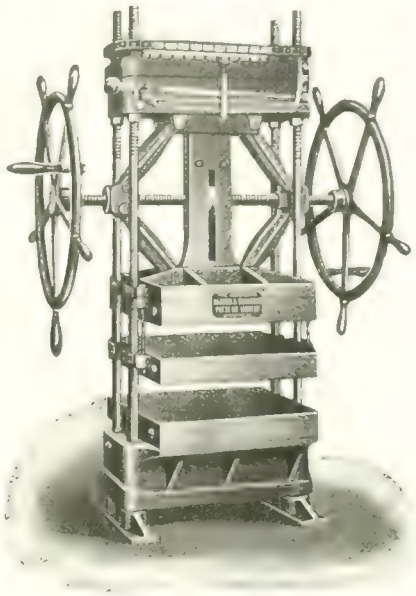
St. Helen's Avenue, - Toronto

W. L. TOBIAS, *Superintendent*

Formerly Superintendent National Cash Register Co.

**KNUCKLE JOINT STEAM PLATE PRESSES**

HAND OR BELT POWER



Designed for rubber and other material requiring heat.

Stands made any desired height.

Pressure indicator supplied.

Special sizes to order

SPECIFICATIONS AND PRICES ON REQUEST

**THE HYDRAULIC MACHINERY CO.**

LIMITED

MONTREAL QUEBEC

**Let them know it's there**

In complimenting us upon the results secured from their advertisement in the classified section, one advertiser said:

> "Of course we would not have sold it without letting people know it was here, that is obvious, and thanks are due you for letting the people know it was for sale."

If you have any old or used equipment for sale, let people know it's there. Your message in Canadian Machinery will be placed before the probable buyers of such equipment.

**Canadian Machinery**

*Classified Advertising Section*

143 University Ave., TORONTO

**Special Purpose**

**Shell Tools**

LOW IN PRICE
EFFICIENT IN OPERATION

**They do one thing only, and do that one thing well.**

Boring Lathes
Base Boring Lathes
Waving Lathes
Band Turning Lathes
Hydraulic Band Presses
Shell Grinding Machines
Shell Cleaning Machines
Undercutting Machines
Finish Tapping Machines
Inside Profiling Machines
Nicking Machines
Centering Machines

We can supply any of the above complete, **at about half the cost of ordinary tools for the same purpose**, or we can furnish you with a **complete set of castings** ready for you to machine and set up.

**Marsh Engineering Works, Ltd.**

BELLEVILLE, ONT.

*If what you read is not advertised, consult our Buyers' Directory and write advertisers about it. It may mean a saving of*

METAL STAMPINGS

We are manufacturers of stamped parts for other manufacturers.

We do any kind of sheet metal stamping that you require. Our improved presses and plating plant enable us to produce the finest quality of work in a surprisingly short time.

We can finish steel stamping in Nickel, Brass or Copper.

Send us a sample order.

W. H. BANFIELD & SONS
372 Pape Avenue, Toronto, Can.

THE IRON WORKS LIMITED
Successors to
Owen Sound Iron Works
Owen Sound, Ont.
Engineers
Boiler-makers
Founders
Machinists
Tank Work
Smoke Stacks,
Grey Iron and Brass Castings,
Special Machinery
Made to Order

STERILIZED WIPERS
NO LINT
E-PULLAN WIPERS & WASTE CO LIMITED TORONTO

PLEWES Limited
WINNIPEG
For All
Machinists' Supplies

lowering of Fawson and Water Streets, car cleaning shop, stores and ice house, temporary station, baggage, mail, express and commissary building. Tenders close on the 13th. Plans can be seen at the following offices: Chief engineer, Department of Railways and Canals, Ottawa, Ont.; chief engineer, Canadian Government Railways, Moncton, N.B.; Halifax Ocean Terminals Office, Halifax, N.S., and Messrs. Ross and MacDonald's office, Montreal, Que.

**Ottawa.**—Sealed tenders will be received until noon, April 23, 1918, for electric conduit and fittings required in the reconstruction of the Parliament Buildings, Ottawa. All tenders to be based on the supplying and delivering on the site of the quantities of the schedule of material for electric conduit and fittings, in strict conformity with the specifications and the samples submitted and to the satisfaction of the architects. Deliveries to commence so far as possible immediately after the signing of the contract and to continue as directed in such quantities as to ensure complete delivery by June 1, 1918. The schedule of material, specification and any other information required can be obtained at the office of the P. Lyall and Sons Construction Company, Limited, Ottawa; John A. Pearson, architect; J. O. Marchand, associate, Centre Block, Parliament Hill, Ottawa.

## CONTRACTS

**Matheson, Ont.**—The town of Matheson is passing a by-law to provide for the borrowing of $40,000 for the purpose of building a system of waterworks and sewerage. The equipment needed comprises a concrete pump house, well, oil engine, plunger pump suction and discharge pipe, reservoir and water mains, etc. H. George Ginn is the clerk of Matheson.

## MARINE

**Washington.**—In order to discourage the shifting of shipyard labor from one yard to another, the Shipbuilding Labor Adjustment Board recently put into effect a standard wage scale for all yards on the Atlantic and Gulf coasts.

**Detroit.**—Each of the Great Lakes was at a higher level in March than the average for the month in the last ten years, according to the monthly report issued by the United States Lake Survey Office at Detroit. Lake Superior was the only lake falling to a lower level in March than in February.

**Sarnia.**—Steamboat managers in Port Huron and all along the lakes have received notice that no enemy aliens will be allowed to ship aboard any boats plying the lakes this season. If found on any ship they will be arrested and placed in imprisonment. The American Government is very strict as to who shall go aboard ships this year.

**Toronto.**—The navigation season has opened. The steamer Macassa, of the Canada Steamship Lines, left her Toronto port for Hamilton. Capt. Corson was in charge of the vessel, and, according to a time-honored custom, will be the recipient of a silk hat. Although the decision to send the Macassa across the lake was just made on short notice, there was an unusually heavy freight cargo.

**Port Burwell.**—The car ferry, Maitland No. 1, running between Ashtabula Harbor and Port Maitland, started on her first trip of the season on April 1, and is meeting with some heavy ice on the way. The S.S. Ashtabula, under Capt. Meyers, is expected to move on Wednesday. She runs between Ashtabula Harbor and Port Burwell. The fishing is well under way at this point, the catches being reported good.

**Halifax.**—The trial of the action and counter-claim in the Admiralty Court between the owners of the Mont Blanc and the owners of the Imo, in which each ship is claiming two million dollars against the other, was completed to-day. Without leaving the bench, Mr. Justice Drysdale gave his decision that the Mont Blanc was wholly to blame, and he said he would file a memorandum accordingly. The damage would be assessed in the regular way, against the owners of the Mont Blanc.

**Fort William.**—The icebreaker Whalen is to start out at once, according to instructions received from the east by the Canadian Towing and Wrecking Company. Ice conditions are about same as last year. It is expected everything will be ready. Navigation is to open April 21. Last year ice-breaking was commenced April 6. At the Soo, navigation is expected to open between April 18 and 20. This cancels recent orders of the Minister of Marine and Fisheries, saying that the government would not have any ice-breaking done at the head of the lakes this spring.

**Toronto.**—Mayor Church is very dissatisfied with the announcement from Ottawa that the Government will place orders for building four ships only with Toronto firms this year. So he has wired ex-Controller Foster, M.P., requesting him to arrange for a conference with the Government at an early date so that the question of shipbuilding may be thoroughly discussed and the advantages of Toronto for that class of work may be laid before the Government. His Worship said orders for at least 20 vessels should be placed in Toronto.

**New York.**—For the first time in nearly a year there was noted to-day a stiffening in private war risk insurance rates for vessels destined to ports of the United Kingdom. Rates quoted to-day by leading insurance brokers showed an advance from 3½ per cent. to 4 per cent. for belligerent ships, and from 6 to 8 per cent. for unarmed neutral vessels. The advance in rates, it was said, was occasioned by the increased number of ships reported sunk last week, news of the torpedoing of the White Star liner Celtic, and fears of the present insurance men that better weather in the war zone would favor the submarines.

**Galt.**—J. H. Hancock, secretary of a special committee representing Kitchener, Galt, Brantford, Port Dover and intermediate towns, has arranged through

F. S. Scott, M.P., for a conference with Hon. Frank Carvell, Minister of Public Works, regarding the improvement of the harbor and docks at Port Dover. A delegation numbering more than twenty is to go to Ottawa. The chief object is to make it possible for the Lake Erie & Northern Electric Railway to connect with a ferry service so as to provide a short haul for coal and other raw materials from the United States for this industrial district.

**Halifax.**—The appointment of the new harbor master will probably be made next week, as according to experts the inland navigation will probably start in a few days if the present weather keeps on. Since the tragical death of Captain Murray in the Halifax catastrophe, many names have been suggested as successor of the deceased, but it is now reported that at last the government has chosen the man who will occupy the position, and it would be a very well-known navigator of this city. The first boat to leave for the Gaspe coast, will, according to information, be the Marie Josephine, chartered by the Dominion Fish and Fruit Co., and it will bring back a cargo of fish to be sold in Quebec.

**Port Huron, Mich.**—The invoices and shipbuilding plant of the Reid Wrecking Co. will be merged with the Foundation Co. of New York. The Foundation Co. is a large construction concern, which of recent years has branched out extensively into marine work. They laid the foundation of the Woolworth building in New York, and of the Dime Savings' Bank building, Detroit, as well as doing the work at the Sault Ste Marie locks. The drydock here will be lengthened to 625 feet, and 1,500 men will be employed. Keels for ten steel vessels of 150 feet in length, to be used as trawlers, will be laid as quickly as possible, delivery to be made before the close of navigation.

**Montreal.**—A slight movement of the ice in the St. Lawrence River opposite St. Lambert has taken place. Special interest is attached to the present shove by reason of the fact that the movement has started about two miles above the Victoria Bridge, which is about half a mile above the area where the break usually takes place. There are two narrow strips of open water along the north and south shore, while open water is also visible in the centre of the river below Victoria Bridge. So far there has been no damage by water, but the road on Front Street near Coteau Rouge is covered by about four inches of water. The police authorities are of the opinion that, unless exceptionally warm weather sets in, the general movement of ice will not start for some days yet.

**Port Arthur.**—A unique event occurred at the plant of the Port Arthur Shipbuilding Company at noon on April 4, when the freighter "War Isis," built to the order of the Imperial Munitions Board, full canal size, was launched. One hour after a trawler was launched at the same plant. While the freighter was still rocking in the water off the dock after her first launching, the keel plates for another freighter were laid on the same


## Is an Automobile a Luxury in War Time?

[illegible]

### Exchange Situation Explained

In THE FINANCIAL POST [illegible] appears on page 1 this week, most concise explanation of the present situation as regards Canadian Exchange relations with the United States that ever guided busy men to the position of authority in finance or affairs. To be clear in mind on this important question at this time means distinction, and probably profit also in the [illegible] Canadian industry, commerce, and finance. Get a clear idea of the situation by starting a new interest with THE FINANCIAL POST this week. You will then find yourself informed on, and prepared for, the decisions of Ottawa regarding imports whether automobiles, machinery, hardware, [illegible] food [illegible]

### Business News of the Week

[illegible] other business matters of importance are as clearly and concisely dealt with in THE FINANCIAL POST this week. Here are just a few of the headings:

**Shipbuilding as a Permanent Policy.**

**New $5,400,000 Pulp Mill at Temiskaming. May Double Dividend of St. Lawrence Flour.**

**Some Farmers Finish Seeding in Ontario. Whale Canning a New Industry of North. Shipbuilding Will Benefit Dominion Steel. Canadian Rubber Co. Earns 35 Per Cent. Tax and Water Rate Increases Boost Rents. Gross Debt of Toronto Over $100,000,000. Solution of Land Problem in B.C.**

**Sam McRoberts "Seven Figure Thinker." Significance of Call to Class "B" Men.**

**Holiday Causes Decline in Bank Clearings. Campaign for Thrift on Broad Lines.**

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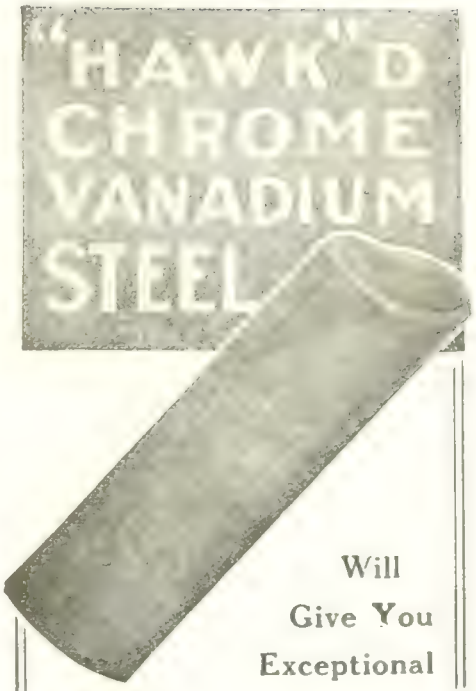


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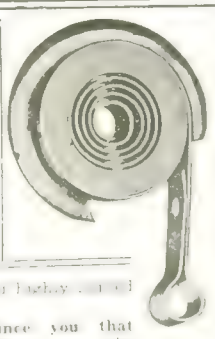

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shipway as that just vacated by the newly launched steamer. This freighter, 261 feet over all, will also be built for the Imperial Munitions Board, and another freighter for the same order is now half-plated and on the road to completion. As soon as building berths are vacated more large freighters will be built. Many trawlers are also on order, and much repair work on boats which have wintered here prior to the opening of navigation. Thirteen hundred men are now employed at the plant.

**St. John, N.B.**—War traffic continues to make heavy demands on the port facilities at St. John, and there is every indication that conditions after the war will call for still greater accommodation for the growing trade of the country. To meet these conditions, Lieutenant Harold Manning, a member of the engineering staff of the Dominion Public Works Department before going overseas, and who had an opportunity to study port development while in Europe, has prepared a comprehensive plan which has been submitted for the consideration of the citizens. His plan calls for three new breakwaters which would completely enclose the harbor and make it one of the largest and safest on the Atlantic coast, providing wharf accommodation for ninety-three steamers without crowding. The plan includes the reclaiming of a large area of shoal ground at the present entrance to the harbor. He estimates the cost of the work outlined at $5,000,000, a much smaller sum than any previous plan suggested for providing anything like the same amount of accommodation.

## INCORPORATIONS

**The Tallman Brass & Metal Co.** has been incorporated by J. N. Tallman, W. N. Tallman, A. H. Tallman, I. Tallman and M. Tallman, to take over the business of the Tallman Brass & Metal Co. of Hamilton. The capital is placed at $800,000, and the place of business is Hamilton

**The Interurban Engineering Co. Ltd.** has been incorporated at Toronto to manufacture, sell and deal in machinery, motors, electrical apparatus, etc. The share company is placed at $35,000, with the following as provisional directors: E. Smily, B. Williams and W. Rhodes.

**The Unilectric Co. of Canada** has been incorporated with head office at Edmonton, with capital stock of $25,000, to carry on business as mechanical and electrical engineers, contractors, etc. The incorporators are C. McMann, J. R. Ulery, G. B. O'Connor, G. H. Beaudry and B. Simmerman.

**The Forbes Corporation, Ltd.** has been incorporated with capital of $50,000, with head office in Montreal. They are entitled to purchase, contract for, sail, etc., vessels and steamships, tugs or barges. Incorporators: J. J. Creelman, S. C. Demers, J. B. Henderson, B. I. Brandt, J. F. Lindsay.

**The Harbison-Walker Refractories Ltd.** has been granted incorporation. Head office, Montreal, and the incorporators are L. A. David, L. P. Crepeau, S. H. R. Bush, G. Whittaker and J. P. Callaghan. Capital placed at $10,000. Company will lease and prospect mineral lands of coal, clay, magnesia, etc.

**The Great Lakes Oil Refining Co.** has been incorporated, with head office in Toronto and share capital of $1,750,000. The company can prospect, develop, explore and maintain oil wells, gas wells, etc. The directors are J. H. Spence, G Cooper, H. A. Hall, L. M. Heal and E. Staples.

**The Churchill Mining and Milling Co.** has been incorporated with head office in Toronto, for the purpose of leasing exploring and developing ores, metals and minerals. The capital is placed at one million ,and the provisional directors are: G. A. Young, E. Whitehead, H. Young, L. Leigh and D. A. Sheriff.

**The Universal Car Co. Ltd.** has been incorporated with head office in Toronto, and capital of $60,000 to manufacture, buy, sell, etc., automobiles, accessories, and conduct a garage business. Provisional directors, G. H. Sedgewick, J. Aitchison, A. B. Nind, D. A. McCrimnon and M. Tomlinson.

**The Lauder, Spears & Howland Ltd.,** has been incorporated with head office in Toronto for the purpose of dealing in lumber, timber and pulpwood, etc., and manufacture of same. The capital stock is $250,000, and the provisional directors are W. W. Vickers, H. Wilson, R. F. Angus, C. I. Macartney and H. Quigley.

**The Continental Chemical Co., Ltd.** has been incorporated, with head office at Kingston, for the purpose of dealing in chemicals and working and developing mineral lands and rights. The capital is limited to $100,000, and provisional directors are E. D. Chaplin, A. MacKinnon, J. G. Bogart, C. C. Nash and P. H. Hyck.

### TRADE INQUIRIES

THE following trade inquiries have been received by the Department of Trade and Commerce, Ottawa. Further particulars may be obtained on application to the inquiries branch.

**Agricultural and Mining Machinery, Motor Cars, etc.**—A South African correspondent, now on active service in France, wishes to get into touch with Canadian manufacturers of agricultural implements, mining machinery, motor cars, etc., wishing eventually to appoint an agent in South Africa.

**Tools.**—A South African commission agent, covering all centres of South Africa, with permanent sample rooms in Cape Town and Johannesburg, is prepared to take up Canadian representation of tools of all kinds.

**Machinery for Wood Turning.**—A Cape Town firm makes inquiry for the supply of a small wood-turning machine for turning out wood-blocks of several sizes. Sample of standard size of block with the Department of Trade and Commerce.

**Wire.**—A Johannesburg firm requests samples and quotations of plain and barbed wire.

### PITTSBURG MARKET REPORTS

(Continued from page 396.)

and launchings has been inaugurated. Such a statement for March was given out early in the week, showing 27 steel vessels launched, with 201,286 tons deadweight capacity, but next day a conflicting statement was made, referring to 30 vessels of 219,586 tons deadweight. About one-half gross ton, or a trifle more, of finished rolled steel is required per deadweight ton of vessel. Thus the steel involved in the March launchings was not over 125,000 gross tons, not much against a total productive capacity of 3,000,000 gross tons a month of all forms of finished rolled steel, but the steel now being shipped, representing launchings in future months, is presumably at a considerably heavier monthly rate.

Orders for the 100,000 freight cars involved in the Railroad Administration's program have not been allotted, but probably will be soon, covering about 50,000 box cars, wooden superstructure, 25,000 gondolas and 25,000 hoppers, the gondolas and hoppers being all-steel construction. The 100,000 cars represent about 1,000,000 gross tons of finished rolled steel, and this may involve deliveries at the rate of 175,000 or 200,000 tons a month while the cars are being built. Ships and cars together, however, do not promise to take nearly as much steel as many observers have seemed to expect.

## WAITING NOW FOR MORE PARTICULARS

**Announcement of Coming Sweeping Embargo List Causes Speculation**

CANADIAN dealers are not sure to what extent they will be affected by the embargo on goods from U.S. to Canada. It is likely to be followed by another embargo on goods from Canada to United States. While the immediate effect of the ruling might be considered as equal to a protective tariff for Canadians, manufacturers are not in a hurry to accept it as such. They point out that the whole arrangement is primarily for the purpose of equalizing the trade balance between United States and Canada, which has of late been very much against this country. Canadian dealers were alarmed when the rate was around the 1½ per cent. mark, but now that it more often hits the 2 per cent. margin, it is even worse. They are not quick to look upon any deal put through for the purpose of helping out an abnormal situation as one under which they would care to launch out on new or more work.

Jobbers have not been able to figure out exactly how it is going to affect the various lines they carry. They point out that it often takes many weeks for the influence of such a change to work out to its full extent.

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15 x 8 SEBASTIAN LATHE, $125; 20" BARNES [illegible] power feed drill press, both excellent condition. Massecar, 163½ Church Street, [illegible]. (c15m)

FOR SALE ONE NATIONAL BOLT CUTTER with complete set of die holders for bolts up to [illegible] in size. Machine is in excellent condition and practically good as new. Canadian Blower & Forge Co., Kitchener, Ont. (c15m)

SECOND-HAND DIRECT CURRENT GENERator, 60 k.w., 110 volts, 680 r.p.m., compound wound; can be used as 880 h.p. motor. Helena Costume Co., 190 King Street, London, Ont. (c16m)

FOR SALE—NO. 2 CLASS F. REEVES VARiable speed transmission, 12 h.p., also Granger three-roll steam polisher, rolls 16 in. dia. by 36 in. long. Apply Box 205, St. Catharines, Ont.

FOR SALE.—ONE BAND SAW; FOUR-SIDED moulder; double shavings fan, 14" opening; single shavings fan, 14" opening; wood split pulley, 8½ ft. diameter x 12" face; wood split pulley, 6 ft. diameter x 14" face; 18" rubber belt in good condition, about 50 feet. Address St. Marys Wood Specialty Co., Ltd., St. Marys, Ont. (c16m)

## FOR SALE

FOR SALE LOGEMANN HYDRAULIC BAling Press, No. 1-P, with No. 1-A pump, with or without motor. First-class condition. Immediate delivery. Low price. Also [illegible] furnace and miscellaneous equipment for sale. Metal Drawing Company, Limited, St. Catharines, Ont., Can. (c16m)

## WANTED

ADVERTISER WOULD PURCHASE SECONDhand punch press if in good condition. Press must have at least three-inch stroke and weigh five thousand pounds or more. Either back geared or direct drive. Box 395, Canadian Machinery. (c16m)

### REPRESENTATIVES WANTED

TO HANDLE ONE OF THE BEST FACTORY trucks on the market. Man devoting a fair amount of attention to this line will be able to make good thing out of it. Give particulars (in confidence) of lines you are now handling, etc. Box 392, Canadian Machinery. (c17m)

CANADIAN AGENT WANTED TO HANDLE line of drinking fountains made in Canada. Man calling on manufacturing plants, public buildings, etc., preferred. Box 393, Canadian Machinery. (c16m)

WANTED—250-ton Hydraulic Press with 30-inch platen, high and low pressure control, complete with accumulator and pump. Canadian Hart Wheels, Limited, Hamilton, Ont. (c17m)

WANTED — IMMEDIATELY ONE SECONDhand compound rest lathe, back gear 4 ft. to 6 ft. bed. Also one shaper 12" to 18" stroke. Central Tools & Forgings Ltd., Winnipeg. (c18m)

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# CANADIAN MACHINERY

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*A weekly newspaper devoted to the machinery and manufacturing interests.*

Vol. XIX. TORONTO, APRIL 18, 1918 No. 16


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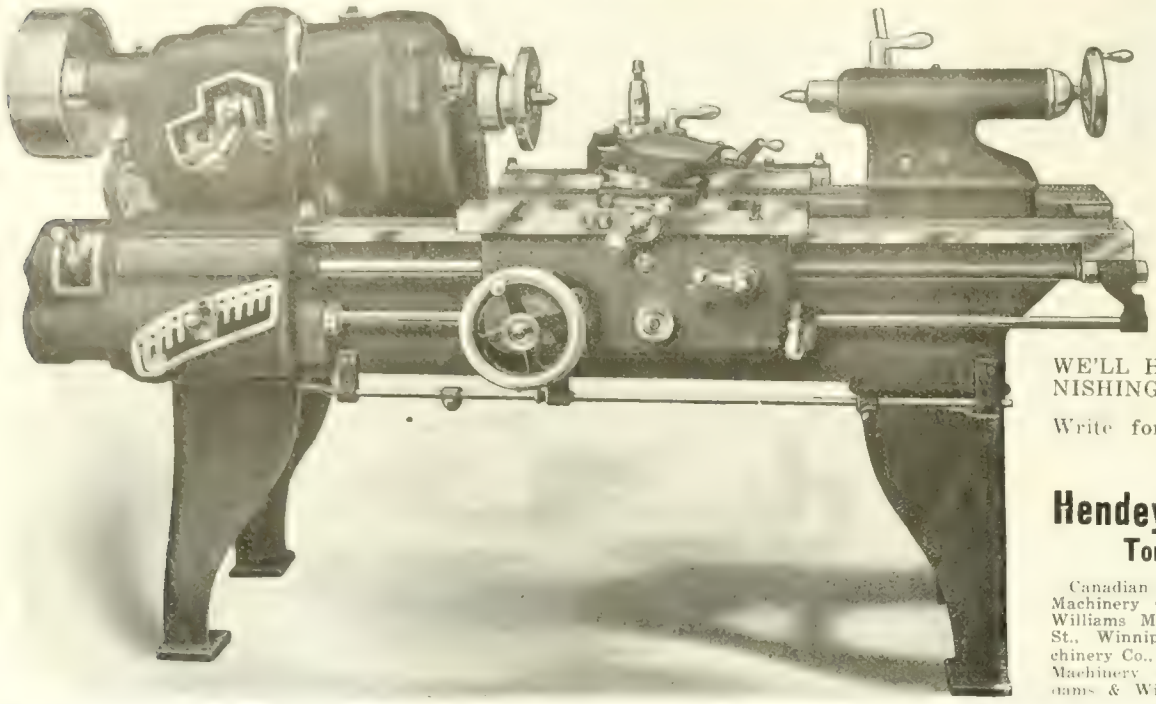

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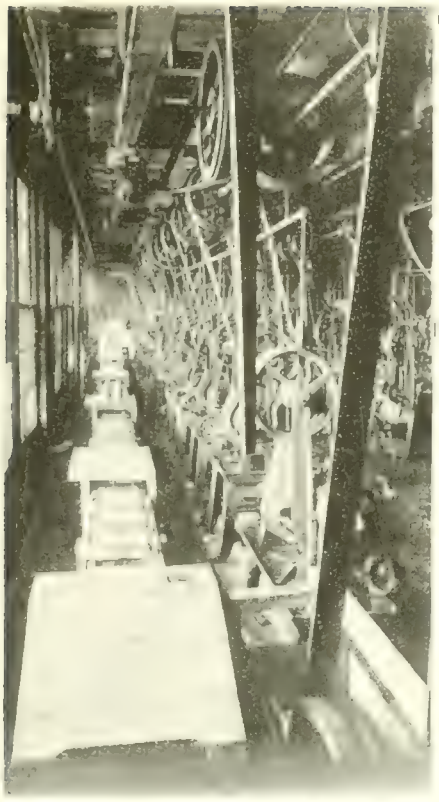


SPECIAL SHELL MACHINES AND CONVEYOR

# Manufacturing the 75 mm. High Explosive Shell

By J. H. Rodgers †

Part I.

FACILITIES for the production of munitions under the most modern practice differ very largely from what was originally adopted during the early stages of this work. The utilization of special equipment has been one of the chief factors in the solution of the shell-making problem, and the firm of Lymburners, Limited, were among the pioneers in the development of single purpose machines for shell making, the progress made in this connection being particularly emphasized in the machining of the American 75 mm. shell were described.

†Associate Editor, CANADIAN MACHINERY.

### Plant Layout and Equipment

In the machining of shells under present-day practice one of the principal factors in economic production is in the routing of the work as it progresses through the shop from its initial operation until the shell is finally completed and ready for shipment. Overlapping of the work is not permissible if maximum efficiency is the objective, and it is, therefore, imperative that the arrangement of the equipment be such as to avoid any excessive delay or confusion while the material is being transferred from one operation to another or from one section of the plant to the other. Plants that are specially constructed for the manufacture of certain products can be so designed that facilities enable the highest percentage of effective work to be obtained; but where the building must be constructed on restricted area, or where it has been used for other lines of manufacture, the best results are not always to be had.

The plant dealt with here consists of a three-storey building, partly of recent construction, and the entire floor space is utilized at present for the manufacture of the 75 mm. American shell. The ground floor is utilized for machining from the initial operation of cutting off to the first Government inspection—the second floor is used for the operations of swedging the nose to the washing of the shells—the top floor is reserved for the final operations of swedging the copper band to third Government inspection and packing.

With the exception of the equipment in the heat treating department, the New Britain machines, the Ford Smith grinders, and the presses for assembling the base plates, the machinery has been designed by L. A. Desy, chief engineer, along with other heads of departments. These machines have been developed from the experience acquired through the manufacture of other types of shells, and their efficiency as producers is amply demonstrated by the record of their performance. These machines have been designed to obtain the maximum of power with the minimum of floor space. With the objective of 8,000 shells per day the machines have been placed so that no trucking is required in any of the departments, the shells being transferred from one machine to another by the adoption of ramps located between the various machines. Shells move across the room from one group of machines to the next until they reach the conveyer on the opposite side. This conveyer carries the semi-finished shells to the first in-

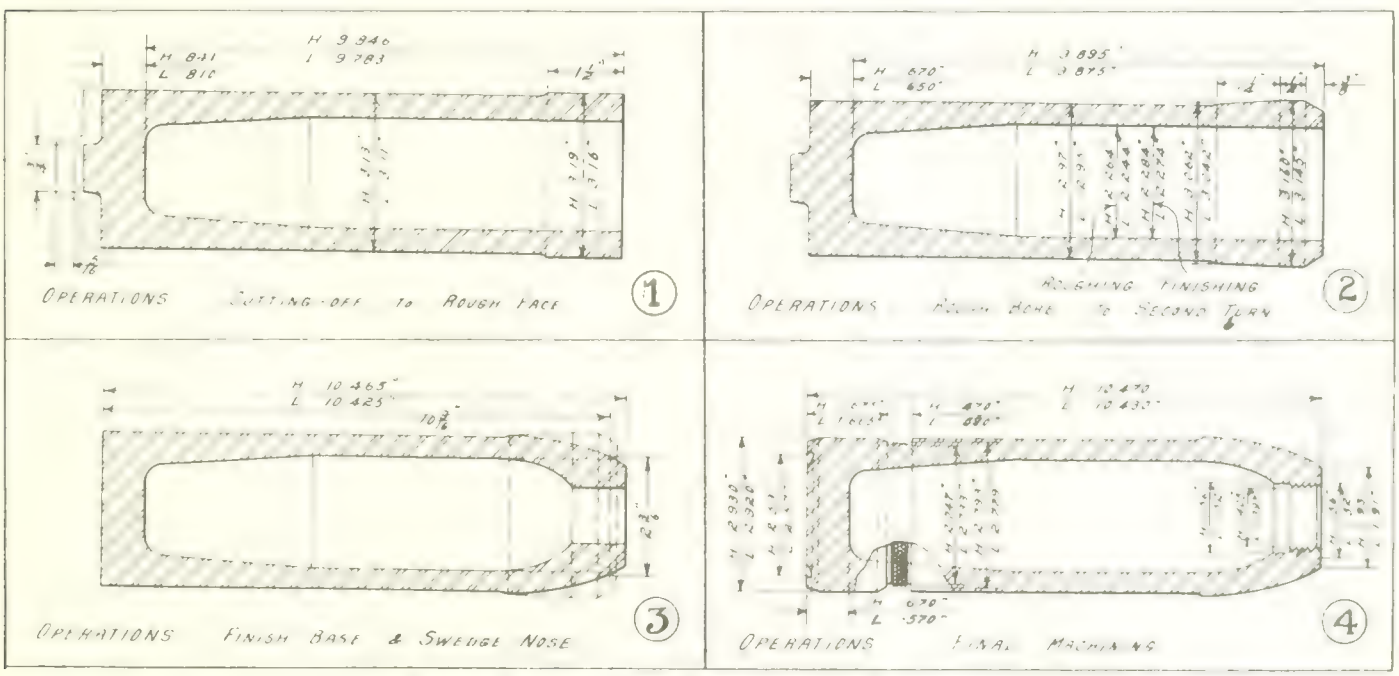



CHART SHOWING THE FOUR GROUPS OF OPERATIONS PERFORMED ON THE SHELL DURING MANUFACTURE

process is followed on the other floors, so that in no instance does the shell "back up." Some little trucking is required in

### General Shop Features

Gravity system of lubrication has been installed for the cutting tools. Individual chip pans have been provided on most of the machines, and those that are not so equipped are placed in specially constructed sheet iron floor trays. From these the lubricant is drained through perforated pieces into piping that leads to a central well, whence the liquid is pumped to a large tank located on the ceiling of the top floor of the building. As can be seen

ficult matter to keep anything like an accurate check upon the output unless some method is adopted to maintain a record of the shells at certain points in their semi-finished condition. This plant has adopted a system of automatically counting the shells at stated periods in the shell development that virtually eliminates any possibility of miscalculation in the number of shells—passed and rejected—that are handled by the many operators during the entire day. The fact that the plant is operating three shifts of eight hours each adds to the liability of mistakes or errors arising from the changes necessary in the different shifts. Seven points have been selected—following the rough facing, final base facing, passed first Government inspection, passed body grinding,

are given the second Government inspection for the major portion of the shell dimensions. Following the varnishing of the interior the shells are ready for the final inspection. As the shells are sprayed they are placed on specially-constructed four-wheel trucks that ride on the top of the inspection room tables. The platforms of these trucks are provided with shallow recesses, in which the shells are placed nose upward.

Each truck has a capacity of a hundred and travels along rails located on the outer edges of the tables. When fully loaded the trucks are pushed along to the end adjoining the Government weighing scale. In this way the inspector can take the shells from the truck and place them on the scale without moving from his chair; when a truck is empty it is re-

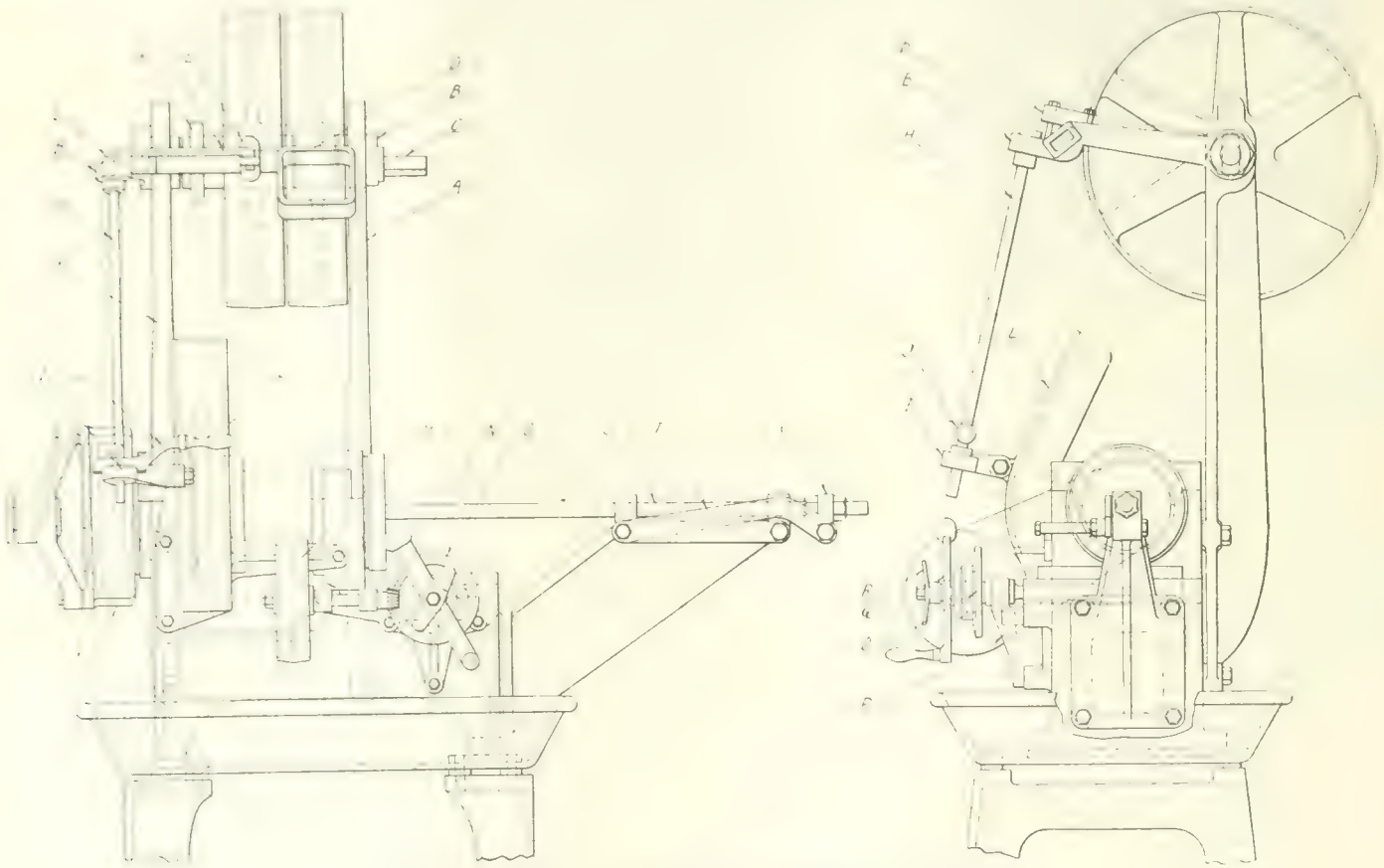


FIG. 1. ASSEMBLY OF FACING AND CUTTING OFF MACHINE.

in some of the illustrations herewith, the delivery pipes for this system are located at a low level and firmly attached to the framework of the machines and to the pillars of the building.

Another feature in connection with the general piping installation is the identification system, whereby all pipe lines are painted in different colors, to distinguish clearly the particular purpose for which they are used. Wherever possible the driving motors have been placed on the ceiling, so that all available floor space can be utilized to the best advantage for actual production.

### Daily Automatic Counter Record

Where work of this character passes through in such large quantities and also in such regularity it is very often a dif-

passed washing, passed band turning, and passed to shipping room. By checking up the reading of the counters and the number of "rejected" shells at any of these points it is a relatively easy matter to keep an accurate tabulation of the progress of the work.

### Inspection and Tests

The first Government inspection takes place after the finish facing operation, and just previous to the shells being removed to the second floor. This examination covers the close visible inspection of the bore and also dimensions; when passed, the shells are stamped with the Government acceptance stamp and placed on the elevator and taken to the heat treating department. Prior to pressing on of the copper band the shells

moved from the table and carried to the opposite end, as it is very light and can be handled by a boy. The order of the inspection details are weighing, copper band, base plate, thread gauging, stamping Government acceptance, noting heat number, stamp lot number by machine, after which they are ready for lacquering. Power machines are used for the gauging of the thread; the base of the shell is placed in the top end of a revolving shaft (operated from beneath the table) and the gauge applied. If the gauge will not go, the additional friction prevents the shell from turning, so that it can be removed with very little trouble. The shells are run through in lots of 10,000.

### Details Relative to Forgings

The identity of all forgings supplied

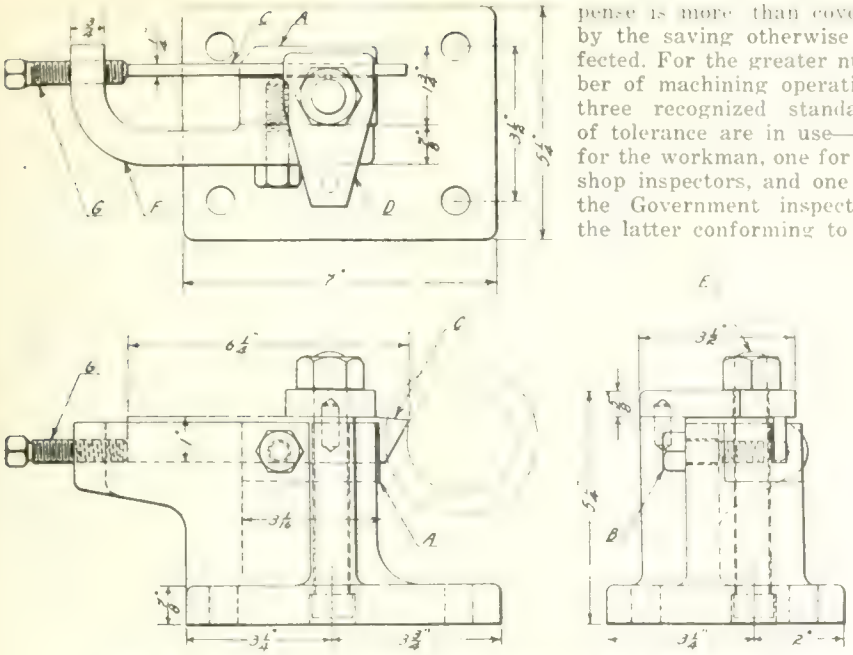



FIG. 2 TOOL POST DETAILS FOR CUTTING OFF MACHINE

by the Government for machining is established by a code letter and number designating the steel maker and heat number respectively; a letter is also used to indicate the class of steel from which the forging has been made. In addition to this a complete record of the physical and chemical tests accompanies each series as a guide to the manufacturer in matters relating to heat treatment. Throughout the process of machining care is exercised in keeping heat series from becoming separate, so as to facilitate the progress of the work. It is quite obvious that certain invisible defects may get past the forge plant inspector. Unless the machining manufacturer can show positive proof that the dimensions of the forging are such that it is impossible to obtain the same he will be held responsible for rejected shells, as incorrect centring may bring about the same result. Shells showing material defects (such as seams, cracks, piping, scale, pockets, forge marks, etc.) are promptly referred to the Government inspector, and he decides as to their disposition and establishes responsibility.

### Reclaim Department

Experience has shown that the efficiency of munitions production has been to a large extent dependent upon the elimination or minimization of spoiled or rejected shells. Apart from the physical defects that are very often unavoidable in the raw material, the bulk of the work that fails to pass inspection is due to the carelessness of the workmen, either in the heating, the machining, or the gauging of the semi-finished shells. In order, therefore, that the accumulation of doubtful shells may be reduced to the lowest possible figure, this firm has adopted what is known as a reclaim department, and its effectiveness as an important factor in manufacturing has been amply demonstrated by the results obtained.

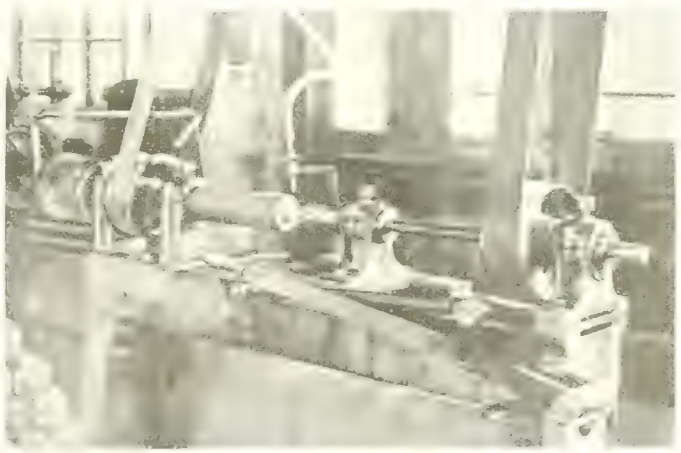
The system involves the use of many additional gauges, but this initial expense is more than covered by the saving otherwise effected. For the greater number of machining operations three recognized standards of tolerance are in use—one for the workman, one for the shop inspectors, and one for the Government inspectors, the latter conforming to the specification of the American Government for that particular type of shell. For instance, we will suppose that the specified outside diameter of the shell body is 2.925 inches, and the allowable variation is .005 above and below this dimension, this gives a tolerance of .010 inch. Then the tolerance of the shop inspector's gauge may be .008 inch and that of the workman's gauge .006 inch, the mean diameter in each case being constant. By this method it is obvious that greater accuracy is required from the machine operators owing to the closer allowance of error.

A factor that tends to more careful application on the part of each operator is that he is not credited with those shells on which the "no go" gauge goes in or over, even though the shell may be within the specified limit of tolerance. When an operator gauges a shell after the machining has been performed and finds the "no go" gauge will go the shell is labelled with a [illegible] card, indicating the nature of the defect, the number of the machine, the operator's number, and the shop inspector that has made the rejection. The use of the defect card has a three-fold purpose—to avoid the possibility of the "reject" being placed with "passed" shells, to enable a record to be kept of the efficiency of the machine, and to maintain a check upon the operator responsible. The red card does not imply that the shell is spoiled, but signifies that it must be forwarded to the reclaim department for further inspection. As a greater tolerance is permitted on this subsequent gauging it is very seldom that the shell cannot be reclaimed. This may appear to be a hardship upon the operator, as he receives no remuneration for his work, even though the shell passes the final or intermediate inspection; however, practice has shown that the system works entirely satisfactorily, as the men exercise greater care in the machining of the work. It also assists the foreman or the superintendent in keeping a close check upon each machine and its operator. If an unreasonably large percentage of "rejects" are shown as coming from any particular machine or workman immediate attention is given with a view of eliminating further trouble.

### Cutting Off the Open End

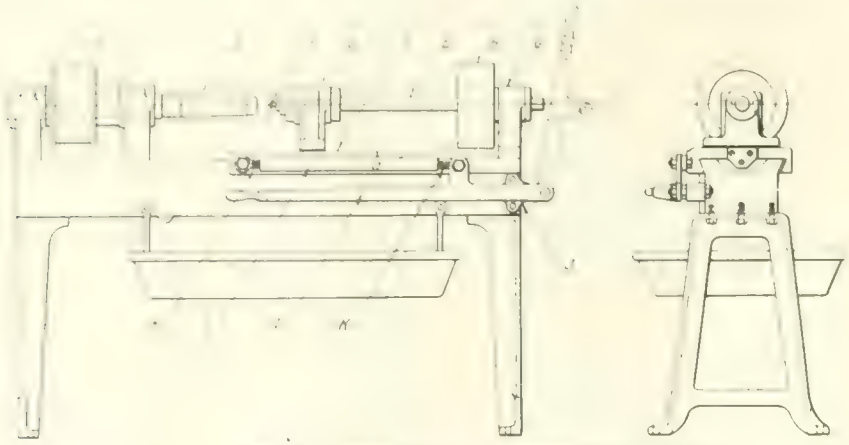
The forgings as they are received at the plant have an approximate weight of 12 lbs, an overall length of 12 inches, the internal and external diameters being 2⅜ inches and 3¾ inches respectively, with a slight taper for relief when stripping the shell from the punch and the die. Cutting off the open end is the first operation, and is performed in machines specially designed by the plant engineer for this particular purpose. An assembled line drawing of the machine is shown in Fig. 1. The adoption of a particular design of self-contained countershaft is one of the features of a large number of the machines in this plant. The use of an extra wide belt from the lineshaft to the countershaft, together with the application of the short chain belt from the latter to the machine spindle, provides a very powerful drive and the necessary speed reduction.

The two upright supports A are secured to the rear of the machine frame,



[illegible]

the upper ends carrying the countershaft. On the outer ends of the arms B an oblong slot is located to carry the shifter rod C, to which is secured the shifter D and the bracket E. The link F connects this bracket with the piece G, the hub of which revolves in the extension of the left side shifter arm. Through the centre of the piece G is a square cored hole into which the rod H is inserted, the lower end carrying the shifter handle J and supported in the bracket I fitted to the chain guard L of the machine. K is the sprocket pinion secured



ASSEMBLY OF CENTERING MACHINE

ment R. A bracket is fitted to the right-hand end of the machine to carry the gauging S, which is operated by the toggle T. By means of the collar U and the two locking nuts the position of the rod S can be accurately adjusted. When placing the shell in the chuck the end of the rod S bears against the inner base of the forging, the action of a spring within the chuck assuring exact setting of the shell. When the air is released the shell is automatically ejected from the chuck.

The design of the tool holder used on the cutting-off machine is illustrated in Fig. 2. The casting forming the body of the fixture is secured to the cross slide of the machine, and to the upper portion is fitted the tool steel hardened block A; this block has a slot shaped in it to receive the cutting tool C. The block is held in position by means of the cap screw B, while the tool is clamped by the strap D and the bolt E, the latter passing entirely through the block. Extending from the main casting is the arm F that carries the set screw G for adjusting the cutting tool. The tool is made of ¼-in. by 1-in. high-speed steel. The shell after cutting off the surplus stock at the open end has a mean length from the inner base of 9.815 in.

### Centring the Base End

While the operation of centring the base is apparently of minor significance, the importance of this detail and the bearing it has on subsequent operations cannot be over-estimated. One factor influencing the successful performance of repetition work is the accuracy with which the primary operations are performed. In addition to the rapid handling of the shell from one machine to another, it is necessary that the various machine operations be accomplished as rapidly and accurately as possible. Fig. 3 shows a view of one of the machines used for the centring of the rough forging and also for the recentring of the shell after the base has been roughed off. The arbors used on these machines are of the expanding type, the jaws being operated by the action of a central draw rod secured to the piston contained in the air cylinder at the rear of the main spindle.

It will be noticed that the machine is of the double-acting type, the spindle with the shell revolving in one direction, while the drill spindle revolves in the opposite direction; this method insures the centre being in accurate alignment with the bore of the shell. In the sketch, Fig. 4 is shown a line drawing of the assembly. A is the pulley secured to the main spindle, and B is the expanding arbor, the pneumatic cylinder being omitted. Secured to the traverse carriage C is the housing D that carries the forward end of the drill spindle E, the tail end of which is supported in the fixed bearing G; the pulley H being so fitted to the bushing in the bearing G that it remains in a permanent lateral position. Rapid action of the centring drill is obtained by the link arrangement of the levers. The rear end of the handle I is fulcrumed in a bracket fitted to the right-hand end of the machine; the connecting rod L is adjustable by means of the right and left-hand eye bolts K. When the handle is raised to a vertical position, as shown by the dotted line, the drill has been removed to the extreme right position, leaving ample room for the removal of the shell.

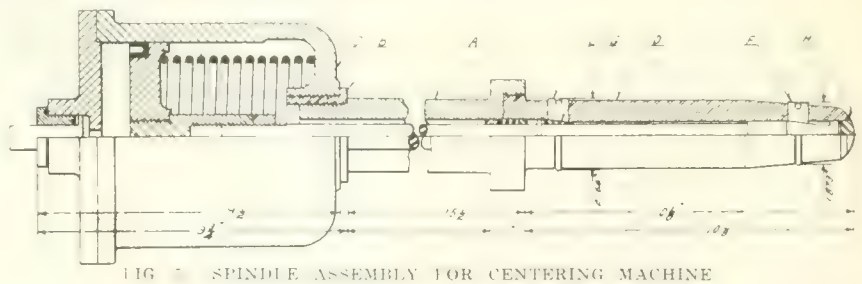


FIG. 5. SPINDLE ASSEMBLY FOR CENTERING MACHINE

The details of the centring machine spindle are shown in Fig. 5. Secured to the rear of the hollow spindle A is the air cylinder C, the bush B being used in this particular instance to fit the bore of the cylinders where the connection is made. The arbor D is threaded to the nose of the spindle and carries two sets of jaws E and F, the front set being operated by a tapered section on the draw rod and the rear set by a bush G fitted to the rod and backed up by the collar shown. The end is closed by a small steel cap H. Two machines are used on this operation, each having a capacity of 180 per hour.

### Rough Turn and Face End

Rough turning the outer diameter is the third operation. This is accomplished in 26 special Lymburner machines, each having a capacity of 17 shells per hour. The main portion of the body is turned to a mean diameter of 3.12 inches, while for a distance of 1½ inches from the open end the diameter is left 3.175 inches. First setting of the tool only is required on these operations, as once the set is adjusted for the proper size, subsequent shells are turned almost automatically; this is done by means of a cam placed at the front of the machine and just back of the cutting tool. This cam is supported on an extra heavy cast iron beam fixed at either end to arms extending out from the headstock and tailstock respectively. This arrangement not only assists in taking the end thrust of the axial pressure, but adds considerable rigidity to the cutting tool, it being held in a special holder of the rocker type, the outer end containing the cam point for generating the desired contour on the shell surface. One-half inch Stellite is used for rough turning operations. The machines are similar to those used on the boring, with the exception of the carriage and the tailstock. These machines are also fitted with the machine countershaft and Baldwin chains are used from the overhead shaft to the gear on the spindle.

Following the rough turning, the base is faced off to a mean thickness of .825 inch. Ten machines similar to those adopted for cutting off the open end are used on this operation. A double tool is used for removing the metal, the leading tool taking off the initial tit, while the second tool takes a cut across the greater portion of the base, leaving a small section for recentering. Each of these machines has a capacity of approximately 50 per hour.

### Machining the Bore

A row of special boring machines is shown in Fig. 6. Thirty-two machines are installed for performing the boring of the shells—18 on the roughing and 14 on the finishing. Both these operations are accomplished with single-pointed tools of high-speed steel, 5-16 by ¾ in.,

held in the end of a boring bar. A good general view of the machine countershafts is shown in this illustration, also the piping arrangement and the flexible lead for the cutting lubricant to each machine. The lever for controlling the air supply is shown directly above the headstock and within easy reach of the operator. It will be noticed that a chain guard has been provided on each machine for the protection of the workmen. The screw and dog for adjusting the cam contact point is shown at the extreme left end of the special arm. The traverse carriage is of ample length to insure maximum rigidity and alignment. The lubricant passes through the boring bar to the cutting point of the tool. The feed is obtained by belt drive, increased lap being given on the pulleys by means of small idlers supported in suitable brackets secured to the headstock of the machine. The profiling point is kept in contact with the generating cam by means of a spring located at the rear of the carriage. On the roughing operation the machines have a capacity of 23 per hour and the finishing machines can turn out on an average of 30 during the same period.

FIG. 6. ROW OF SPECIAL BORING MACHINES

Fig. 7 shows a line drawing of the assembled profile boring machines. In common with most of the other machines these are equipped with the overhead countershaft, but the sketch of the same has been eliminated in this view. The profiling arm A rides upon a flat surface near the forward end of the traverse carriage, from the back end of which extends an arm that carries the pivot pin B. Secured to the middle top of the arm A, and directly above the carriage bearing, is the boring bar support D. In the plan view the cam point is shown at F with the adjusting screw G, the former bearing on the cam that is fastened to the piece H extending out from the main front bearing. The clutch lever is shown at I, and J is the feed clutch. The lever I is so arranged that the feed can be automatically disengaged when the tool has reached its extreme depth. K is the feed pulley, and the adjustable idlers are shown at L. It might be here stated that in both the rough turning and the boring operations two machines are operated by one man, as the design of the machines and their location are such that this can be done very satisfactorily.

### Finishing Inside Base and Open End

After the profile of the bore has been completed the shells are passed to other machines for roughing and finishing the interior base. Eight special Lymburner machines are used for each operation, the output from each machine being about 50 per hour. When roughing the base a half width cutter is used, while a full width flat cutter is used for finishing the base to the specified dimensions. To insure a uniform depth of bore from the open end to the interior base a special cutter head is located on the boring arbor for facing and chamfering the open end. This is shown in Fig. 8. Both facing tool and chamfering tool are made of ½-inch square high-speed steel; the chamfering tool is set parallel with the axis of the bar and the angle of the chamfer is 24½ degrees with the axis of the shell; the facing tool is set at 20 degrees with the face of the work.

### Intermediate Turn and Finish Face

Following the recentring of the shells, which is performed on machines similar to those used for the initial centring, the shells are given a second rough turn. This operation is accomplished in 14 machines like those adopted for the previous turning, the capacity of each approximating 30 shells per hour. The mean dimensions after turning are 2.96 inches for the lower portion and 3.152 inches at the nose, tapered and bevelled as shown in the operation chart.

The base is now finish faced to a mean thickness of .620-inch. Ten machines similar to the cutting-off machines are used for this work and each has a capacity of 50 shells per hour.

(To be continued.)

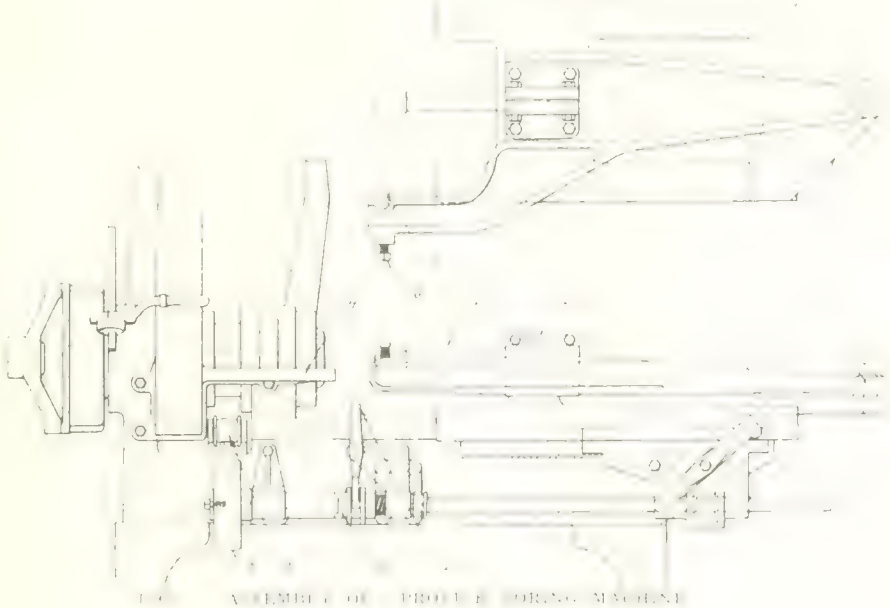


FIG. 7. ASSEMBLY OF PROFILE BORING MACHINES

## BRITISH AND GERMAN TERMS OF CREDIT IN THE ORIENT

THE increasing determination of British commercial interests in Hong-Kong and the Far East generally to break up the system of long credits built up by German traders in Eastern ports has been subject to continuous observation by commercial agents of other countries, particularly the United States Consul at Hong-Kong, who recently made this activity the subject of a report. This credit system, to which most non-Germans have ascribed the German success in securing trade from old-established British interests, was peculiar in the fact that it rested in turn upon British export and financial houses. So closely were the operations of these houses connected with German credits that the charge was freely made before the war, and to some extent since the war commenced, that German houses were given financial facilities which British houses could not obtain.

### German Business Methods

The examination into German methods resulting from the liquidation of the affairs of German firms in Hong-Kong has not indicated that German firms had facilities which British or other firms could not secure, but it has been the means of ascertaining exactly how German firms conducted their business. The subject is of general interest to British traders in Hong-Kong and in the United Kingdom as explaining the credit system. To American exporters it is not only interesting for the same reason, but

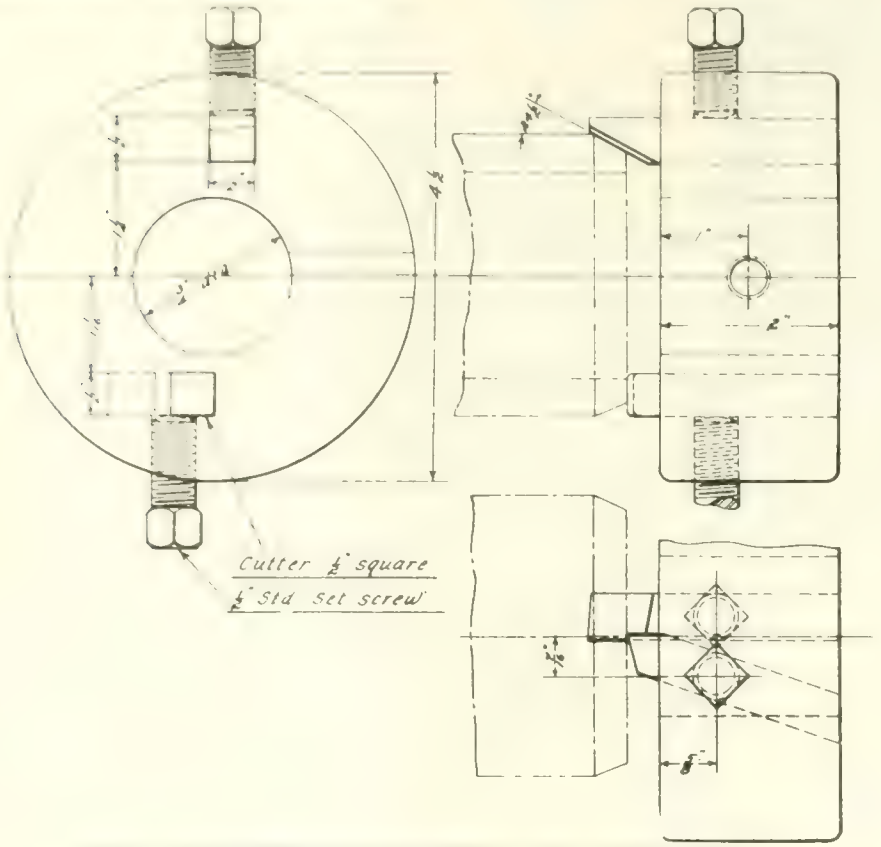



FIG. 8.—ATTACHMENT FOR CHAMFERING AND FACING NOSE

ket, which has made such houses possible and profitable.

**Financing Through "Acceptance Houses"**

An authoritative statement of the matter in its essential features appears in certain correspondence between the China Association (a London organization), the British Colonial Office, the Government of Hong-Kong, and the Hong-Kong General Chamber of Commerce, just published in the Hong-Kong Blue Book of 1917. From this correspondence it appears that German firms doing business in Hong-Kong and the open ports of China not only dealt in German products (in which trade they were aided by the German Government), but they also dealt in British goods and were financed in both cases largely by British houses and were so leniently treated by the latter that strict compliance with the terms of the financial arrangements was seldom insisted upon. As a matter of fact their trade in British and, in some cases, in American manufactures was the foundation of the prosperity of some, at least, of the leading German houses.

The manner of financing exports is succinctly set forth in a statement put before the British and Hong-Kong Governments by the China Association and the Hong-Kong General Chamber of Commerce:

"Arrangements are made with a certain 'accepting house' to accept the drafts of the shippers up to a certain amount. When the goods are shipped from Manchester, Bradford, or Hamburg a bill is drawn at six months' sight on the accepting house, which accepts it, and the drawer then discounts it in the open market. Inasmuch as the draft is fine paper, on account of the standing of the acceptor, it can usually be discounted at 1 per cent. below bank rate. The acceptor usually charges one-eighth of 1 per cent. per month for the service, and the total cost of financing is merely the accepting commission (one-eighth of 1 per cent. per month), interest at 1 per cent. below bank rate, and the cost of the bill stamps. The accepting house sends the documents, with a letter of lien attached, to its clients in China, either direct or through an Eastern bank—usually direct. The China house signs the letter of lien, returns it to London, and takes delivery of the goods upon arrival."

## WOMEN IN WORKSHOPS

From an English Correspondent.

THERE is very little attention being paid to the future of female labor in engineering, although it is generally admitted that it will be one of the most difficult problems we shall have to solve during the period of reconstruction. It is surprising that women were not engaged in engineering before the war, considering that they were employed in many industries that were manifestly less suited to them; but there is some consolation in the thought that our insular conservation was not responsible for this, as even in Germany their value was not realized until sufficient male labor could not be had.

Women have become so important a part of the producing machine now that it is difficult to see how they can be ejected from it when the most pressing need for labor is past. This is looking at it from the purely economic point of view, and ignoring the social danger that would be incurred by throwing women on the labor market. Many of them will return to their domestic duties when their husbands return from the army, but many more will desire to make their new vocation their life work, and it is in the interest of industry that they should be allowed to do so. But their sphere of usefulness is limited, and their greatest value is not realized when they are employed at work for which they are unsuited.

For example, girls or women may be useful in the core shop, but the heavy labor of the foundry floor is man's work. It would have been a wise policy if, when it was first determined to introduce women into the engineering workshops, a committee of experts had been appointed to consider any advice on the best methods of training them for suitable classes of work. We might now have had a great army of really skilled women workers who would have released more men for the colors.

It is erroneous to suppose that the only opponent of women labor is the skilled male worker. The foremen's opposition has been potent during the war. The workman's prejudice is logical, and is usually based on the fear of undercutting. The history of women in industry is not pleasant reading. Invariably she has been used to keep down the rate of wages, and consequently lower the living standard. The only way to eliminate the risk is to abolish sex rivalry. If workmen would open their unions to women they would find them loyal members of their craft. It may be admitted, however, that women in certain work require more help, because of their physical weakness, than men, and it may not be economical for an employer to pay them the same rate of wages as men. This difficulty could be adjusted amicably, however, between the workers and employers in conference.

The war period has seen new developments in engineering. The gasoline engine has advanced wonderfully, and the manufacture of aeroplanes, while it is not likely that it will continue in its present proportions, is a permanent addition to engineering activity. It is probable in this motor car and aeroplane work that women will score her greatest successes, although even in the general works there is room for her. It will be interesting to observe the effect of women's entrance into engineering on workshop conditions. She enters with a mind unbiased and unbittered by the memories of industrial struggles and unprejudiced by worn out customs.

# The Cooling of Cutting Tools: Efficiency of Modern Practice

By R. B. Huyett, M.E.

*That tool's production should have been stepped up through the ... fact of metal cutting efficiency will always remain a peculiar ... development. Much effort could have been saved had as much ... the heat of cutting as was given to finding materials to withstand it. Present practice, however, is largely a result of the path of events in the past.*

PROGRESS in the cutting of metals and, coincidentally, in the lubrication of cutting tools, can be divided into three periods of evolution. The first period is often referred to as the good old days of the backyard shop, when the boss and his workmen vied with each other in the performance of difficult work, requiring great skill, owing to the lack of proper equipment. Each shop was limited in the quality and quantity of its product to the skill of the individual workman.

During this period, the time necessary to complete a piece of work was a secondary consideration. The workman was expected to use his skill in performing the work as near perfect as possible, regardless of the time consumed in so doing. The machine tools then employed, while they accomplished wonders in comparison with hand work, were not equipped to perform the greatest amount of work in the shortest time. Lubrication of cutting tools was unheard of and unnecessary. The machines were not as yet built to run at high speeds.

The introduction of quantity production necessitated the designing and construction of machine tools of greater strength and speed. Then it was found that the cutting tools (all low carbon) would not stand up under the speed of which the new machines were capable as the friction of these speeds generated enough heat to soften the tools and make them lose their cutting edge.

### Efforts to Reduce Friction

To remedy this experiments were made along the line of reducing the friction of cutting. Friction was reduced in bearings by lubrication, why not here? So a squirt of oil now and then was tried on the theory that some might get between the tool and the work and grease the cutting edges.

The futility of trying to eliminate or reduce this friction soon became apparent as nothing could be gotten between the cutting edges of the tool and the work. It was found that a little lubricant at the rake of the tool where the chip slides back over it might do some good, but only a very little. At this time, for some unaccountable reason, it did not occur to the experimenters that, although they could not prevent the great friction at the cutting point, and in this way prevent heat, they could arrange to dissipate the heat as fast as it was generated and in this way prevent the tool from becoming the conductor and burning. Instead of developing a means of taking the heat away from the tool they developed a tool steel which, as they thought at the time, could withstand the heat. This was then called high-speed steel, and is in use to-day.

Now comes the third and present period. Machine tools are designed with much greater cross-sectional area, larger and longer bearing surfaces, special alloy steel parts and greater driving power. These improvements make them capable of such high speed as to generate sufficient heat to destroy the cutting edge of even the high-speed steel tools which had been thought immune from heat.

### Coolant Helps High-speed Steel

Up to this time the manufacturers of high-speed tools claimed that their tools should not be used in connection with coolant.

It was discovered however by users of the tools, that when a ¼ in. or ⅜ in. stream was circulated over the tool there was a very marked lengthening of a lifetime of a high-speed steel tool.

Working perhaps on the theory that if this small amount of coolant was good, more would be better, many progressive engineers tried the use of more.

Among these experimenters was Mr. Frederick W. Taylor. He arranged to circulate, without pressure, a large stream of coolant instead of the small ¼ in. and ⅜ in. streams. The results were remarkable. As much as a 40 per cent. increase in cutting speed was found possible with less deterioration to the tool and a far smaller number of tool grinds. We quote from Mr. Taylor's able work on the subject, "The Art of Cutting Metal": "When one appreciated the very small gain in cutting speed amounting to perhaps from 2 per cent. to 5 per cent. attained by the many experiments which have been made upon the exact angles to which tools should be ground and also the small practical results realized from experiments upon the pressure of the chip on the tool, and when one realized the large amount of time and expensive apparatus entailed [illegible] hand the extreme simplicity of making experiments on the effect of cooling the tool and the 40 per cent. of gain from this source, it is indeed a matter of wonder that this element has been entirely neglected.

"In cutting steel the better the quality of tool steel the greater the percentage of gain through the use of a heavy stream of water. The gain for the different types of tools in cutting is:

| | Per cent. |
|---|---|
| (a) Modern high-speed tools ..... | 40 |
| (b) Old style heavy-hardening tools | 33 |
| (c) Tempered tools | [illegible] |

To quote from a recent article by M. H. Williams, in "Railway Mechanical Engineer": "The value of having an ample supply of cooling compound flowing over the tool to properly carry away the heat generated by the cutter is hard to estimate, and without it the present high speed of milling would not be possible. Looking backwards at old practices with milling and other machines makes one wonder why we didn't flood the cutters at an earlier date. For years it had been the practice to flood the chasers of bolt cutters and taps in nut tapping machines, and we all knew the value of the same. Probably the fact that the old style milling machine was equipped with a can from which some 10 to 40 drops of oil per minute could be fed to the cutter prevented experiments of flooding cutters.

"With the advent of high-speed steel cutters and the increase of speeds it was found that the limit of speeds was reached when the chips removed showed the effect of heat by discoloration, this being an indication of dull cutting edges. Flooding the cutters with cooling compound has the effect of cooling each cutting edge of the cutter after taking a chip so that when coming into play again the edge is cool and the work is also kept cool. An article milled at high speed and also the chips show no indication of heat when handled directly after milling with a flooded cutter, but if the cooling compound is shut off the chips will discolor at once.

### Increased Coolant Cuts Costs

"Many old milling machines of the planer type used largely on rod work, also the upright type and the tool room millers as well as the plain knee type, have been speeded up above their original rate of milling as a result of the application of a more liberal supply of cooling compound. This has generally required larger pumps and piping, and where used has at times resulted in overflowing the tables, making it necessary to increase the passages from table to tank and to place extra guards around the table to prevent flooding the floor. However, where the machines have been equipped for greater supply of cooling compound the results have well justified the cost on account of a greater output from the machines. It is cheaper to speed up machines than to buy new ones.

"It is not advisable to direct the compound on the cutter with great force on account of splashing, but it is desirable to have a large stream at low pressure and for the average machine pumps to supply 10 to 15 gallons per minute answer very well."

The real function of the liquid is to carry away the heat from the tool and prevent its temper from being destroyed. Lubrication therefore is a misnomer and the word "coolant" is a much more appropriate term. We quote from Mr. Becker's able work, "High Speed Steel": "While the word is in common use in this [illegible]

speak of lubrication in connection with metal cutting. It is quite impossible to force oil or other substances between tool and chip. The purpose of the so-called lubricants in the main is merely to assist in carrying away heat from the [illegible] keeping down the temperature of the cutting edge and lip of the tool below the point where softening will begin."

### Volume of Coolant Necessary

The size of the stream of coolant to be used depends on the speed of the machine, the depth of the cut, and the kind of material. The easiest and only sure way of knowing when enough coolant is being used is to run the machine at its maximum speed from the standpoint of the strength of machine, material and tool. If the tool smokes or the chips come off hot at this speed, an insufficient amount of coolant is being used and the flow should be increased.

It is far better to use too much than too little, and Mr. Becker, in his work, "High Speed Steel," puts it this way: "The output of most old style milling machines can be about doubled by following the plan of keeping the cutters cool, and this applies to the smaller tool-room machines as well as to the larger millers. Where machines are not so equipped it would undoubtedly pay to apply a cooling compound system."

Such statements as these started investigation in the right direction and the possibilities for increased efficiency by scientific cooling of the cutting tool are gradually being more and more recognized. However, there still exists a deplorable amount of indifference to these possibilities even in many otherwise progressive shops, as is evidenced by the smoking tools and hot chips. It will pay an executive interested in everything that affects profits to investigate these conditions.

The absence of smoking tools or hot chips is not conclusive evidence that enough coolant is being used. The machines may be slowed down to accommodate the small streams of coolant being used.

The small streams customarily used are quite ineffective. It is necessary to deliver gallons of coolant where it has been customary to deliver pints. The heavy streams serve another useful purpose in cases where the chips come off small or well broken up in that they carry or float them out of the way.

### Water Solutions the Logical Coolant

Since to cool is the prime function of the liquid, it naturally follows that the best liquid to use is that which possesses the greatest cooling qualities. The lighter and therefore more easily evaporated the liquid, the greater its cooling qualities, consequently, water fills the necessary requirements when properly mixed with a sufficient quantity of some good cutting compound to eliminate the corrosive effects of water alone. Such water solutions are not only much better coolants than pure oils, but are far cheaper. Oils pick up heat slowly and release it more slowly. Water picks up heat quickly and releases it more quickly.

### Effective Application of Coolant

It is not sufficient that a copious flow of coolant be used. A great deal depends on the manner in which it is used. It must be directed at the right point and delivered at a slow velocity. Again quoting from Mr. F. W. Taylor's "The Art of Cutting Metal": "A series of experiments has demonstrated that water thrown directly upon the chip at the point where it is being removed from the forging by the tool will give higher cutting speeds than if used in any other way."

And further: "After deciding to try experiments upon the cooling effect of water when used upon a tool, it was our judgment that if a stream of water were thrown upward between the clearance flank of the tool and the forging itself, in this way the water would reach almost to the cutting edge of the tool at the part where it most requires cooling, and that by this means the maximum cooling effect of the water would be realized. We therefore arranged for a strong water jet to be thrown between the clearance flank of the tool and the flank of the forging and made a series of experiments to determine the cooling effect of water with various feeds and depths of cut. So confident were we of the truth of this theory that we did not deem it worth while to experiment with throwing streams of water in any other way until months afterwards, when, upon throwing a stream of water upon the chip directly at the point where it is being removed from the forging by the tool, we found a material increase in the cutting speed and thus our first experiments were rendered valueless.

"Practically great difficulty will be found in getting machinists in the average shop to direct the stream of water on the chip in the proper way as indicated, because when a sufficiently heavy stream of water is thrown upon the work at this point it splashes much more than when thrown upon the forging just above the chip, and a machinist prefers slower cutting speeds and less splash. However, when they are managed under the "task system" with trained speed bosses who are accustomed to obeying orders, this trouble disappears.

"The most satisfactory results are obtained from a stream of water falling at rather slow velocity, but with large volume, at the proper point upon the tool, since a stream of this sort covers a larger area of the tool and is much freer from splash."

### Most Efficient and Economical Means of Delivering Coolant

Machine tool builders as a general rule have entirely overlooked the necessity of supplying adequate coolant circulating facilities on their machines. Users found that the machines were not properly equipped to deliver sufficient coolant. In order to overcome this defect some users have gone to great expense and trouble to instal a gravity system to provide the proper flow and eliminate the troubles of the gear-type pump, such as loss of prime, clogging, short life, etc. The installation of a gravity system has cost several time per machine what it would cost to provide each machine with an efficient individual pump at the present time. By installing gravity systems users of machine tools have done nothing more than trade the troubles incident to the use of the old gear-type pump for those of the gravity system. With a gravity system in use it is necessary that all machines connected with the system use the same grade of coolant. It is unsanitary, requires constant attention, and, if the least thing goes wrong every machine connected with the system is put out of commission until the defect can be repaired.

A very large majority of machine tools are still being furnished to the users with small capacity pumps and small-sized piping. This necessitates the changing of the circulating system on machines by the users.

Although it seems a hardship to have to do so, until such time as they can insist that the machine tool builder equip machines properly, it is far more economical for the users to throw away the small capacity pump and piping than to use it. A few dollars spent to get a pump and piping of the right capacity will be saved many times over by the increase in production and the lowered tool expense.

## LUBRICATION OF SHAFTING

TO obtain efficient lubrication a film of oil only is necessary, and to get this without waste the old dodge of using twisted worsted or cotton yarn is hard to beat when properly used. The methods of application differ, although the principle is the same in all cases. A receptacle partly filled with oil forms the reserve supply, and in this there is one end of a loosely spun thread of cotton or woollen yarn, the other end being in contact with the shafting or other part to be lubricated, the oil being drawn over by capillary attraction.

The rate at which the oil passes depends partly on its viscosity and partly on the tightness with which the yarn is spun, while for some purposes a flat woven lamp wick very well supplies what is needed. No large amount of oil is needed for well-balanced machinery which is not overloaded, provided the right quality of oil is used, but it is necessary that the supply be continuous or lubrication will be inefficient. A flood of oil for half the day and dry bearings for the other half is almost as bad as no oil at all, and is avoided in good practice. It is wasteful of lubricant and harmful to the plant.

BELTS are more durable and work more satisfactorily when made narrow and thick, rather than wide and thin.—Belts.

IDLER pulleys work most satisfactorily when located on the slack side of the belt about one-quarter of the distance from the driving pulley.—Belts.

# Heat Treatment of Large Forgings: Methods and Apparatus-II*

By H. H. Ashdown

*So much lecture-matter enters into the proper method of heat treating ... the modern equipment used and the ... article is a problem in itself and ... with the various methods in use and the ... The present article deals ...*

### Pyrometers

Pyrometers are of great value and service in indicating temperatures, but in inexperienced or careless hands, they are more harmful than helpful, and so far as recorders are concerned, little value should be placed on them without knowing that careful observation had also been kept on the furnace. The record simply indicates the temperature of the area in which the pyrometer is located, Fig. 2, 10, 11, and 12, and a great diversity of temperature may often be seen in large furnaces within a few feet of this position. In the author's opinion, the greatest value of a recorder is the moral effect it has on the furnacemen. It certainly causes them to be more attentive than they otherwise might be to their fire control.

The following instance relative to the deception of pyrometers is given: Let us imagine the pyrometer being in contact with the shaft end of the forging, Fig. 12; one might then record the desired temperature for many hours, and yet the body of the forging could still be several hundred degrees below that indicated. Indeed, the author has seen comparatively small engine parts, of which, within a length of three feet, after heating and quenching, one end has been

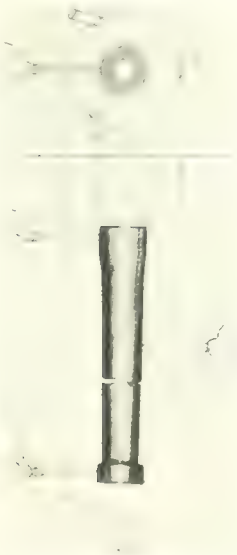


FIG. 11. ILLUSTRATING THE USE OF PYROMETER.

in its softest possible condition whilst the other end has been practically unfileable. When it is fully realized that pyrometers simply indicate a local temperature, and that uniformity of temperature is entirely dependent on careful observation, many of the so-called mysteries, together with their consequent troubles, will disappear.

Although only one form of pyrometer has been illustrated, the Fery radiating pyrometer, Siemens water pyrometer, and Brearley sentinel pyrometer, Fig. 13, have each their own spheres of usefulness. In the latter case, for instance, the sentinels can be placed in positions quite inaccessible to other forms of pyrometers and again can be laid in rotating bodies, their complete fusion denoting their prescribed temperatures.

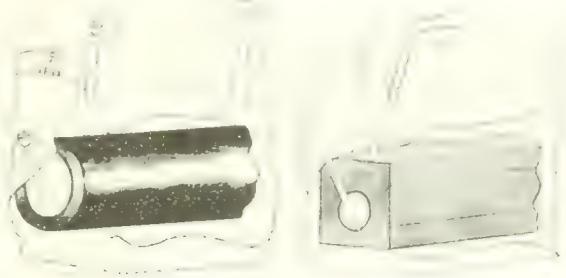


FIG. 10. FURNACE DIAGRAMS ILLUSTRATING THE USE OF PYROMETER

### Sand Annealing

When it is generally realized that forgings, after their structures have once been refined by a correct heat treatment and are quickly cooled, give better mechanical and physical tests generally, the fallacy of sand annealing will soon disappear. These remarks apply equally so to those which have been quenched and have received a subsequent light annealing or tempering to conform to specified tests. It is sometimes an advantage to bury in sand forgings made from steels akin to those exhibiting air-hardening properties, with a view to rendering them soft for machining; but if such forgings after machining are to be assembled in the machine in this annealed state, it is then better to cool quickly and reheat slightly below the change-point.

If it is intended to anneal forgings in sand with the object of softening for machining, they should be fully covered before they have fallen below the critical temperature, and for comparatively small forgings hot sand should be employed. For want of a little knowledge on this subject much apparent slackness is practised, and this in a large measure accounts often for much of the so-called hard and soft spots which cause endless trouble and expense in the machine shop.

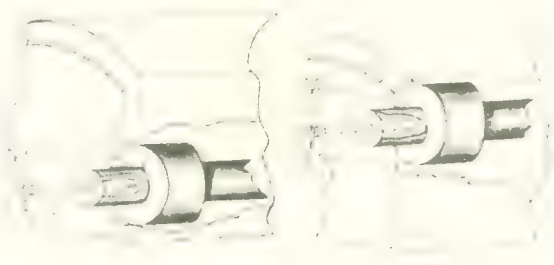
The steel- maker, of course, usually has all such troubles reflected back upon him, often being informed that his steel is badly made and wanting in uniformity.

### Oil Quenching

Attention has already been called to the want of uniformity in heating for annealing, and this applies equally to the case of forgings being heated for quenching, in order both to improve their structural condition and also to effect a certain standard of hardness. It might appear somewhat elementary to embrace such remarks as these, but when one finds that such important essentials are commonly overlooked, it is well to make it quite clear that all forgings, whatever their size, must be quenched only when uniformly heated above the change-point of the steel.

Excessive heating of forgings before quenching is not only productive of a bad structural condition, but also renders the cooling medium unnecessarily hot, and thus effects a comparatively slow cooling of the forging through its critical range, allowing partial precipitation of the ferrite to take place. It will be generally admitted that the quicker a forging can be cooled until the critical range has been passed the better will be its structural condition, and consequently its physical properties will be of a correspondingly higher order. This, in the author's opinion, is a matter deserving of closer attention than it would appear to have received in the past.

This point leads up to the liquid used as a quenching medium. The author trusts he is not exceeding the privilege conferred on him if he mentions the subject of gun forgings. Of recent years marked developments have been seen in the size and weight of these forgings, until they have assumed ponderous masses and require for their quenching tanks of oil from 8 to 10 feet in diame-



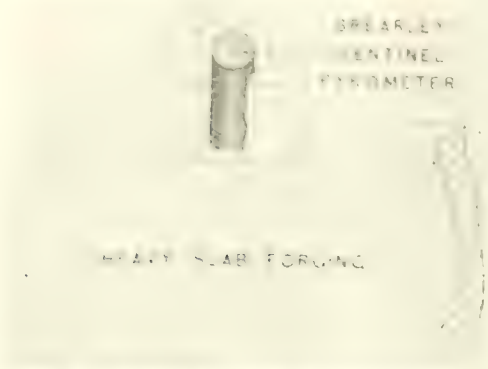
PYROMETER IN CONTACT WITH THE SHAFT END OF A FORGING

*A paper read before the Institution of Mechanical Engineers.

**Sir W. G. Armstrong Whitworth Co., Newcastle-on-Tyne, England.

ter and approaching 100 feet in depth. If further developments are to take place, the quenching of these colossal masses will have to be seriously considered if we are to obtain the best results, and not only compete with, but lead, competitive nations.

Those who have experimented by water-quenching materials in the mass,




SEARLEY SENTINEL PYROMETER APPLIED TO HEAVY SLAB FORGING

know that greatly superior results can be obtained, and also that the structural condition is all that can be desired. The author believes he is correct in stating that this form of quenching, if not in use in this country, is in operation in foreign countries, and of the forgings so treated which have come before him, both for microscopical examination and general testing, to say the least, the results have been highly commendable. He is disposed to think that steel manufacturers would welcome the opportunity of the choice of quenching mediums both from the point of view of producing a better article and also by dispensing with a costly fluid, and one which is attendant with great risks when large masses of steel are being hardened. It is possible that slight modifications in the analysis of forgings so treated may have to be made, and at the same time it must also be remembered that quenching mediums which are highly suited for treating large and heavy forgings are not necessarily the best for light forgings or those of thin section, but such matters as these may be safely left to the discretion of experienced manufacturers.

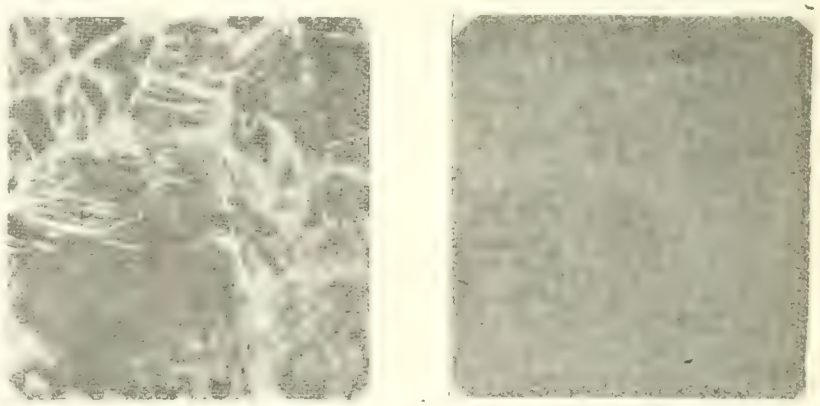
### Specifications

Many specifications covering the composition and treatment of materials leave much to be desired, and suggest anything but progress. They bind the manufacturer in every possible direction, and thus restrict him in the production of an article much superior to that to which he is now limited. An example is cited of specifications covering certain high-class forgings. They are specified to give after heat-treatment, say, 30 to 35 tons tensile with a combined elongation and reduction of area of, say, 80. If a manufacturer produces a better article giving 37 tons together with a sum of 90 representing the combined elongation and reduction, this forging would be rejected, and would have to be re-annealed to conform with the maximum stress. Suffice it to say this forging after the re- treatment, although conforming to specification, would be much inferior than when in its original heat-treated condition.

The author hopes that engineers and the steel manufacturers' customer will correct him if his interpretation of specifications is incorrect. He looks upon specifications as a working basis, drawn up between the engineer and the steel manufacturer when entering into contracts, to be used as a guidance for both parties and with reasonable discretion by the inspecting engineer. If specifications were so framed that they were to be enforced to the letter, one could see little use for the intelligent engineer as an inspector.

### Research

As research investigation should be of great value and assistance to the steel manufacturer in guiding him out of his occasional troubles, it is felt that this paper would be greatly wanting in a most essential detail if reference were not made to this very important subject. In the author's opinion the great value of research work is often lost owing to its want of application. The research chemist may be a highly qualified man, and his conclusions as to the cause of failure within reasonable limits of being correct, but generally speaking, he is not in a position to apply his reasoning into works practice, and his reports being often of a highly technical character are to some extent beyond the technical range of our good practical men. It would therefore appear that a gap yet exists between the works and the laboratory, and requires to be bridged across in such a manner that the full value of research investigation can be infused into works practice.



Practically Heated Before Quenching — Refined and Normally Heated Before Quenching

FIG. 14—80-TON FORGING SHOWING EFFECTS OF QUENCHING AND TEMPERING

It is often stated that the fine structural conditions and excellent tests obtained by treating pieces in the laboratory cannot be obtained when treating masses in the works. This idea is totally wrong; by reasonably careful control of furnace conditions, and where quenching is necessary, regulating these conditions also, equally good results can be obtained. To substantiate this statement, in Fig. 14, is shown the structural condition of a forging weighing about 30 tons, which had been subjected to a prolonged heating before quenching. This was subsequently given a refining treatment, requenched and tempered, with the result shown in the adjoining photograph. This is by no means an exceptional case, and it is questioned if a much finer structure can be produced in the laboratory when dealing with a 1-inch diameter bar.

### Ghosts

Ghosts in steel forgings, as is generally known, are caused by the presence of non-metallic enclosures; and whatever form of heat treatment these forgings may subsequently receive, it is practically impossible to remove these ghost-marked areas. It is, however, within the writer's experience, possible to reduce the size of the ghost-marks, but the treatment necessary is both drastic and costly, and possibly the remedy may prove little better than the evil. This is a subject for which there is yet much room for investigation; and although in some cases their presence need not be looked upon with any degree of alarm, there is no question that a steel free from ghosts is a much superior article. In any case, prevention is always better than cure, and it is quite possible for the steel-maker to cast ingots of 100 tons in weight with the major portion entirely free from ghosts.

It has been endeavored to indicate briefly the principles underlying successful heat treatment on a commercial scale, and although in a small degree the value of science in the works has been discounted, no one is more anxious than the writer to see it take a prominent place. This end, however, can only be attained by creating in those who have the handling of this class of work a personal interest, and this will be best achieved by occasional practical demonstrations.

The great value of correct and careful heat-treatment does not yet appear to be appreciated by many whom it should seriously concern. When it is generally realized that forgings made from the best steel produced can be hopelessly spoiled, due either to insufficient heating or by overheating, and that forgings such as are now under review may be worth many thousands of dollars, and again from this same cause premature fracture may take place with a consequent great loss of life, this subject may be given closer attention and considered more as a crude form of craft.

# Corrosion of Iron and Steel, and Its Prevention-III.*

By Abe Winters

*Perhaps the most pathetic feature of man's existence on this planet is illustrated by the contrast between the immense metallurgical and manufacturing industries based on iron ore, and the loss of finished metal due to corrosion. Sometimes obscure, sometimes prominently noticeable, the ravages of rust are the most relentless of all handicaps which man lives under, undoing with hitherto unpreventable certainty that which he has done.*

AS HAS been shown, the rusting of iron and steel is a definite chemical process due to the combined action of air, moisture, and carbon dioxide upon the metal. The increased rate of chemical corrosive action due to a local increase of temperature is noticeable, and may be due to galvanic action set up between portions of the same metal at different temperatures.

Corrosion, or the oxidation of substances by chemical action is always accompanied by electrical energy, which may be of more or less intensity, or electromotive force according to the substance consumed. Rust proceeds solely from the action of acidulated moisture upon a clean iron surface, and is probably only a point action in the beginning.

The affinity of the iron for the oxygen in the acidulated moisture of the air or water in the oil, or from other sources is greater than its bond with the hydrogen, which is sixteen times the volume of oxygen united with the iron to form hydrated $Fe_2O_3$ or red rust. They hydrogen, from its light specific gravity, in its effort to escape into the air pushes up the overlying coating, increases the area of the affected part, cracks the coating in its exit, moisture enters again, and corrosion is master of that location.

The rust which has thus been formed is hygroscopic and carries twenty-four per cent. of moisture as it forms. This moisture never dries out under any atmospheric heat condition, but is ever ready for a chemical decomposition. The hydrated red rust, being nearly two times the volume of the iron from which it is formed, adds its efforts to the free hydrogen to push through any protective surface film and eventually create havoc over the entire surface. This mechanical action is far more energetic than a mere casual observation would lead one to imagine. In considering the question of rust prevention or prevention of corrosion, it is essential that the nature of the corrosion and the cause of its formation be known.

### Protection

The general subject of protection against rust or the corrosion of iron and steel may now be considered by reference to the four principal methods which may be employed, each method having its respective value and limitations. All have proven practical for particular purposes, although none of them are perfect under all conditions; a very wide field is still open for more extended use of these preventatives.

Group No. 1.—Alloying, or introduction of other metals into the composition of the steel when manufactured.

Group No. 2.—Covering the steel by mechanical means, as by painting, enameling, lacquering or the application of inert metals.

Group No. 3.—Rendering the steel or iron surface passive.

Group No. 4.—Coating with metals electro-positive to iron.

We have already noted that changing the composition of iron influences the resistance to corrosion, wrought iron and steel of various methods of manufacture are greatly influenced in corrodibility by the amount of phosphorus contained in them. With one per cent. of phosphorus present the corrosion is a little over one-half as great as in cases where the iron is free from phosphorus.

If two pieces of steel containing different percentages of phosphorus are immersed in salt water, in contact, the low phosphorus specimen will corrode more rapidly than the high grade metal. Iron alloyed with nickel, cobalt or chromium behaves in a similar manner.

Many different kinds of steel are now being made in which other metals are being added, such as tungsten, copper, vanadium, zirconium, molybdenum, etc. These additional metals not only affect the physical qualities of the steel, but also influence the rate of corrosion to a large extent. It is probable that future development of this method of combating the corrosion difficulty may eventually throw light upon the mysterious iron preservation methods used by the ancients upon various specimens which have been the source of admiration and wonderment on the part of thousands of our leading scientists during recent years.

### Group No. 2

The most common and widely known method of protecting iron or steel from corrosion is by covering the iron or steel surface so as to mechanically protect it. A pigment and a liquid mixed together so as to form a thin coating when spread or sprayed is the method usually employed under this group and requires only brief attention in this article. The essentials of good paint are adherency, non-corrosive properties, hardness and elasticity, proper drying properties, durability and covering power.

Paint destruction may result from the following causes: Mechanical injury, action of gases, chemical action between the pigment and the liquid vehicle, chemical action between the surface covered and the paint, action of light, peeling, cleaning, and from water.

To successfully design a paint which will resist all of the previously named destructive agencies is a difficult matter. The field is an enormous one to cover and but little positive knowledge has yet been obtained, though the investigators and experiments have been legion, and the literature on the subject embraces volumes. Experiments are numerous in the field of designing a waterproof coating to be applied over the pigment which has been found to possess the most preservative qualities, independent of the water-repellant features, but the goal has never been reached.

How effectively a thin coating of the proper material can protect the surface of a paint which it covers can be seen in the lettering of old sign-boards, which is perhaps an example of the most durable paint of which we have any record This protective effect is explained by the well known fact that lamp black is one of the best water-repellants known, that it is practically indestructible by oxidation or acids, and being per se of an oily or greasy nature, when mixed with a pure oil and being in a measure elastic, it has effectually preserved the surfaces and not allowed the water to reach the underlying coats of white lead.

The electro-deposition of inert metals upon iron or steel surfaces as a means of protection from corrosion, as well as coatings obtained by immersing the iron or steel in bath of the molten metal, may or may not be even temporarily effective, the resistance to corrosion depending entirely upon the continuity and mechanical strength of the coating; vitrous enamel is employed effectively as a covering for cast iron water manifolds and is regarded by certain authorities as being superior to any other known process of rust-proofing.

### Group No. 3

Iron under certain special conditions assumes a state in which some of the properties it usually possesses are not apparent. Certain strong oxidizing agents will prevent the solution of iron by an electrolyte.

When bright clean steel is immersed in concentrated fuming nitric acid, it becomes passive and is no longer soluble

*Part 2 appeared April 4

[illegible] able to replace copper from a copper sulphate solution. Authorities differ greatly as to the cause but the condition thus produced is the foundation of one of the present widely exploited methods of rust-proofing iron [illegible].

The Bower-Barff process is an example of the passivity group. The process consists of producing a rustless coating upon cast iron, steel, etc., by exposure to a low red heat in special furnaces or retorts and subjecting the surfaces thus exposed to the action of superheated steam, carbon oxide gas, hydro-carbon and hydrogen gas alternately or in combination according to the different processes.

Other processes by which iron is given a rust-resisting coating are those known as Coslettizing, Parkerizing, etc. These processes depend largely upon the action produced when the iron or steel is immersed in a hot phosphorized solution containing either manganese dioxide or [illegible] oxide.

## DIES FOR DROP FORGINGS

By Mark Meredith.

THE dies and tools used in the production of drop forgings have been compared to the patterns used for castings, but the cost of dies is very much higher than that of patterns and the selection of material for dies for a given purpose or class of forging requires careful consideration in estimating the probable cost of the forgings. Generally speaking, there is little or no reduction in cost of drop forgings compared with hand forgings when less than 100 pieces are required, but above this drop forgings show a saving that increases rapidly with the number required.

Dies are occasionally made for compartively small quantities, but as a rule only when the expense is justified by the greater reliability of drop forgings and the reduction in the cost of machining and finishing, due to the greater accuracy with which such forgings can be made. These advantages are frequently overlooked. The rapidly increasing growth of the industry is one of the most prominent features of modern engineering progress. In some cases, especially in the cycle and automobile trades, drop forgings have completely ousted the malleable castings that were once used extensively, but are now considered unreliable for such work.

For many special purposes the advantages of drop forgings are coincident with the necessity for dealing with higher strains, and at the same time keeping the weight to a minimum. This is particularly noticeable in handling high grade alloy steels, such as nickel, nickel-chrome, vanadium, and chromo-vanadium steels that are capable after suitable heat treatment of standing up to tensible tests as high as 120 tons per sq. in.

The choice of material for dies is largely determined by the nature of the article to be made and the quantity required. Cast iron has been used extensively for plain, heavy forgings, and if a good mixture of iron is used to give a tough and close-grained casting very satisfactorily results may be got on rough work. The great disadvantage of cast iron dies is, of course, their short life owing to breakage. For most heavy forgings that are not intricate in design forged blocks of low-grade Bessemer steel are used, and are much more durable than cast iron. As breakages do occur, it is a much better practice, generally adopted, to use dies of a good open-hearth steel. This, especially if Swedish iron is used in its manufacture, is particularly suitable. Crucible cast steel is more suitable when large quantities of small castings of intricate design are required, especially if great accuracy is specified, and when great care is essential to ensure uniformity in the hardening process.

Where great toughness is necessary to ensure durability and reduce risk of breakage a 3 per cent. nickel steel gives good service, and for special forgings, such as 4 and 6-throw crankshafts, connecting rods, and such like, or when the dies are expensive to make, a durable alloy, such as nickel-chrome steel, is usually employed. It very seldom pays to use a cheap material. The analysis of die steel varies according to quality and purpose. The carbon content depends on whether the dies are to be hardened or not, and to what extent, but for general purposes should be from .55 to .70 per cent. A steel giving the following percentage analysis will be found very suitable for most purposes:—Silicon, 0.45; sulphur, .01; phosphorous, .02; manganese, .60; and carbon, .65. In most shops it is the rule to harden all small dies, but with large dies this is not done except for very special work, such as dies for slender forgings that may be 2 ft. 6 in. or more long, with a sectional area of about .5 sq. in. and weighing only 5 lbs. or so.

Untempered dies harden appreciably in use; in fact, they have to be annealed before they can be recut. In recutting a die that has become worn a cut is first taken off the face on the shaping machine, and then the impression is resunk, as much as possible being done by means of machine tools, such as the lathes, planer, or vertical milling machines. Irregular and minor details are then finished off by hand. The vertical miller is generally recognized as the most useful tool for die-cutting, as it can be used for the same purposes as a planer or shaper for truing the face of a die as well as for milling out the impression. The lathe is a good second, as in addition to surfacing it is particularly suitable for dies required to make gear blanks, collars for shafting, and other circular forms; such dies can be finished entirely in the lathe with the exception of the outlet.

For hardening, the dies are often heated to about 800 degs. C., slowly and uniformly. They are quenched in a tank holding 200 to 300 gallons of water, with a feed pipe arranged to force a stream of water against the face of the die, thus chilling the face quicker than the remainder of the metal, which is required to be tough rather than hard in order to withstand the shocks.

## WAR DEMAND INCREASES VALUE OF CHROMITE

THE mineral chromite is the source of the metal chromium, which, as an alloy in chrome steel and in several chemical compounds, occupies an important place on our battle front on both land and sea. The compounds furnish the strong and durable yet subdued and protective colors that are used to dye the soldiers' khaki clothes and tan the upper leather of his shoes. Chromite readily forms alloys with iron and gives hardness to the steel that is used for armor plate on war vessels and for the armor-piercing projectiles which they hurl at the enemy. It is one of the essential elements in stellite, which is now so largely employed in making high-speed tools for cutting steel in the manufacture of munitions.

Unfortunately for the United States the present domestic output of chromite is scarcely one-fourth of the quantity needed for war and domestic uses, so that the other three-fourths must be imported. According to the United States Geological Survey, most of the imported chromite has come from Rhodesia and New Caledonia, and, notwithstanding the scarcity of ships, much of it still comes from those distant lands. In response to the call for chromite Canada has rendered most efficient help. In 1916 she sent 10,930 long tons and in 1917 she more than doubled her shipments of chromite to the United States.

The domestic production of chromite in 1916 was about 47,000 long tons, and last spring the prediction was made by Government geologists that in 1917 it would reach 48,000 long tons. According to J. S. Diller, of the United States Geological Survey, the latest returns indicate that this prophecy has been fulfilled.

### Beds Far From Transportation Lines

Most of the known bodies of chromite are small, and those that lie far from lines of transportation are not available for exploitation by the ordinary miner because of the difficulty and expense of getting the ore to the market.

Much of the chromite on the Pacific Coast is of low grade, averaging about 40 per cent. of chromic oxide, and on that account is of less value than the imported ore, which generally contains 50 per cent. or more of chromic oxide.

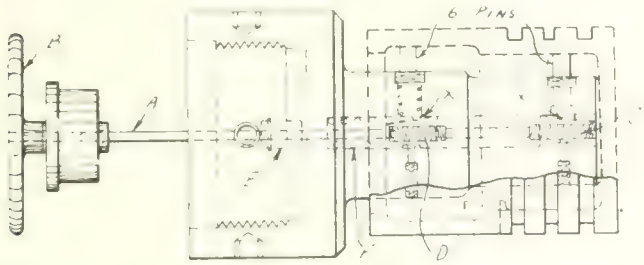
Nicaragua is shipping a small quantity of ore. At Antioquia, Colombia, chromite is reported to be so abundant that it has been used to build the walls of houses. Brazil has valuable deposits several hundred miles north-west of Bahia, and may yet become a contributor to our needed supply.

Most of the chromite is needed in factories in the eastern United States, and on account of the difficulty and expense of long transportation from the western deposits one of the most urgent present needs is to increase the production of chromite in the Atlantic States.

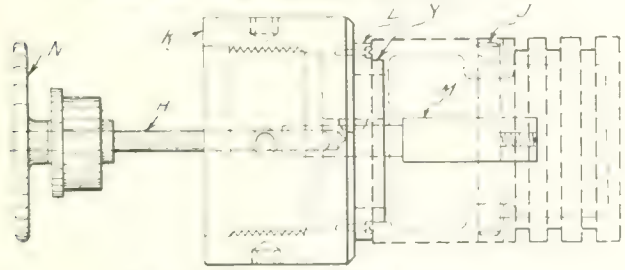
# PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

In Fig. 43 two methods of gripping a piston while turning the outside, facing the end and grooving are shown. The first of these in the upper view is known as a pin arbor, deriving its name from the fact that six pins are used to grip the work and centralize it by the hole. These pins are set three in a circle and are staggered. The pins are forced out and caused to grip the work by means of a drawback rod A, which is operated by a hand wheel B through the spindle of the machine. On this rod right and left-hand threads are cut at C and D respectively; where these threads come bushings are placed, these bushings have tapers cut in them to receive the pins at X, and by turning the drawback rod the sleeves force the pins out, thereby gripping the work. This rod A is made in two pieces and it is connected by a collar at E, this allows the end of the rod with the threads cut on it to float back and forth, thereby allowing the pins to centralize and grip the work by the inside. The spring F pushes back the sleeve D when the arbor is loosened, while continuing to loosen the arbor causes the sleeve C to be drawn in. As the inside is gripped true by the pins it is apparent that the outside will be turned true with the inside or as near as is possible from a rough casting. In locating the piston on the arbor it is pushed back against the arbor end.




Fixture with Sliding Cams for Expanding Pins



Fixture with Pins at Wide Part Holding Piston

TWO FIXTURES FOR HOLDING PISTONS.

In the lower view of Fig. 43 a method of gripping a piston by means of a taper pin and a drawback rod H are shown. Like the method of gripping shown above this arbor screws on the spindle nose of the machine, the body K being a casting. The first operation on this consists of boring out the end Y and this is then used for centralizing the work by having a steel plate L turned down to fit it. The pin J is placed through the wrist pin hole of the work and into the end of the drawback bar at M. Tightening the hand wheel N causes the piston to be drawn back tight against the steel seat L, thus securely holding it in place while the outside is turned.

### Spindle Nose Fixture

Fig. 44 shows a piece being gripped on a spindle nose fixture, this being securely held in place by a vee block A and screw B. The most interesting part of this fixture is that two eccentric counterbalances C and D are used. These counterbalances are drilled eccentric and are swung around the stud E, and thus they may be set closer or further away from center of the machine as may be required. More exact balance is obtained by their use than with the fixed balance.

An example of holding work on an arbor and driving it by means of a chuck is shown by Fig. 45. In this instance the work is put on the arbor A in the usual manner, the arbor is placed between centers as shown when set in this position, the chuck jaws B are tightened independently on the work, so as to drive the same without depending on the drive of the arbor in the short holes.

Fig. 46 shows chuck jaws for gripping under the rim of a pulley; these jaws are set out to suit the size of the pulley at A and are extended out from the chuck so a facing tool may be run over the top B to true up the rim. Three jaws are usually used, C to C, the jaws are tightened loosely in the pulley, and the pulley is pushed against the pot D. In this position the screw C is tightened, this centralizes the pulley from under the rim and also drives the same while the hole is bored, the outside turned, one end of hub face and the rims of the pulley faced; a bushing E is placed in the chuck in this instance for piloting the boring bars.

In Fig. 47 two more spindle nose fixtures are shown and the upper one might be termed a split chuck, the body of the chuck A screws on the spindle nose and

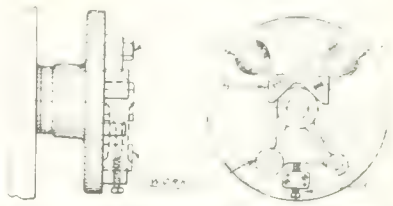


FIG. FIXTURE USING VEE BLOCKS AND COUNTERBALANCES.

has six slots B cut in it. The work is gripped by the chuck in the manner shown and the sleeve C is used to cause the chuck to grip the work by means of the beveled surface X.

In the lower view Fig. 47 a fixture known as the pot type is shown. This fixture D screws on the nose of the spindle; the work is placed inside of the fixture and two rows of screws E and F are used to grip the work. A pilot bushing G is used with this fixture for guiding the boring bars and the work is also pushed back against this bushing. Both of these fixtures Fig. 47 grip the work on the outside while the inside is being finished. The one in the lower view grips on rough diameters, while the one in the upper view grips finished diameters.

Another expanding type of pin fixture is shown by Fig. 48. This is made with a steel ring B on it for supporting one end of the work which has been bored out to size while three pins C grip the other end of the work; these pins are caused to expand and grip the work by the stud D which is operated by means of the nut E. The screw F prevents the stud from turning while the nuts G force the pins down when the stud is released. Steel washers H which are held in place by screws keep the springs in

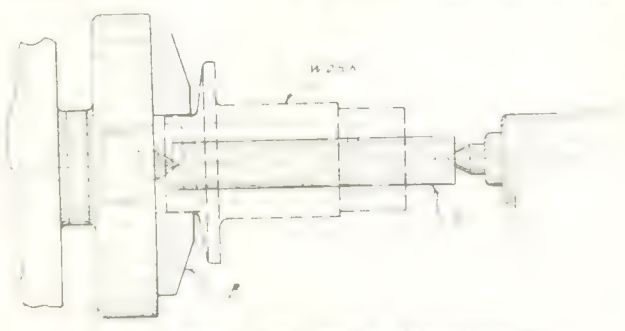


FIG. ARBOR ARRANGEMENT OF WORK HOLDING

position and the body of the fixture A is made of cast iron.

The final illustration, Fig. 49, describes a method sometimes used for turning a part eccentric with a hole which is being bored at the same time. In this illustration the drill A is boring the hole and the work is gripped inside by means of the chuck jaws B. A steel ring C is held on the chuck to conform to the eccentricity of the piece. On the cross-slide tool a roll D is mounted, this roll is held in contact with the ring C by means of a spring or weight on the cross-slide, and as the work revolves the cross-slide travels in and out following the ring. As the turret on the machine advances the bracket E pushes the tool F which is held in the slide G in the direction of the arrow, this causes the same to turn the work, and as the whole cross-slide is going in and out it turns the work eccentric with the hole. The spring H returns the tool-slide G and tool F back to their starting point when the turret returns.

These examples show practical methods of tooling up lathes and chucking machines and are of the type which will be found quite suggestive, of course fixed rules cannot be determined upon for the design of any of these tools as the conditions under which each tool must be handled vary with the work to be done, nevertheless the examples here shown illustrate the advantages to be obtained by the use of good holding and driving methods for lathe work.

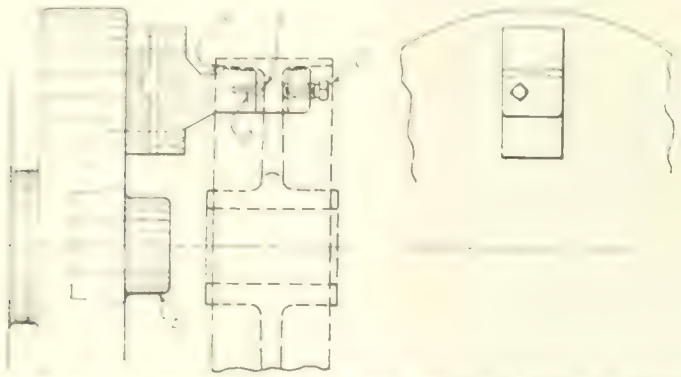


FIG. 48. CHUCK JAWS WHICH GRIP ARMS AND UNDER RIM OF PULLEY

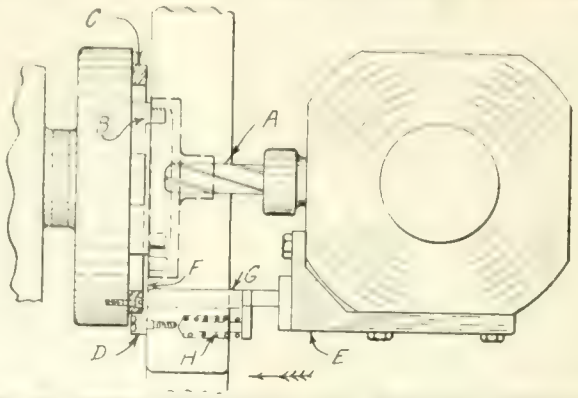



FIG. 49. FIXTURE FOR BORING AND ECCENTRIC TURNING

## HARDENING EXPANDER PARTS

By D. A. Hampson

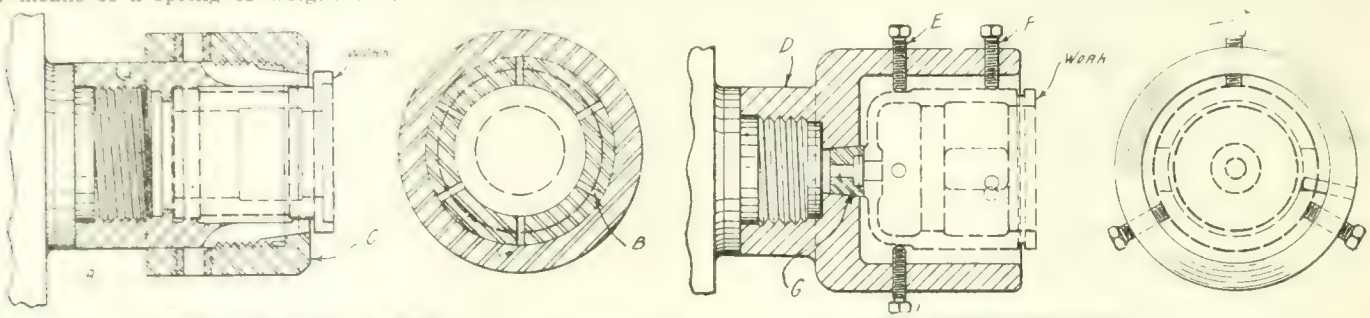
The rollers and the mandrel of a boiler tube expander get about as rough treatment as any tools used by mechanics. They need just the right heat treatment to neither bend nor break and to have durability. Case-hardened parts are now used to an extent but most of the expanders have been made of tool steel.

Not so very long ago one of the largest manufacturers of expanders was hardening all these parts in a blacksmith's fire—at a heavy loss. The mandrels warped severely and required a lot of expensive straightening. The rolls did not warp so much but they were over-heated and under-heated and the loss on them must have been forty per cent. An expert in hardening in another line was called in and he devised the arrangement shown.

A number of lengths of tubing were made up with slits through the side wall and pins across one end to form a bottom. In these tubes the rollers were to be placed end to end, the relative diameters being such that the rollers could not crowd by one another but must always be standing one on top of the other. The pin through the bottom kept them from falling out. At the top end, the tubes were cut and bent to form a hook for handling.

The idea was to heat in lead. The slots in the tubes and the half open bottom allowed the molten lead to circulate in and about tube and rollers almost as freely as if dropped in the lead pot loosely and when the tubes were lifted the lead ran out as fast as the lifting out. With a quenching bath close to the furnace, arranged with a guide for placing and dumping the tubes quickly, the rollers were hardened but a few seconds after they came out of the lead. And they were all of the same heat and all hardened alike. The first roller out of the lead was the first in the bath. A lead pot, or tank, deep enough to take in the tubes was installed. The supply of tubes was such that as fast as one was ready to empty another was filled and put in.

The tubes were longer than the pile of rollers so the latter could all be submerged and, as steel floats on hot lead, a pull pin was needed to keep the rollers down. The mandrels were hardened in the same way. The initial expense was exceedingly light and the results were highly gratifying, the losses being practically nothing and a man hardening more in a day than formerly in two weeks.




Spindle. Split Spindle Nose Chuck.

FIG. 47. TWO METHODS OF HOLDING LATHE WORK.

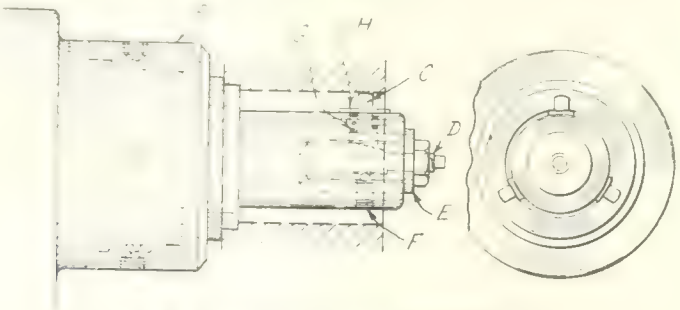
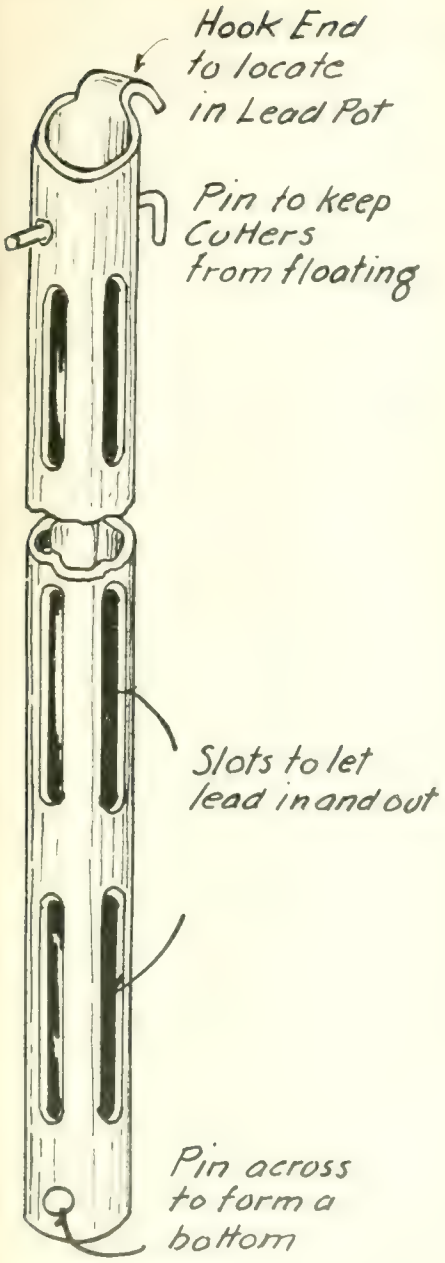



FIG. 48. EXPANDING PIN TYPE FIXTURE

## THE CARE OF SAWS

THERE is a very great deal of bad work by those who use a saw, which no influence of any kind can improve, and a good deal




FIXTURE USED IN THE HARDENING OF EXPANDER ROLLERS.

of this bad work is due to the state of the saws, which will not cut straight unless the teeth are all of one height, and set equally to the right and left. If a board has to be planed after sawing, much more labor has to be expended on it to give it a good surface when badly sawn. In spite of the progress of wood-working machinery, the hand saws will never entirely disappear in remote districts, or in places where they are required occasionally, and the chief consideration is the amount they will cut in square feet without re-sharpening. Much depends on the nature of the wood and the amount of dirt that lies on the surface, which, when carried into the path of the saw, rapidly spoils the cutting action of the teeth. But more depends on the complete regularity of the tooth points both as regards height and projection to right and left after "setting." When half a dozen teeth in various positions on the saw are found to have a rounded point, due to wear, while all the rest of the teeth are quite sharp, it is plain that this half-dozen are projected so much beyond the others as to prevent them from engaging in the work of cutting. The progress of sawing is thus proportionately reduced. A well-filed saw shows equal wear on all the teeth engaged in work, and if the setting is equal it will cut in a straight line with very little guidance. The width of the cut must be nearly twice the thickness of the blade to permit the sawyer to guide it against the influence of knots or change of direction of the wood fibre. Saws of good quality wear out more files than cheap saws, but keep their edge much longer, and being spring tempered they remain perfectly straight. There is no profit in a cheap saw for a man who uses it often. The circular saw, after a long period of popularity, is now giving place to the band saw, which is more easily managed. The circular saw requires very careful management, and if twisted or buckled needs an expert to set it right. Its popularity depended a good deal on the ease with which it could be fitted up on a wooden bench. The frame of the band saw costs much more, but the blades are comparatively cheap, and it will deal with much thicker logs than can be cut by the circular saw. It is estimated that there can be from 50 to 65 thousand feet of average wood cut on one sharpening.

## MACHINING ECCENTRIC PISTON RINGS

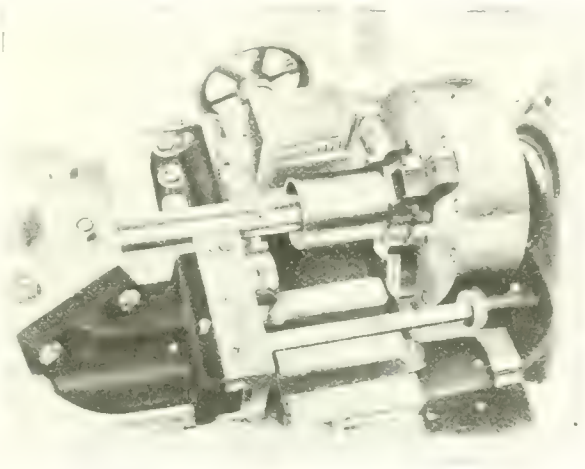
*Herbert's Monthly.*

PISTON rings are articles which are usually manufactured in very large quantities; a common method used for machining the eccentric type of ring is to mount the pot casting on a cross-sliding face plate fixture, which can be set in two positions. The bore is first machined with a single point boring bar, after which the casting is moved over the required distance and the outside turned.

If the quantities turned are large, it is profitable to provide a special attachment which will do the turning and boring simultaneously. An attachment of this kind is shown in the illustration. The pot casting is gripped in a three-jaw universal chuck, to the back of which is bolted a gear wheel, which engages a pinion shaft connected up to a slide bolted on to one of the turret faces. The turret end of the driving shaft carries a cam, which imparts an oscillating movement to the slide which carries the turning cutter.

Boring and turning, therefore, proceed simultaneously, the outside of the ring being turned eccentric, with the bore through the oscillating movement imparted to the turning tool. The front of the cross-slide carries a holder with a series of blade cutting-off tools, each of which projects a little further than the one adjacent to it.

The rings are cut off successively at the same time as the boring and turning operation. Such an attachment is equally as productive as a single purpose piston ring lathe, and has the advantage that it does not prevent the lathe being used for other work.



FIXTURE FOR MACHINING PISTON RINGS.

## STEEL SHIPBUILDING IN AUSTRALIA

P. H. ROSS, Canadian trade commissioner at Melbourne, Australia, reports that considerable progress is being made in the shipbuilding industry in Australia. Recently the expert engaged in England to supervise the Commonwealth Government's shipbuilding scheme arrived in Australia and is now completing his examination of the various federal, state and privately-owned plants and yards.

The Commonwealth Government has extensive yards at Sydney; the State Government of New South Wales has a plant at Newcastle and the State Government of Victoria has extensive yards at Melbourne, all of which (independent of the federal shipping advisor) are managed by competent steel shipbuilders with practical experience in British yards.

It is announced that in February there would be sufficient steel in Australia to build seven steamers. At the outset some imported materials will be used but the bulk of the steel will be supplied by the Broken Hill Company's steel works at Newcastle, N.S.W., which, with subsidiary or associated companies, will ultimately be in a position to furnish all the structural steel for the framing and plates required for the construction of steamers in Australia.

The work will be apportioned to the yards in the several states and, while no authoritative statement has yet been made as to the size and class of the steamers, it is considered by experts having knowledge of the facilities available that the initial vessels will be about 330 feet long by 48 feet beam, with a carrying capacity of about 3,500 tons.

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## NATIONAL FAIRS BECOME WORLD-WIDE INSTITUTIONS

THE fourth British Industries Fair which was brought to a close March 22 in London, is a convincing argument for the soundness of judgment shown in continuing the Canadian National Exhibition without interruption during the war.

The true significance of national fairs only began to be recognized soon after the start of the war when the dislocation of trade, due to rupture of commercial relations with Germany, directed attention to the vast amount of business transacted at the Leipsig fair. Traders from all parts of the world, but particularly Europe, flocked to this gathering and it was a valuable rampart in the wall of commercial supremacy which Germany was aiming to girdle around herself.

The French were quick to seize the opportunity created by war conditions, and the Lyons fair immediately became a national institution for French traders. Like the Leipsig fair, it was of an international nature, certain Canadian manufacturers having availed themselves of the opportunity to introduce their product to future customers on each occasion.

The British Industries Fair, to use the official title, varies in certain important features from the other events. It is directly under Government auspices, being promoted by the Board of Trade, and only British manufacturing firms are permitted to exhibit. The movement of which the exhibition is evidence is aimed directly to capture trade formerly in the hands of German and Austrian firms; exhibits therefore, were confined to articles produced in the following trades: earthenware, porcelain and china; glass and glassware; fancy goods; stationery and printing; paper; toys and games.

The possible benefits to be derived from such events can be gathered from the fact that one firm of exhibitors at the British Industries Fair was reported to have opened 500 new accounts, while in three other cases firms which had contemplated closing down were able, as a result of the Exhibition, to book a sufficiency of orders to place their businesses on a substantial footing again. As a matter of fact the initial effort of the Board of Trade to establish an Industries Fair met with so much appreciation from the manufacturers that they petitioned the Board to make it an annual event.

Exponents of Canadian ability have therefore every argument in favor of developing and intensifying the work of the Canadian National Exhibition. The shell business cannot always be with us. By the time next Fair arrives many existing contracts will either have expired or be nearing completion.

Machine tool building, shipbuilding, engineering and allied metal-working businesses can only be properly cultivated and developed in a country whose general activities and demands are varied enough and large enough to induce a sufficient degree of consumption of all products so that maintenance of plant, extensions of factories due to increased international trade or increase of population, and introduction of new processes and designs to suit advances in taste and consumption will all react on each other to maintain a continuous and evenly distributed activity, with its resulting balance of spending power.

Such conditions tend to stabilize the trade of the country in a desirable manner due to their widespread foundations, based on the country as a whole, and it is because of its significance as a national trade barometer that the Canadian National Exhibition should receive greater and still greater consideration from present and potential exhibitors as well as from prospective visitors.

The Exhibition authorities do much work in spreading the reputation of the Fair, manufacturers in all lines have done nobly during the past four years, and the public have always shown their appreciation.

But, let the event assume a solemn importance—consider it to be a vital event, a psychological period during which the world is our critic, to be influenced favorably or otherwise—let it be an occasion on which our visions may receive successive permanent increases, that our actions may be guided by considerations for the future as well as the present.

While we are not handicapped by having to develop a new institution as in the cases cited, our apparent advantage may be nullified by the familiarity of long acquaintance. The novelty may be inclined to wear off, but such thoughts should be completely dispelled when our possibilities as a factor in world commerce are fully realized.

Although any hour now may see the tide of battle turn definitely toward the final goal, the end is not yet. Greater efforts will be needed to withstand the coming months of stress, but just as the race is to the swift, so will future supremacy in any line be to him who is prepared.

Canada has had unequalled opportunities for being prepared. The National Exhibition is an unequalled occasion for convincing herself and the world that she has grasped them.

## DAYLIGHT SAVING AT LAST

BY the time these words reach our readers, daylight saving as a national event will have been in existence several days.

That it will become an annual event is more than likely; the advantages to the great majority greatly outweigh any minor inconveniences which it may cause to the few.

Food distributors and similar people may not care for the lessening of their daylight in the morning, but the many workers in factories have all too little private time for fresh air and sunshine. The necessity for more real living is obvious to welfare students when the long hours and steady grind of munitions shops are taken into account.

Saturday afternoons and Sundays have been reduced to an indistinct memory for far too many workers, young as well as old, and the opportunity of leaving off work when the sun is fairly high in the Heavens should result in benefit to health and spirits of many tired and jaded people.

The most direct benefit expected is from the increased daylight available for gardening, etc. The farmer uses all the daylight there is at present, but the factory worker with a lot to attend to has to quit all too early for the country's good and his own, too.

That many people may be led to take up market gardening or otherwise assist in the country's most indigenous of industries will serve in its way to ameliorate possible distress should industry be at all dislocated during days to come.

# GALT MANUFACTURERS ARE HOPEFUL FOR THE FUTURE

T. H. Watson, President of the Canada Machinery Corporation, Suggests That the Government Should Act With the Manufacturers

Special to CANADIAN MACHINERY

GALT, April 15.—Interviews with leading manufacturers in Galt indicate that they are not given to prophesying, and while they have their hopes and ideas as to what the future may bring, they are disclined to make any positive statements. Some six or eight plants have branched out into the making of munitions since the great need arose for unlimited quantities of weapons of war, some of them manufacturing shell cases, and others smaller parts, such as the brass fittings. Still others have had their normal output increased by the demand for munition making machinery.

### Not a Pessimist Yet

A. R. Goldie of the Goldie & McCulloch Co., Ltd., said it was hard to forecast what the future might hold. He suggested that the best way to prepare for the future was to deal effectively with present problems.

He was hopeful as far as the labor problem was concerned after the munitions business stopped. "When our shell plant was shut down for two or three months," he said, "our men were absorbed by other industries, and I presume the same thing would happen again, provided there is no slump in general business."

He said no particular plans had been made by his company with regard to entering the foreign field, and he was not looking for any expansion along that line.

### War Makes New Connections

"It is no easy matter to anticipate after-the-war conditions," stated Mr. W. D. Sheldon, of Sheldon's Limited, "but we are ready to revert to our regular lines (the manufacture of fans and ventilating machinery) at any time. The war has given us foreign connections which we expect to make future business. Manufacturers generally are trying to be prepared for whatever may come after the war—either the handling of an unusual volume of business, or for a slackening off of production."

Mr. Sheldon pointed out that, at the present time, a large number of women were being employed on the manufacture of munitions, many of whom were soldiers' wives, who would return to their domestic duties when their husbands came back to civil life, and this would help to create normal conditions as far as labor was concerned.

In passing, Mr. Sheldon remarked that he had found female labor satisfactory, the women having shown an adaptability and capability that was surprising.

### Government Should Assist

T. H. Watson, president of the Canada Machinery Corporation, had a suggestion with regard to the exploitation of the foreign field by Canadian manufacturers. He said that he had as yet taken no steps along that line, and he believed that, generally speaking, individual effort for such expansion would be a failure. He thought that for the manufacturers of this country to become established in foreign markets it would be necessary for the Government to create a bureau whose duty it would be to enquire into the needs of other countries, secure orders, and place them with the firms able to turn out the work. The expense to individual firms in trying to build up an export trade kept them from seeking expansion in that direction.

Mr. Watson added that women constituted the surplus labor on war material, and it was safe to assume that male munition workers would readily find employment in other lines.

# DAYLIGHT SAVING WILL NOT MAKE GREAT DIFFERENCE

Manager Also Believes That Time Is Coming When Molding Will Be Done Largely By Foreigners

WHILE piece work enters so largely into the industrial plan, the changes to be brought about by daylight saving will not make a great deal of difference to the manufacture.

This is the opinion at least of Mr. S. Stone, manager of Fittings, Limited, Oshawa. This concern is employed very largely on munitions, and no discouragement is placed in a man's way if he desires to add an hour or two to his day's work. The daylight plan will probably result in a greater degree of evening work being placed on garden plots—inducing many people to go in for this kind of work on a larger scale than might otherwise be the case.

With regard to the help problem, Mr. Stone states that the men who have found work in munition plants for the time being do not in the great majority of cases look forward to employment in the iron and steel business as a permanent thing. When the readjustment is in sight, and it is no longer possible to make a minimum wage of say, $4 a day, these men will, in all likelihood, drift back to their former fields of work.

"We have found that it pays to train men, from the ground up, in the class of work that we require," said Mr. Stone. "Such men will, we feel, be with us permanently. We try to instill into them the idea that a man's future is just what he, himself, makes of it, and that opportunities are as promising in this field as in any other. The fact must be impressed upon workmen that there is a time coming when keen competition is going to weed out the culls and that the demand is going to be for the specialist—no matter what the field of effort may be.

"By placing these so-called temporary men on jobs to which they seem adapted, we have made some remarkable discoveries. ome of them have developed so rapidly that in a short time they have proved as efficient as those who had a much longer training. We have tried to keep these men with us, and in some cases have succeeded—but it is difficult to retain men who come from the farms. When spring comes they hear the call and are off. One of these was a man whom we had placed in an over-position, but when spring came money was no object to him—and of course we do not wish to be too persuasive with men who go in for agriculture. Shortages caused by this drain are always filled from other sources."

One of the greatest problems is in connection with the foundry. Although good money is paid, the number of Canadians employed in the molding trade is becoming less and less, and the outlook is that it will become one of those lines of work in which foreigners are largely employed."

WHAT is value? The law student used to learn that it is the price arrived at between the least urgent buyer and the least urgent seller. Very good. An Ontario tool dealer quoted a price by mail on a certain machine. The prospective customer laughed at the figure, saying it was too low for the machine to be any use. He came to town a few days later and bought the same machine, unknowingly, after personal inspection, at a price almost seven hundred dollars up. What is your definition of value in that case?

# Pig Iron Continues Very Scarce and There Is a Run on Scrap Metal Now as Result

## Orders Given to U.S. Board to Increase Production on War Orders—Shell Steel Coming to Canada to be Turned Into Big Size Shells—Machine Tools and Supplies in Good Demand.

IT is very easy to read between the lines that the United States realizes the need for speed in connection with her war program. Pershing calls for motors, large shipments of shell steel are booked for forging and machining in Canadian plants for United States war orders, and a free hand is given to the War Industries Board to commandeer anything they need to run their war operations at full blast. Toronto and Montreal firms have orders for twelve-inch American shells, and plants are being made ready for the work. The production of pig iron continues to show larger figures at the American furnaces, but this situation does not find its expected improvement in the supply that is reaching Canada. Consequently there is a greater run on scrap metals, the prices of which in several cases have advanced quite sharply during the week. Dealers complained a few weeks ago that the embargo that was placed by the Dominion Government against the export of scrap would result in stagnation. It has not done this, and stocks in Canadian yards are well cleared out. The shortage in scrap is also quite acute in United States, the great demand for it from the war shops and foundries being given as the result.

United States officials speak of the danger of a steel shortage, and are warning against allowing it to come to pass. This may mean a further reduction in the list of those who can secure steel, confining the output more and more to strictly war purposes. The production of air-craft in the United States is not as satisfactory as was hoped for.

Canadian dealers in machine tools and supplies report business as being brisk. The munitions plants are still operating long hours, and this means a steady run on high speed steel in all shapes, and certain lines used in these operations are scarce as a result.

## ORDERS FOR BIG SHELLS HAVE BEEN PLACED IN MONTREAL

Special to CANADIAN MACHINERY.

MONTREAL, Que., April 16, 1918.—Within a very short time we may see enforced throughout the United States regulations affecting the allotment of raw materials to all industries now engaged in essential undertakings for the Government, with the purpose of maintaining undisturbed production. Heavy ordnance manufacture on an extensive scale is one of the recent developments in the States. Munitions actively has been revived in Canada by the placing of large orders for the heavier American shells with the possibility that more will follow; these recent contracts call for the production of 9 and 12-inch shells. A factor that is causing some uneasiness throughout industrial circles is the uncertainty of labor during the coming weeks and the possibility of strikes on or about the 1st of May. Some action has been taken by the American Government to guard against this eventuality, but time alone will tell how successful such steps will be. Another feature in connection with the labor situation is the acquisition of help for food production, to secure which it may be necessary to restrict non-essential manufacture to permit additional help to go on the land. Apart from this, however, the industrial situation is one of pronounced activity and prospects are encouraging.

### Steel

General conditions throughout the steel trade have shown little improvement during the past week and the demand for steel of every description is as heavy as ever; so much so that the American Government are contemplating taking steps to regulate the distribution of raw materials in addition to controlling the prices at which they may be sold. The week's announcement that the United States propose the construction of extensive ordnance works indicates that their requirements will be increased, entailing greater restrictions on the ordinary demands. Efforts are being made to stimulate the steel output to meet the immediate needs. The better car supply and improved transportation facilities have been factors in maintaining more regular production, and as a result mills are operating closer to capacity. Many furnaces have been favored with a plentiful supply of coke, due to the better car service. This, however, does not prove that cars are more numerous, as certain activities, such as coal distribution, are inadequate to present requirements; not that immediate needs are suffering, but the pressure on the railroads continues to be of such abnormal character that little headway has yet been made in accumulating fuel for future requirements. This condition, however, will be gradually regulated during the coming months, when navigation will assist in relieving the pressure hitherto pronounced. Many steel producers are suffering from lack of scrap; the accumulation of scrap under normal working conditions being greater than at present. Scrap supply from domestic enterprise is practically nil. While Government regulations are partly responsible for these conditions, the actual shortage might rather be recognized as a factor of abnormal activity in shell steel production, a condition that nets little scrap in proportion to the finished output. Fewer complaints from consumers would apparently indicate that deliveries are more regular. Recent shipments from the mills have been in excess of production, and as a consequence stocks have been somewhat depleted. In sympathy with the plate producers the dealers here are quoting lower prices, but the possibilities of obtaining material are, if anything, more difficult than ever. The changes effective on local plates are approximately 10 per cent. below those previously quoted; $9 for plates, ¼ to ½-inch; $9.65 for heads, and $9.50 for 3/16-inch tank plates.

### Metals

The general market has developed a weaker tendency, partly owing to the better supply and partly due to the slight falling off in the demand. The relief given to transportation has enabled better delivery to consumers, but little additional buying has been reported. Copper is very steady, but some agitation is being made for higher prices. Tin is very unsettled, and the trade is showing considerable nervousness. Spelter and lead are both weak and quiet. Antimony is unchanged, and aluminum has declined on a weak market.

**Copper.**—The market in general is steady in character and the present price as fixed by the Government is apparently operating satisfactorily. Effors are being made, however, to have the price revised to a higher level. It is the impression among many that the present price is too low for the profitable operation of many of the small refineries, and in view of this it is not unlikely that some concession may be made to the smaller producers to encourage them to greater

production and also to enable them to dispose of their metal in competition with the larger interests that are at present well satisfied under the existing regulations. Dealers here report a steady business at the unchanged price of 29c and 30c per lb.

**Tin.**—The claim that little spot tin is available on the New York market has added to the strength of the situation, if such a condition is possible. Consumers are apparently willing to pay any figure for immediate delivery, but exorbitant bids fail to bring out any metal. Greater restriction on export from Britain has stabilized the London market, but added to the acuteness of the American situation. Local dealers intimate that the market here is a little easier, and this week's prices represent a decline over last week of 2c per lb. The reason for this is said to be the possibility of obtaining permits to ship metal now held in England. The market, however, is far from a weak one, and dealers are inclined to believe that the present strength will continue.

**Spelter.**—The market is not active, but sales have been reported. The situation is more cheerful and the trade anticipates a revival from the recent dullness. Plentiful supplies are, however, available for immediate and early future requirements, and unless a sudden demand should develop it is not thought that a stronger market will result. The American situation is relatively unchanged, but quotations are slightly lower. The local market has declined ½c on a quiet demand, the current quotation being 10c per lb.

**Lead.**—The quiet condition that continues on the market has had the tendency to develop further weakness, as buying is very light. Better delivery has added to the available supply, but otherwise the situation is featureless. The New York market [illegible] to ¼c lower, and a listless local market has had the effect of weakening prices, the quotation of 9½c representing a decline of ½c per lb.

**Antimony.**—The situation is quiet and unchanged, and quotations are the same as last week—17½c per lb.

**Aluminum.**—Better supply and weaker demand has resulted in a decline of prices both here and in the States. Dealers here are asking 50c per lb., this being 5c lower than that quoted last week.

### Machine Tools and Supplies

Improved conditions mark the week's activities in the machine tool industry; this has not only been the result of better deliveries, but the general inquiries appear to indicate renewed interest in manufacturing centres. A revival of activity has developed in the trade following the announcement that several large orders have been placed for heavy shells for the American Government. This includes contracts for the 9-inch and also the 12-inch shells. One firm in the Maritime Provinces is rapidly tooling up for the 9-inch size and another here in Montreal expects soon to start operations on the same size shell. One company has recently received a contract for a shell order amounting to about $3,000,000, and in order to manufacture these shells it is learned that an addition will be required to the present plant entailing an outlay of approximately $600,000; it is intimated that this firm has secured the contract for the 12-inch shells. Much equipment will be required for this purpose, and the machine tool trade are deeply interested in the early developments. General machine business has been steady, but not very active. Heavy demand continues for all classes of supplies, particularly for munitions and marine work. One difficulty that is still pronounced is that of the delivery of material and supplies from the States; one dealer here reported that he has been waiting receipt of a shipment of pneumatic tools from the factory in the States that left there about the middle of January. Labor conditions and the scarcity of raw materials is a factor in the maintenance of high prices.

### Scrap

Nothing of special interest has developed in the old material market, and the situation is much the same as last week. Dealers report a condition that permits of little comment, and consumers are apparently only buying to cover their immediate requirements. It is difficult to define the early future of the market and dealers are unable to state clearly the possibilities of the coming weeks. In the absence of anything to base their transactions on the trade here are continuing to quote the prices that have prevailed for the past few weeks.

## POINTS IN WEEK'S MARKETING NOTES

**Orders for 12-inch shells are being placed in Canada, Toronto and Montreal firms handling the business at present. United States mills will supply the material, the forging and machining being done in Canada.**

**Scrap iron prices advanced quite sharply in some lines to-day, boiler plate, machine cast iron and iron car wheels being the lines most affected.**

**The scarcity of pig iron in Canada is causing a greater demand for scrap material, and stocks in Canadian yards are at a rather low level.**

**Cotton rope, from ¼-inch up, shows a price of 62¼ cents now. The substituting of cotton for so many other lines makes the increase.**

**Cylinder oil and lard oil show slight advances.**

**Black sheets, No. 28, are down $5 per ton.**

**Lake shipping is being requested on many orders placed with Toronto jobbers now.**

**A mark of 3,000,000 tons a month is now considered possible by United States steel mills.**

**Steps are being taken to force U. S. ship-builders to specify exactly what they require in orders at the mills, and not go over the mark to secure material for other purposes.**

**Pittsburgh reports that foundry coke is still very difficult to obtain.**

**Unlimited power has been given to U. S. War Industries Board for commandeering industry for war purposes.**

**Great care is being taken to avoid a further steel shortage.**

**A "disappointment" is the term used to describe the results secured in the production of U. S. aircraft this week.**

**There is delay in placing orders for heavy artillery by U. S., although negotiations have been under way for some weeks.**

**General Pershing has sent request which resulted in orders to double the output of Liberty motors.**

## LAKE SHIPPING IS SPECIFIED NOW

**And This Helps to Get Quicker Service —Scrap Metals Are on Upward Grade Now**

TORONTO, April 16.—The scarcity of pig iron in Canada has not been relieved, nor is there anything in sight that would lead to the belief that better things are likely to come to pass in the immediate future. The trade is turning to scrap [illegible] is a brisk trade in this line of metals, and a few quotations are showing a higher price level in consequence.

Lake shipping is coming to the relief [illegible] few of the orders that are on the books of local jobbers contain the request to ship by boat. Several consignments to [illegible] sent out in this way.

No. 28 black sheets show a drop of 25 cents in Toronto prices this morning. That is about the only price change. The dollar-off plate prices announced last week are still holding, and further change does not seem likely just now.

The continuance of the shell business [illegible] machines in certain lines. Orders for the 12-inch variety are being placed for the American Government, and this will necessitate the bringing in of a large amount of shell steel to be converted into this large measure munition.

### Iron and Steel

Cars are arriving in Toronto yards within a very reasonable time of their departure from the mills now and jobbers are thus able to keep in much closer

touch with their trade, although it is still limited closely to the requirements of war orders. The only important price change this week was in light sheets. No. 28 gauge were quoted 25 cents a hundred down on the Toronto list. That amount is not a very great move in these days of high levels, but it is interesting to recall by way of comparison that in normal times that same change, which would amount to $5 per ton, would be considered a move of rather considerable importance. Dealers having orders for lake ports points are being requested now to ship via boat in many instances, the season being well open for points close to Toronto. The supply of available pig iron does not improve, and many shops are resorting to a greater use of scrap than formerly. Figures from the pig iron districts continue to show an increased production by actual performance, and the same figures find no reflection in an improved position in the Canadian market. One explanation, and it sounds plausible enough, is that much of the product now being turned out passes into contracts that have been on the books for some weeks and months, and in this way does not relieve the pressure that is piling up by reason of new and urgent business.

### Scrap Metals

Advances, rather sharp, were noticed in several of the scrap metal lines on the market this morning. Boiler plate takes a $2 increase, this being explained by the fact that there is a scarcity of heavy melting steel, and greater quantities of the boiler plate are being used. Car wheel scrap went up $5, being now quoted at $30 against a former price of $25. No. 1 machine cast iron has also taken a similar advance, the price paid to-day being $30 against the $25 quotation of last week. In spite of the embargo placed against the shipment of scrap metals from Canada, the stock in this country is lower than it has been for some weeks past, and yards generally are getting to a low mark in the amount of available stock on hand. The steel mills and foundries are working to full capacity, and are using a large amount of material. In fact it looks as though they were using much greater proportions of scrap than usual because of the increasing difficulty in securing enough pig iron. Some dealers assert that shops are using as high as sixty per cent. scrap against 20 and 25 in normal times. It was expected with the putting on of the embargo the stocks in Canadian yards would increase, but there are other forces working against this. While a large amount of cuttings come from munitions plants, it must be remembered that many of these places were formerly engaged in lines of work where a similar amount of scrap was made, so that in this way there is nothing additional coming on the market from these places. Dealers are keen to buy right now and the higher level of prices shows that they are out after business, which is a decided change from the past few weeks, when they have been rather indifferent and holding values on a lower level. Scrap metal business is brisk and things are moving out in quick order.

### Rope Is High

Packings, waste and wipers show no change. There is a good demand for these lines, and not much difficulty in securing supplies needed. Cotton rope, quarter-inch and up, has reached the high price of 64½c. Dealers say that the scarcity causes it. There is a greater demand than ever for cotton products, due to the shortage of linen and the bringing in of cotton as a substitute.

Cylinder oil shows an advance for both Capital and Acme, while the same is true of lard oil. No quotation is made for castor oil, although a small amount of the poorer grades is advertised.

### Non-Ferrous Metals

COPPER.—The effort, backed by strong interests in United States, that is now being made to bring up copper prices is being watched by the Canadian trade, although it must be admitted that the local dealers are inclined to think that the present government price will stand. The period for which it runs expires on the first of June. The Toronto price remains.

TIN.—The tin situation does not improve. Any favorable feature that may be noticed in regard to it is so small when compared to the whole situation that it loses size and weight. In fact it is almost useless to try and keep up with the various price changes. Many of the price changes are simply the results of efforts to buy, and have no bearing on the market situation.

LEAD.—Nine dollars is still the local price, and business is fair, held in largely by supplies. More lead has been sent to England lately from United States points, and a corresponding decrease has been noticed in the amount sent to Canada.

ALUMINUM.—American metal papers are publishing rather pertinent warnings, in connection with their remarks about the aluminum situation, drawing attention to the fact that it is against the law of the land to sell aluminum at a figure above the Government fixed price. Sellers are liable to a stiff fine and the loss of their license. No doubt the prevailing high prices are a temptation to jump the restrictions adopted by the Government as to price.

## WINDSOR FIRM CONTENDS THAT TRADE CONDITIONS ARE UNFAIR

Canadian manufacturers of ship fittings in certain lines find that they are in a peculiar position just now by reason of the tariff and other war-time conditions. A representative of the Penberthy Injector Co., of Windsor, Ont., speaking to CANADIAN MACHINERY of this matter a few days ago, said:

"For some time past it has been possible for shipbuilding and munition manufacturers to import supplies from United States free of duty, simply because same was to be used on Government work. There have been large quantities of this material used in Canada during the past two years, and Canadian manufacturers, such as ourselves, are helpless to secure any of the business because we have to pay a duty on all raw material used in our products. We have been advised by the War Trade Board that it is possible to get a refund of 99 per cent. of the duty paid on this raw material, but the only parties able to collect this refund are the shipbuilders, as, according to the regulations same is not payable to the manufacturers. As far as this is concerned, it is out of the question for us to make arrangements with the shipbuilders to secure this refund for us, as they will not go to the trouble, and the result is that practically all of this business goes to United States manufacturers, whereas we consider that Canadian manufacturers are entitled to the same.

"We might also say that even though we were able to secure a refund of the duty paid on such raw materials as are used in our products, we would not be able to compete on an equal basis with American manufacturers, as manufacturing costs are higher in Canada than in the United States on account of the demand for manufactured articles being much smaller, and also for several other reasons.

"We have explained this injustice to the War Trade Board at Ottawa, but are unable to get any satisfaction from them.

"The same situation, as explained above also applies to Canadian jobbing houses. For example, in the city of Vancouver we understand that several United States jobbing houses have agents situated in this city, taking business from under the nose of Canadian jobbers, simply because their goods are allowed into the country free of duty, while the Canadian jobbers have the goods on their shelves, but cannot compete with their prices. This, of course, affects us indirectly, as the majority of our goods are sold through the jobbing trade."

## VERY WIDE POWERS TO AMERICAN BOARD

### Warn Against Allowing a Shortage of Steel to Become a Reality

Special to CANADIAN MACHINERY.

WASHINGTON, April 16.—The United States to-day is better prepared to wage an industrial war than at any time since the declaration of a state of war against the Imperial German Empire. Steps taken during the past week have added materially to the war force of the nation. Perhaps the most important step is that taken by the President in connection with the appointment of Bernard Baruch as head of the War Industries Board. Although Baruch's appointment was announced some time ago, it was not

until this week that announcement was made of his powers.

The War Industries Board, under Baruch, is now carrying on the work which is done by the Director of Munitions in England. The board has been given wide powers over all industries. The power of the President to commandeer any business for war purposes has been turned over to the War Industries Board, and with this power as an instrument work has been started to bring every essential industry in the United States under the control of the War Industries Board.

### The Tonnage Available

Another step which has been taken to co-ordinate the industries of the nation is the taking over of all steamships in coastwise and river traffic. This action is for the especial interests of transportation in United States and is aimed to relieve all congestion on railroads and to divert to water transportation that part of the war traffic which can be so diverted. It will also mean that a portion of the coastwise shipping may be diverted to trans-ocean traffic. Every effort is being made to put forth the maximum American tonnage for transportation of troops and supplies to Europe and where possible coastwise vessels will be used for this purpose. One example of the effort that is being made to utilize every inch of cargo space is an order which has been issued against the transportation of fruits by water transportation. The Cuban shipping has been practically set aside for the sugar trade. This commodity is considered a necessity and only sufficient tonnage is being allotted to Cuba and the West Indies to transport the necessary sugar for the United States and the Allies.

### A Striking Change

The following statement by J. Leonard Replogle, director of steel supplies for the War Industries Board, gives some insight into the steel situation in the United States. "At the time of the Garfield workless day order, January 17, 1918, the production of the principal steel products was as follows: Merchant bars dropped from 137,000 tons a week down to 55,000. Plates for ship construction dropped from 90,000 tons down to 45,000 tons, or just fifty per cent. Projectile steel, which is a very important factor, dropped from 67,000 tons to 37,000 tons. After the mills began to get fuel the production steadily increased and our production of plates now, on our telegraphic reports last week, was 106,000 tons, or just 12,000 a week more than the country has ever produced in any week in its history.

### Pig Iron Short

"At blast furnaces, pig iron is being produced at the rate of about 27,000,000 tons, as compared to an annual capacity of about 45,000,000 tons; in other words, it is a little more than sixty per cent. approximately. We are going to get into a very serious situation in regard to other things. The necessities of our allies are very great. General Pershing has secured some 750,000 tons of steel from the French and the British Governments to meet his urgent necessities, and has agreed to replace it with an equivalent tonnage of steel in this country, in various forms. We are producing projectile steel, largely in rail mills, because before the war there was no capacity for this kind of steel. We are rolling those projectile shapes in rail mills and now the necessities of the railroads are such that they will have to be given every consideration; otherwise our transportation situation will break down." This statement coming from Replogle indicates that the steel situation in the United States is not at all glowing and that great care must be exercised in order that there be no steel shortage.

### Wages Fixed

Wages have been standardized at the shipyards on the Atlantic coast by a labor board working under the direction of the United States Shipping Board. The following wages per hour give an idea of the cost of labor: Hammer and machine forgers, $1.35; anglesmiths and blacksmiths, 87½c; furnacemen, 85c; rivet testers, 80c; lever men or cranemen, 70c; acetylene welders, 60c; marine erectors, 65c; drillers, 60c; stage builders, 57½c.

Labor conditions in the United States are again somewhat unsettled. Action taken by the Senate which threatens a law to prevent strikes during the period of the war has aroused labor to a state of unrest. President Wilson has announced that he will appoint a National War Labor Council which will undertake to adjust all questions of labor and will be a court of appeal for labor. It is hoped that this body will be able to control labor and prevent any action which might embarrass the nation's war program.

The production of bituminous coal was decreased during the week ending March 30, by 27,000 tons, according to reports just issued. The Fuel Administration is urging great conservation and early purchases for next winter's use.

The United States Shipping Board has asked for an appropriation of $50,000,000 for use in carrying out a program for the construction of concrete ships.

A report issued by the Senate Military Affairs Committee this week shows "a disappointment" in the aircraft program and demands greater centralization of control.

## PERISHING ASKS FOR SPEEDING UP

### So Order Has Gone Out to Double the Output of Liberty Motors

Special to CANADIAN MACHINERY.

NEW YORK, April 16.—Shipbuilders have come into the market for shop and yard equipment in greater volume during the last week, being stimulated into action by orders from Washington to speed the construction of boats and to carry out immediately previous contracts to build additional yards. Among the larger companies that have bought machinery is the Chickasaw Shipbuilding Co., located at Mobile, Ala., the southern subsidiary of the U. S. Steel Corporation, which has purchased fabricating machinery, including punches. The Foundation Co., which is building new yards on the Atlantic, will be soon in the market for equipment and has already purchased machinery for one of its Pacific coast yards. The Southern Shipbuilding Co. is speeding work for its boat yard at Brunswick, Ga., and the Virginia Shipbuilding Co. has made additional purchases of tools and conveying machinery. The Merrill-Stevens Shipbuilding Corporation of Jacksonville, Fla., is also placing supplementary orders for tools.

In the North, the Sun Shipbuilding Co., the Chester Shipbuilding Co., and the Groton Iron Works have all been conspicuously in the machinery markets. The Connecticut plant has purchased cranes, the Sun Co. has purchased radial drills. Other plants in New England are preparing additional specifications.

### New Gun Plants

Some disappointment is felt because of the slow movement of the Ordnance Bureau of the War Department in placing contracts for heavy artillery that have

## A LARGE NUMBER OF SINGLE MEN UNDER 34 HAVE NOT JOINED ARMY

Special to CANADIAN MACHINERY.

OTTAWA, April 16.—The operation of the Military Service Act is of no small importance to the industrial world. Figures show that the great bulk of the Canadian army has been drawn from the cities and towns, and the next move in connection with the M. S. A. is awaited with interest. The matter is giving the members of the Cabinet no end of trouble and they are not exactly sure what is going to happen, although they know that up to date the act has not produced anything like the number of men it was counted on to secure.

Your correspondent learns from a source of information that cannot be doubted that there is a feeling that the single men of the Dominion will have to furnish a good many more thousands before the married men will be called to the colors. An official said, "I am inclined to think that there are a good many single men under 34 years of age who have yet to report, and I would like very much to see some radical step which would procure a large number of these single men in the early future."

Some announcement will undoubtedly be made soon. It may extend the age limit of the single men, taking in those up to 40 at first before calling on the married men classes.

Government program, however, is now ... will result in the placing of contracts for new gun plants. Much interest is manifested in the report from Philadelphia that the Government has commandeered large gun boring lathes for installation at the Ambridge plant of the American Bridge Co., ... of the U. S. Steel Corporation. Local officials of the Bridge Co. profess ignorance of such Government action. A great machine shop at Ambridge has been remodelled and renewed with the latest modern tools, and this process has been going on for the last eighteen months, the long time in preparation being due to the difficulty in securing shipments of machinery from manufacturers. The Bridge Co. has manufactured some tools for its own shops and also for sister subsidiary companies, and it is not improbable that gun lathes will be made at Ambridge for shipment to Gary, Ind., where a large gun forging plant is being constructed at the request of the Government.

The Watervliet Arsenal has come into the market for additional machinery and private manufacturers of ordnance are making tentative inquiries for shop equipment. The Ingersoll-Rand Co., which expects to make recoil mechanisms for 75-mm field guns, is preparing to purchase milling and screw machines and boring lathes. Projectile manufacturers have received orders from Washington to double their output of shells and several of them are preparing to increase shop equipment. The American Can Co. is asking for a large number of machine tools and the Spicer Manufacturing Corporation, South Plainfield, N.J., is taking bids on a list of milling machines, grinders, lathes and die-sinking machines.

In response to a request from General Pershing, the output of Liberty motors and trucks is being increased. To assist such manufacturers the Government has commandeered tools which will permit the doubling of such production of trucks and of automobile parts.

Shipments of tools from New England factories are large notwithstanding the railroad embargoes, but some Western machinery builders in order to get tools into New York territory have been forced to make shipments to Boston and transshipment thence to New York.

The demand for cranes has fallen off somewhat recently and builders have been tempted to shade prices slightly. Shipbuilders, however, are still buying cranes of various types.

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IT is possible with boilers as at present constructed to reach efficiencies as high as 80 to 85 per cent., and if cost were not a consideration as high as 90 per cent.. This is remarkably good when it is realized that the most efficient turbine yet built utilizes only about 75 per cent. of the available energy delivered to it.

# GREATER OUTPUT AT THE U.S. PLANTS

## An Allotment of Shell Steel for Canada to Fill Orders for Big U. S. Shells

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., April 16.—The American Iron and Steel Institute reports that 29 steel companies, which in 1916 made 88.14 per cent. of the total output of steel ingots, produced 3,110,381 tons in March, against 2,273,741 tons in February and 2,203,845 tons in January. Allowing for production by companies not reporting, and taking account of the number of working days, it appears that during March the industry was producing steel ingots at the rate of about 42,000,000 tons a year, against rates of about 33,500,000 tons in February and 28,500,000 tons in January. The March rate corresponds with the average rate of 1917. Production in March was nevertheless at less than 90 per cent. of capacity, which is at least 47,000,000 tons, some estimates placing the capacity as high as 50,000,000 tons.

Production of finished rolled steel is about 75 per cent. of the ingot production, the difference being scrap produced in rolling, which goes into the open-hearth furnace and is weighed again as ingots, and mill scale, which is charged to the blast furnace and comes out as pig iron.

Thus the output of finished rolled steel in March was about 2,600,000 gross tons. The shipments were materially larger, probably between 2,700,000 and 2,800,000 tons, as on account of better car supplies the mills were able to move a considerable part of the steel accumulated in yards and warehouses during January and February. If the mills operated at capacity, and it is a distinct possibility that eventually they will be able to do so, they would produce about 3,000,000 tons a month.

### War and Commercial Requirements

The importance of these figures lies in the comparisons they make with war requirements, as stated in some cases specifically and in other cases only very loosely. As to shell steel, the minimum estimate for the second half of the year has been 2,500,000 tons for the United States and 500,000 tons for its Allies, the maximum estimates running a million tons more. The estimate for the United States includes, of course, the steel that will be produced here and shipped to Canadian shell factories to fill orders of the United States. Thus there is in prospect about 300,000 tons of shell steel a month. When the shipbuilding program reaches the stage of producing 500,000 tons deadweight a month, the March launchings having been somewhat less than half of this, about 250,000 tons of steel will be involved. If steel deliveries for the 100,000 freight cars it is now contemplated to let are delivered over a period of five or six months, it will represent 200,000 tons a month, this including plates, bars, rivets, axles and everything in the steel line involved.

The three items mentioned will probably involve 750,000 gross tons of rolled steel a month. There are many other items, but all will involve individually relatively small tonnages, and the total, whatever it may be, is to be viewed in the light of the fact that production in March was about 2,600,000 tons, while capacity is about 3,000,000 tons. It seems quite obvious that there will be a large tonnage of steel left for ordinary consumptive requirements, after all war requirements, direct and indirect, have been met. Nevertheless statements continue to be made that the war will absorb practically all the steel. Washington dispatches would indicate that this is the view of Government officials, but perhaps it is a case not of its being their opinion but of its being their policy thus to regard the matter, in the interest of safety, for it is much better to assume that the war will take all the steel, and then if there really is a surplus, let somebody have it. The effect upon the market, however, is to make consumers indisposed to formulate plans for the consumption of steel.

### Plates and Shipbuilding

The reason that some of the shipyards have found themselves not fully supplied with plates, considering the tonnage that has been produced, is that some of the shipyards have not in the past made their requirements fully known, and plates have been improperly distributed. The War Industries Board understands this fully and has been taking steps to force the shipyards to specify precisely what they need, and not to overspecify. Some of the plate mills long ago recognized that the system of distribution of specifications was faulty, and that they were being left largely in the dark as to which sizes of plates were most urgently needed. Accordingly some of them have had men travelling about the shipyards taking stock in detail of plates on hand, so that shipments could be made to bring all stocks to the same level. Other plate mills did not do this. Furthermore, it is probable that some of the present difficulty arises from a misunderstanding between the mills and the yards, the mills feeling that close connection could and should be made between receipts of plates and consumption, whereas the yards claim they need large stocks of every size. However, unfortunate the condition may be, the mills are strenuously engaged in rectifying it, and are now working on the programme of stocking up every yard with a supply equal to 30 to 60 days' consumption of every size involved. This is to be accomplished within a few weeks. Meanwhile plates are scarcer, for other requirements, than they will be later.

### Shell Steel for Canada

Various and conflicting statements are made as to the amount of shell steel that is to be shipped to Canadian shell factories having shell orders from the United States. In addition to whatever

Continued on page 68.

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago | 37 50 |
| Standard low phos., Philadelphia | ..... |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 32 00 |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | ..... | ..... |
| Victoria | ..... | 50 00 |

## FINISHED IRON AND STEEL

Per lb. to Large Buyers. Cents

| | |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 5 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 5 75 |
| Chequered floor plate, 3-16 in. | 12 20 |
| Chequered floor plate, ¼ in. | 12 00 |
| Staybolt iron | 8 50 |
| Bessemer rails, heavy, at mill | ..... |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | *3 50 |

F.O.B., Toronto Warehouse

| | |
|---|---|
| Steel bars | 5 50 |
| Small shapes | 5 75 |

F.O.B. Chicago Warehouse

| | |
|---|---|
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

## FREIGHT RATES

Pittsburgh to Following Points

| | Per 100 lbs. C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 38.1 | 50.5 |
| Halifax | 39.1 | 51.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

## METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $30 00 | $28 00 |
| Electro copper | 30 00 | 28 50 |
| Castings, copper | 29 00 | 28 00 |
| Tin | 96 00 | 99 00 |
| Spelter | 10 00 | 10 00 |
| Lead | 9 50 | 9 00 |
| Antimony | 17 50 | 16 00 |
| Aluminum | 50 00 | 50 00 |

Prices per 100 lbs.

## PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¾ to ½ | $ 9 00 | $ 9 00 |
| Heads | 9 65 | 9 25 |
| Tank plates, 3-16 in. | 9 50 | 9 10 |

## WROUGHT PIPE

Effective Feb. 5, 1918.

| | Black | Galvanized |
|---|---|---|
| **Standard Buttweld** | Per 100 feet | |
| ⅛ in | $ 6 00 | $ 8 00 |
| ¼ in. | 5 16 | 7 29 |
| ⅜ in. | 5 16 | 7 29 |
| ½ in. | 6 55 | 8 12 |
| ¾ in. | 8 28 | 10 41 |
| 1 in. | 12 24 | 15 39 |
| 1¼ in. | 16 56 | 20 82 |
| 1½ in. | 19 80 | 24 89 |
| 2 in. | 26 64 | 33 49 |
| 2½ in. | 42 72 | 53 53 |
| 3 in. | 55 85 | 70 00 |
| 3½ in. | 70 84 | 87 86 |
| 4 in. | 83 93 | 104 10 |
| **Standard Lapweld** | | |
| 2 in. | $ 29 60 | $ 36 08 |
| 2½ in. | 44 46 | 54 70 |
| 3 in. | 58 14 | 71 53 |
| 3½ in. | 72 68 | 90 62 |
| 4 in. | 86 11 | 107 37 |
| 4½ in. | 97 79 | 122 56 |
| 5 in. | 114 00 | 142 82 |
| 6 in. | 147 80 | 185 28 |
| 7 in. | 192 80 | 241 57 |
| 8 L in. | 202 50 | 253 75 |
| 8 in. | 233 30 | 292 32 |
| 9 in. | 279 50 | 350 18 |
| 10 L in. | 259 20 | 324 80 |
| 10 in. | 333 70 | 418 18 |

Prices—Ontario, Quebec and Maritime Provinces.

## WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

## OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 22 50 |
| Copper, heavy | 22 50 | 22 50 |
| Copper wire | 22 50 | 22 50 |
| No. 1 machine composition | 22 00 | 21 50 |
| New brass cuttings | 16 00 | 14 00 |
| Red brass turnings | 18 00 | 17 00 |
| Yellow brass turnings | 12 50 | 12 50 |
| Light brass | 10 00 | 9 50 |
| Medium brass | 12 00 | 12 00 |
| Heavy brass | 15 00 | 14 00 |
| Heavy melting steel | 24 00 | 21 00 |
| Steel turnings | 12 00 | 12 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 27 00 | 20 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 23 00 |
| No. 1 machine cast iron | 31 00 | 30 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 20 00 | 13 00 |
| Car wheels, iron | 26 00 | 30 00 |
| Steel axles | 38 00 | 35 00 |
| Mach. shop turn'gs | 9 00 | 8 50 |
| Cast borings | 12 00 | 12 00 |
| Stove plate | 19 00 | 19 00 |
| Scrap zinc | 6 50 | 6 50 |
| Heavy lead | 7 50 | 7 00 |
| Tea lead | 5 00 | 5 75 |
| Aluminum | 21 00 | 20 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, ¾" and less | 10 |
| Carriage bolts, 7-16 and up | net |
| Coach and lag screws | 25 |
| Stove bolts | 55 |
| Plate washers | List plus 20 |
| Elevator bolts | 5 |
| Machine bolts, 7-16 and over | net |
| Machine bolts, ¾ and less | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | 10 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | add 25 |
| Nuts, square blank | add $1 50 |
| Nuts, square, tapped | add 1 75 |
| Nuts, hex., blank | add 1 75 |
| Nuts, hex., tapped | add 2 00 |
| Copper rivets and burrs, list plus | 30 |
| Burrs only, list plus | 50 |
| Iron rivets and burrs | 25 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 37½ |
| Wood screws, O. & R., brass | 32½ |
| Wood screws, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

## MILLED PRODUCTS

| | Per Cent. |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil. Head Cap Screws | net |
| Flat But. Hd. Cap Screws | plus net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. & Semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2 in. | plus 10 |
| Studs | net |
| Taper pins | 40 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | list plus 20 |
| Collar screws | list plus 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | 65 |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add 7 00 |

## BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $47 50 |
| Open-hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.

F.O.B. Pittsburgh.

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails | $5 25 $5 20 |
| Cut nails | 5 70 5 65 |
| Miscellaneous wire nails | 60% |
| Spikes, ⅜ in. and larger | $7 50 |
| Spikes, ¼ and 5-16 in. | 8 00 |

## ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 41 |
| Plumbers' oakum, per lb | 5½ |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila rope | 0 33 |
| New Zealand hemp | 0 33 |
| Transmission rope, Manila | 0 45 |
| Cotton rope, ½ in. and up | 0 25 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | net |

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | 0 47 |
| [illegible] | 0 50 |
| [illegible] | 18 to 70 |
| Soldering coppers, lb. | 0 53 |
| Lead wool, per lb. | 0 16 |
| [illegible] | 1 75 |
| White lead, pure, cwt. | 16 05 |
| Red dry lead, 100-lb. kegs, per cwt. | 15 50 |
| Glue, English | 0 35 |
| Tarred slater's paper, roll | 0 95 |
| [illegible] | 0 31½ |
| Benzine, per gal., bulk | 0 30½ |
| Pure turpentine, single bbls., gal. | 0 71 |
| Linseed oil, raw, single bbls. | 1 95 |
| Linseed oil, boiled, single bbls. | 1 98 |
| Plaster of Paris, per bbl. | 2 50 |
| Sandpaper, B. & A. | list plus 20 |
| Emery cloth | list plus 20 |
| Sal Soda | 0 03½ |
| Sulphur, rolls | 0 05 |
| Sulphur, commercial | 0 04½ |
| Rosin "D," per lb. | 0 03 |
| Rosin "G," per lb. | 0 03½ |
| Borax crystal and granular | 0 12 |
| Wood alcohol, per gallon | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

### CARBON DRILLS AND REAMERS

| | Per Cent. |
|---|---|
| S.S. drills, wire sizes up to 52 | 40 |
| S.S. drills, wire sizes, No. 53 to 80 | 40 |
| Standard drills to 1½ in. | 40 |
| Standard drills, over 1½ in. | 40 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 |
| Bit stock | 40 |
| Ratchet drills | 15 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 40 |
| Sleeves | 40 |
| Taper pin reamers | net |
| Drills and countersinks | list plus 40 |
| Bridge reamers | 50 |
| Centre reamers | 10 |
| Chucking reamers | net |
| Hand reamers | 10 |

### COLD ROLLED SHAFTING

| | |
|---|---|
| At mill | list plus 40% |
| At warehouse | list plus 50% |

**Discounts off new list. Warehouse price at Montreal and Toronto**

### IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 8 00 | $ 8 00 |
| Sheets, black, No. 10 | 10 00 | 9 50 |
| Canada plates, dull, 52 sheets | 9 00 | 8 65 |
| Can. plates, all bright. | 9 50 | 9 50 |
| Apollo brand, 10¾ oz. galvanized | | |
| Queen's Head, 28 B.W.G. | | |
| Fleur-de-Lis, 28 B.W.G. | | |
| Gorbal's Best, No. 28 | | |
| Colborne Crown, No. 28 | | |
| Premier, No. 28 U.S. | | 8 95 |
| Premier, 10¾ oz. | | 9 25 |
| Zinc sheets | 20 00 | 20 00 |

### PROOF COIL CHAIN

B

¼ in., $12.35; 5-16 in., $11.85; ⅜ in., $11.50; 7-16 in., $10.90; ½ in., $11.20; 9-16 in., $11.20; ⅝ in., $11.10; ¾ in., $11.00; ⅞ in., $10.90; 1 inch, $10.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $15.50; 3-16 in., $11.70; ¼ in., $8.40; 5-16 in., $7.40; ⅜ in., $6.35; 7-16 in., $6.35; ½ in., $6.35; ⅝ in., $6.35; ¾ in., $6.35.

**Prices per 100 lbs.**

### FILES AND RASPS.

| | Per cent |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 40 |
| Black Diamond | 40 |
| J. Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 37½ |
| Disston | 50 |
| Whitman & Barnes | 50 |

### BOILER TUBES.

| Size | Seamless | Lapwelded |
|---|---|---|
| 1 in. | $36 00 | $..... |
| 1¼ in. | 40 00 | ..... |
| 1½ in. | 43 00 | 36 00 |
| 1¾ in. | 43 00 | 36 00 |
| 2 in. | 50 00 | 36 00 |
| 2¼ in. | 53 00 | 38 00 |
| 2½ in. | 55 00 | 42 00 |
| 3 in. | 64 00 | 50 00 |
| 3¼ in. | ..... | 58 00 |
| 3½ in. | 77 00 | 60 00 |
| 4 in. | 90 00 | 75 00 |

Prices per 100 ft., Montreal and Toronto.

### OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | |
| Royalite, per gal., bulk | 18 |
| Palacine | 21 |
| Machine oil, per gal. | 26½ |
| Black oil, per gal. | 15 |
| Cylinder oil, Capital | 49½ |
| Cylinder oil, Acme | 39½ |
| Standard cutting compound, per lb. | 0 06 |
| Lard oil, per gal. | $2 60 |
| Union thread cutting oil antiseptic | 88 |
| Acme cutting oil, antiseptic | 37½ |
| Imperial quenching oil | 39½ |
| Petroleum fuel oil | 13½ |

### BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30-5% |
| Standard | 40% |
| Cut leather lacing, No. 1 | 1 95 |
| Leather in sides | 1 75 |

### TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 06 |
| Emery glue | 15 to 20 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 35 |

**Prices Per Lb.**

### BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 38 |
| Brass sheets, 24 gauge and heavier, base | 0 43 |
| Brass tubing, seamless | 0 46 |
| Copper tubing, seamless | 0 48 |

### WASTE.

| White. | Cts. per lb. | | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 18½ |
| Peerless | 21 | X Empire | 17¼ |
| Grand | 19¾ | Ideal | 17¼ |
| Superior | 19¾ | X press | 16 |
| X L C R | 18½ | | |

| Colored. | | | |
|---|---|---|---|
| Lion | 15 | Popular | 12 |
| Standard | 13½ | Keen | 10½ |
| No. 1 | 13½ | | |

| Wool Packing. | | | |
|---|---|---|---|
| Arrow | 25 | Anvil | 15 |
| Axle | 20 | Anchor | 11 |

| Washed Wipers. | | | |
|---|---|---|---|
| Select White. | 11 | Dark colored. | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING.

Standard ... 10% Best grades .. 15%

### ANODES.

| | |
|---|---|
| Nickel | .50 to .54 |
| Cobalt | 1.75 to 2.00 |
| Copper | .44 to .46 |
| Tin | .49 to .56 |
| Zinc | .23 to .25 |

**Prices Per Lb.**

### COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | 42 50 | 43 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 46 00 | 44 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 48 00 | 48 00 |
| Copper sheet, planished, 16 oz. base | 57 00 | 45 00 |
| Braziers,' in sheets, 6x4 base | 45 00 | 44 00 |

### LEAD SHEETS.

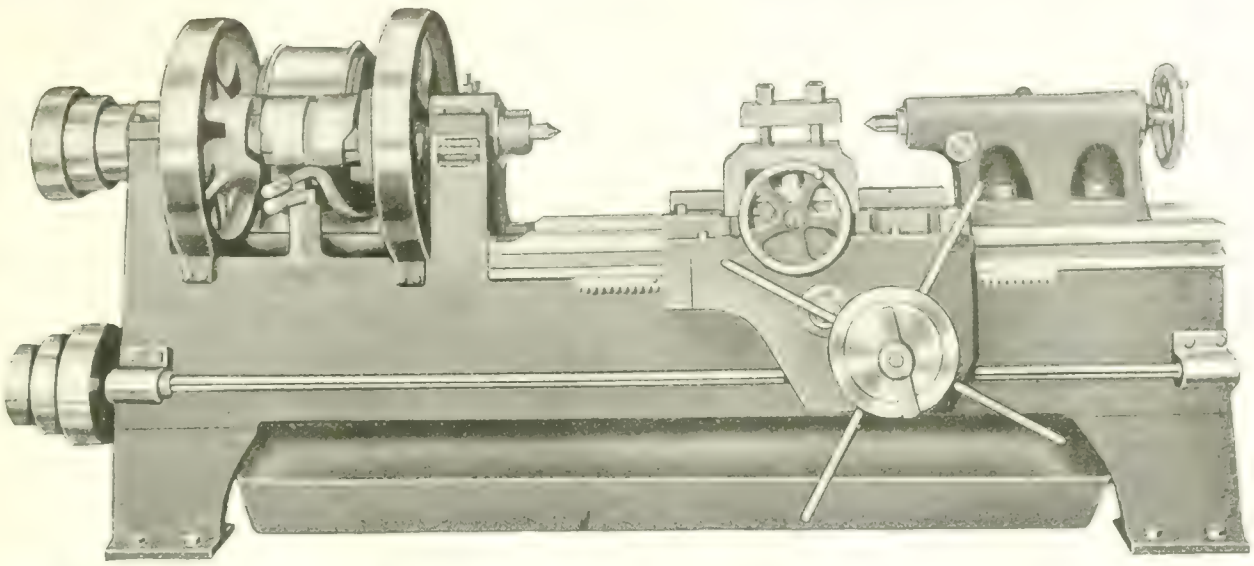
| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $13 25 | $13 25 |
| Sheets, 3½ lbs. sq. ft. | 13 25 | 13 25 |
| Sheets, 4 to 6 lbs. sq. ft. | 12 50 | 12 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS.

| | |
|---|---|
| Acid, boracic | $ .15 |
| Acid, hydrochloric | .05 |
| Acid, hydrofluoric | .14½ |
| Acid, nitric | .10 |
| Acid, sulphuric | .05 |
| Ammonia, aqua | .08 |
| Ammonium carbonate | .15 |
| Ammonium, chloride | .11 |
| Ammonium hydrosulphuret | .40 |
| Ammonium sulphate | .07 |
| Arsenic, white | .12 |
| Copper, carbonate, anhy | .35 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .70 |
| Iron perchloride | .20 |
| Lead acetate | .16 |
| Nickel ammonium sulphate | .12 |
| Nickel carbonate | .35 |
| Nickel sulphate | .15 |
| Potassium carbonate | .75 |
| Potassium sulphide (substitute) | .20 |
| Silver chloride (per oz.) | .65 |
| Silver nitrate (per oz.) | .55 |
| Sodium bisulphite | .10 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .41 |
| Sodium hydrate | .04 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | .14 |
| Tin chloride | .60 |
| Zinc chloride | .60 |
| Zinc sulphate | .09 |

**Prices per lb. unless otherwise stated.**



# The MONTREAL Heavy-Duty Rough Turning Lathe

## Description

**BED** is of heavy massive construction, wide and deep and braced with box section girths, ways are flat provision is made at rear side for attaching profiling attachment when needed.

**HEADSTOCK** Cast integral with bed giving great rigidity and permanent alignment. Two gear ratios are obtainable through gearing and change is made instantly by means of jaw clutches. Drive is by 8" belt on backgear shaft through friction clutch. On account of the integral construction the gear [illegible] diameter and the advantage has been taken of this feature. Bearings are [illegible] ample oiling facilities and provided covers are furnished for gears.

**CARRIAGE** [illegible] heavy, with wide bridge [illegible] cuts, plain heavy duty rest with graduated collar, hand feed to cross slide.

**APRON**—One piece double wall type giving support to both ends of shafts. Gears are of steel or semi-steel, worm wheel of bronze. External friction plate of large diameter giving great power for feeds.

**FEEDS**—Three provided through felt from spindle.

**TAILSTOCK** of massive design with long nose making it unnecessary to extend tailstock spindle for ordinary work. Spindle is of large diameter. Four clamping bolts are provided to secure tailstock to bed.

**OIL PAN** of heavy gauge sheet steel.

**PUMP** Triplex Rotary Pump provided for supplying [illegible]

No countershaft is furnished as friction and jaw clutches are part of machine [illegible] shaft.

## Specifications

| | |
|---|---|
| Swing over bed | 21" |
| Swing over carriage | 11" over |
| Distance between centres | 12' |
| Length of bed | 9' 4" |
| Width of bed | 18" |
| Depth of bed | 18" |
| Width of ways | [illegible] |
| Height from floor to centres | [illegible] |
| Front spindle bearing | [illegible] |
| Rear spindle bearing | [illegible] |
| Spindle nose | [illegible] |
| | [illegible] |
| Diameter tailstock spindle | [illegible] |
| Taper in spindle and tailstock (Morse) | [illegible] |
| Ratio of gearing in headstock | [illegible] |
| Diameter of largest gear | [illegible] |
| Drive pulley | [illegible] |
| Length of carriage on ways | [illegible] |
| Width of bridge | [illegible] |
| Feeds per rev. of spindle | .119", .079", .053". |
| Approx. weight | [illegible] |


# The A. R. Williams Machinery Co.
LIMITED

**64 West Front Street** **Toronto, Canada**

*If interested, tear out this page and keep with letters to be answered*

# INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

## ENGINEERING

**Welland, Ont.**—The Welland Iron and [illegible] organized by E. J. Anderson, of Welland, has taken over the old Beatty plant and will establish a brass and iron foundry and also a machine shop. Machinery is being installed and the plant will be in operation shortly.

**Perth, Ont.**—The Canadian Union Iron Mines Corp., Ltd., have commenced operations at their mines near Perth and expect to produce upwards of twenty-five tons of hematite iron ore per day. The company have a contract for twenty-five thousand tons which should be completed during this season.

**Ottawa.**—The British-American Nickel Refining Company, which has been negotiating for property for some time, has decided to locate on the Hull side of the Ottawa River. It is learned that representatives of the company have purchased the property known as the old Conroy piling grounds, at Deschenes, upon which a nickel refining plant, to cost in the neighborhood of $1,000,000, will be erected. The company will employ at least one hundred and fifty hands.

## TENDERS

**Barrie.**—Tenders will be received up till noon, April 25th, for the sale of the ferry steamers Island Queen and Kathleen, as they now lie burnt and damaged at Toronto Island, Toronto. The damaged hulls to be promptly removed and berthed elsewhere to the satisfaction of the harbor authorities. Hugh Calderwood, underwriters' representative, Barrie, Ont.

**Ottawa.**—Sealed tenders will be received at this office until 4 p.m. on Monday, April 22, 1918, for the charter of tug Hercules. This is a steel tug, Official Registry No. 122,217; length, 105 ft.; beam, 24 ft. 6 in.; draft, 10 ft. 6 in.; triple expansion engine of 14¼ in., 22 in. and 36 in. by 21 in. stroke. The tug is in Midland Harbor, Ont., and can be inspected by appointment with the district engineer of the department at that place. Apply district engineers, Midland, Equity Building, Toronto, and office of assistant chief engineer, Birks Building, Ottawa.

**Ottawa.**—Sealed tenders will be received until noon, April 23, 1918, for electric conduit and fittings required in the reconstruction of the Parliament Buildings, Ottawa. All tenders to be based on the supplying and delivering on the site of the quantities of the schedule of material for electric conduit and fittings, in strict conformity with the specifications and the samples submitted and to the satisfaction of the architects. Deliveries to commence so far as possible immediately after the signing of the contract and to continue as directed in such quantities as to ensure complete delivery by June 1, 1918. The schedule of material, specification and any other information required can be obtained at the office of the P. Lyall & Sons Construction Company, Limited, Ottawa; John A. Pearson, architect; J. O. Marchand, associate, Centre Block, Parliament Hill, Ottawa.

## DAYLIGHT SAVING WAS WELL RECEIVED

### Galt Factories Believe It Will Work Out To Good Advantage

Special to CANADIAN MACHINERY.

**Galt, April 17.—The moving forward of the clock and inauguration of daylight saving in Galt was generally welcomed among the employees of this industrial city's many factories and foundries, according to enquiries made by your correspondent.**

**R. M. Hamilton, works manager of Canada Machinery Corporation, said that practically all the workmen in his plant would welcome daylight saving, especially because they would have an extra hour for leisure or work in the garden in the evening. One or two of the employees who, because of the nature of their work, had to be on hand very early in the morning, did not contemplate the change with so much pleaure.**

**The Galt Knitting Co. employs a large number of girls, and James Knechtel, superintendent, said he believed the change would work out very satisfactorily. He had heard very few complaints from the employees. The fact that the measure was now applicable to the whole country did away with its former disadvantages in Canada.**

**D. Hastings, superintendent of the Goldie and McCulloch Co., said he had heard no complaints and he thought the daylight saving scheme would result satisfactorily.**

**His employees did not appear to be very enthusiastic, said James H. Cowan of Cowan and Co., but after the plan had been given a fair trial those concerned would be in a better position to judge of its benefits.**

## PERSONAL

**Hein and Crombie**, consulting engineers, have recently opened an office in the Transportation Building, Montreal.

**C. W. Kirkpatrick**, a well-known Hamilton newspaperman, has been recommended by the controllers for the position of industrial commissioner with a salary of eighteen hundred dollars a year.

**Captain McGough**, one of the veterans of the old sailing vessels, has been appointed acting harbor master in place of Captain Murray, who was killed in the Halifax disaster last December.

**Edgar Mill McDougall** died in Montreal last week. He was president of the Canadian Iron Foundries, Ltd., and also of the John McDougall Caledonian Iron Works. The several companies with which Mr. McDougall was connected were largely represented at the funeral.

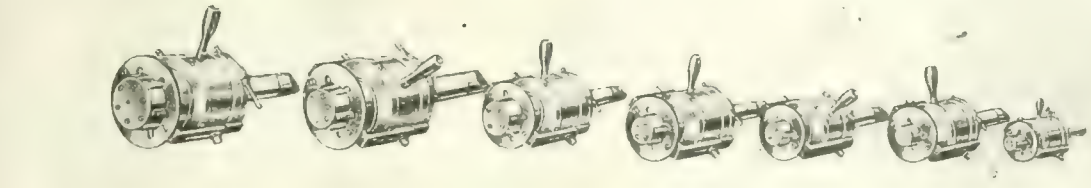
**Capt. W. R. Hutchison**, of the Royal Scots, who was killed in action, was formerly a resident of Montreal, and was connected with the firm of Drummond & McCall Co., iron and steel merchants, J. T. McCall of the company being his uncle. Capt. Hutchison was well known in the old country as a Rugby player, and while in Montreal he was prominently identified with the Rugby game. He was 28 years of age.

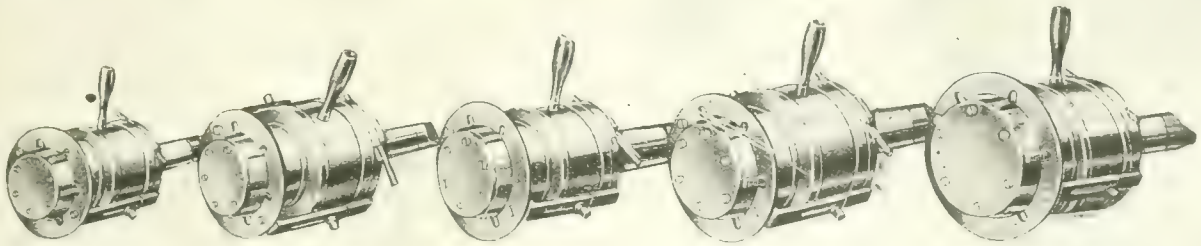
**Thos. Lawson**, head of Thos. Lawson and Sons, P. H. Powers, boiler manufacturer, Andrew Imlack Sr., one of the founders of the Victoria Foundry, and Alex Fleck, of the Vulcan Iron Works, all of whom have been long and prominently identified with the iron and steel industry in Ottawa, have been spending the winter in California. They are expected home about the end of the present month. Mr. Lawson and Mr. Imlack were at Los Angeles, Mr. Powers at Riverside, and Mr. Fleck at Coronado Beach.

**Second Lieutenant Maurice F. Peiler, R.F.C.**, was reported missing on April 6, according to a cable message from the British War Office, received by his father Mr. H. L. Peiler, general manager of the Mason Regulator & Engineering Co., Limited, Montreal. Lieut. Peiler was born in Montreal twenty-one years ago and was educated at the Montreal High School, Berthier Grammar School and Montreal Technical School. For two years he was with the St. Catherine street branch of the Molsons Bank and later accountant with his father's business. He went to Toronto July 6 last and was given his wing as a qualified scout pilot eleven weeks later, was in training in England at the end of October, requalified on November 23, and on the 30th of that month was in France on active service. On February 26 last he downed his first Hun 'plane and bagged two more enemy machines on the 13th of last month.

**Charles F. Sise** is dead at Montreal. He was at the time of his death chairman of the Bell Telephone Co. of Canada. He was born in Portsmouth, U.S. in 1834. He early took to the sea and was made captain before he was 21 years of age. On the outbreak of the Civil

# GEOMETRIC TAPS





# FOR U.S.

## SIZES 3/4" TO 6"—AT A U.S. ARSENAL

THIS illustrates only one of the groups of Geometric Collapsing Taps that have gone into United States Arsenals and Navy Yards to bear out the reputation that attaches to all Geometric Thread Cutting Tools.

These taps are equipped with the roughing and finishing attachment, a feature of Geometric Taps that are required for close work.

A micrometer scale adjusts them for a tight or loose thread. Because of the adjustable feature, Geometric Taps always produce accurate threads, no matter how often the chasers have been ground.

When ground beyond further use, the chasers may be replaced, while the tap remains as good as new.

Chasers recede automatically when the required depth of thread is reached.

Geometric Collapsing Taps can be fitted to Screw Machine or Turret Lathe, also live spindle.

Why not put your tapping proposition up to a Geometric?

**THE GEOMETRIC TOOL COMPANY**
**NEW HAVEN CONNECTICUT**

***Canadian Agents***

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B.

*If interested, tear out this page and keep with letters to be answered.*

War, Mr. Sise acted as private secretary to Jeff Davis. He was also engaged in running blockades, taking in arms and ammunition. In 1879 he undertook the work of bringing all the various telephone companies under one head on a national basis. Mr. Sise identified himself with other important business corporations of Canada, having been a director at various times of the Bell Telephone Company, the Wire & Cable Company, the Northern Electric & Manufacturing Company, the North American Telegraph Company, the Canadian Westinghouse Company, the North British & Mercantile Insurance Company, the Sincennes-McNaughton Line, the Nova Scotia Telephone Company and the New Brunswick Telephone Company, and many years ago of the Royal Electric Company of Montreal, of which he was at one time vice-president.

# TRADE GOSSIP

**Will Purchase Truck.**—Chatham will purchase a motor service truck from the American La France Co. for $9,325.

**Using Old Factory.**—The Thornton Rubber Co. are fitting up the old malleable range factory at Oshawa for the manufacture of rubber textiles to be used largely in motor car tops.

**Industry Closed Out.**—The works of the Crossen Car Co., Cobourg, have been dismantled and most of the machinery disposed of. The one-time active Cobourg industry thus passes out of existence.

**A Joint Stock Co.**—The Tallman Brass & Metal Co., of Hamilton, has been changed into a joint stock company and is branching out into different lines of brass work. The present partners will become directors of the new company.

**Who's Behind It?**—Considerable interest is attached to the controversy now going on in connection with the formation of the Dominion Steel Workers' Union at Sydney, N.S., which is seeking incorporation.

**'Phones Hard to Get.**—The demands that are being made on the supply of telephones by the military and allied concerns make it hard to get these instruments for private houses and there is considerable delay.

**Fire in London.**—Fire of unknown origin destroyed the sawmill of D. H. Gillies and the showcase works of John H. Campbell, Bathurst street, London, on Saturday evening. The total loss will exceed $40,000, which is partly covered by insurance.

**Gas Supply Is Short.**—Large industrial consumers of natural gas in Western Ontario will in all probability be compelled after July 1 next to use other fuel, according to the policy outlined by the Ontario Railway and Municipal Board in a circular letter sent out yesterday to the producing and distributing companies.

**Shows an Increase.**—The statement of operations of the Nova Scotia Steel and Coal Company for the first quarter of the present year shows little change in volume of output as compared with the third quarter of the previous year. A good increase, however, is shown in the tonnage of iron ore mined.

**May Move Plant.**—At the meeting of the Hamilton Board of Trade Controller Jutten urged that the influence of the board be exerted towards retaining for Hamilton the bolt works of the Grand Trunk Railway, which the railway propose to move to some other point. Secretary Brown was instructed to take the matter up with the head officials of the Grand Trunk Railway.

**A Coal Shortage.**—Warnings that a shortage of bituminous coal exists were issued in New York by fuel authorities. The situation is so serious, according to Harry T. Peters, chairman of the State Fuel Conservation Committee, that "we will be back where we were last winter unless something is done to relieve matters." March was the worst month in point of production during the past year and a half, Mr. Peters asserted.

**Canadian Cars in United States.**—At Ottawa Mr. Casgrain was told by the Minister of Railways that 18,146 Canadian box cars and 5,531 stock cars are at present in the United States and due to Canadian railways. The Government, said the Minister, had taken action on different occasions to secure the release of these cars, and would continue to impress upon United States authorities the necessity for returning them as soon as possible.

**Shortage of Power.**—Militia Department instructions to give flour mills preference compelled London to hand over 300 horse-power from her scanty Hydro allowance to a new mill here. As a result it has been found necessary to arrange a schedule under which the factories of the city will close one hour each day. The city will be divided into eight areas and one will close down each hour, thus reducing the total Hydro load through the whole period.

**Pedlar People Extending.**—The Pedlar People Limited, of Oshawa, have completed a building 125 x 80 for their culvert department, thus making room in another section of their factory for their sheet metal stamping department, a new branch of their industry. This is equipped to handle certain lines of motor car work as well as serving other industrial purposes, including the marine field. The Pedlar People are now employing 250 hands.

**The British-American Shipbuilding Co.,** who leased part of Beatty & Sons' plant at Welland, Ont., will shortly launch the first 3,500-ton steel freighter, which they are building for the Imperial Munitions Board. The vessel is 261 feet long, 43 feet broad, 23 feet deep. On the second hull the keel and floor frames are down and about 50 per cent. of the steel has been fabricated. Arrangements are being made for a third berth. The officials of the company are as follows: H. F. S. Estrup, president; H. A. Sifton, vice-president; H. M. Balfour, general manager; H. D. Davison, treasurer, and G. A. Leonard, secretary.

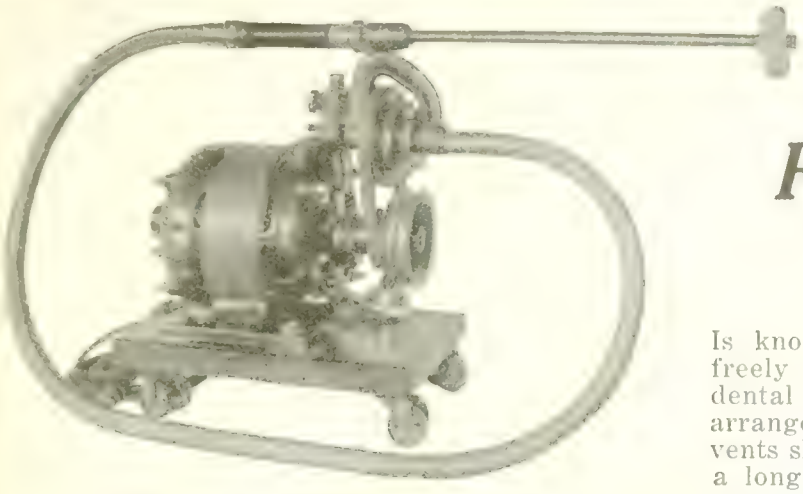
**Profits Increase.**—The annual statement of the Canadian Fairbanks-Morse presented to the shareholders shows net earnings after operations and tax reductions amounting to $1,033,817. After allowing for depreciation of $251,843, the earnings amount to $781,974, as against net profits after depreciation of $636,629 in the previous year. Preferred dividends for eighteen months amount to $135,000, leaving $646,974 available for common dividends, which amounted to $436,000. Surplus for the year totalled $210,974, which with the surplus of $1,129,466 forwarded from the previous year, brings total surplus to $1,340,440.

**Sydney, N.S.**—The Sydney Mines dispute has been amicably settled as the result of a conference which commenced last night in Sydney Mines and had not been concluded until after 1 o'clock in the morning. Representing the Nova Scotia Steel and Coal Co. were General Manager Adams and Superintendent Cunningham, and representing the men were Vice-president Robert Baxter, Secretary-Treasurer J. B. McLachlan, and George Bagnall, of the Amalgamated Mine Workers' Union, and seven Sydney Mines men, John Stewart, Robert Williams, James Daley, Adam Scott, Henry McKinnon, Charles Foster and Louis Speers.

**Want a Bounty.**—An Ottawa despatch says: "The Canadian Government is giving serious consideration to an application of the Central Iron Committee of Vancouver Island for a federal bounty to stimulate the production of iron and steel from British Columbia ores. Bounty of three dollars ton iron, same on steel up to 500 tons per day, with $2 per ton beyond that to 1,000 tons asked. British Columbia members with R. R. Neild and J. F. Bledsoe had several meetings with the Government. Acting Finance Minister McLean yesterday stated to the meeting he expected the Government would almost immediately be in a position to deal with the question.

**Canadian for Australian Railways.**—The premier of the state of Victoria has announced that to fill the vacancy caused by the recent death of one of the railway commissioners it was the intention of the government to secure the services of a capable and experienced commissioner from abroad. It is understood that already applications have been received from ambitious men now in the service of Canadian railways for the position which—for the present at least—is not that of chief commissioner. The present chief railway commissioner receives a salary of £2,500 (but the last chief commissioner from oversea received a salary of £3,500) and the second and third railway commissioners, respectively, receive a salary of £1,750.

**Trade Consolidation.**—One of the most interesting examples of after-war trade organization in the engineering industry is shown by the well-known firm of Dick, Kerr & Co., Ltd., the development of whose business organization during the war has been such as to place this firm in an exceedingly strong position. For many years past Messrs. Dick, Kerr &



Drill chuck is quickly and easily attached by simply removing the detachable handle and wheel. And there's no overloading of the motor. Three-speed countershaft and belts prevent that.

# Aikenhead's Flexible Shaft Grinder

Is known in Canada as the one machine freely flexible and yet proof against accidental short bends. The automatic stop arrangement of this Aikenhead machine prevents short bends. The metal casing gives it a longer service life by years than that of unarmored machines.

**For Cleaning Out Shells of All Sizes**
**For Light Grinding, Polishing, Drilling**

You will find this Aikenhead Flexible Shaft Grinder an economizer of time and labor—a machine that does much in little time.

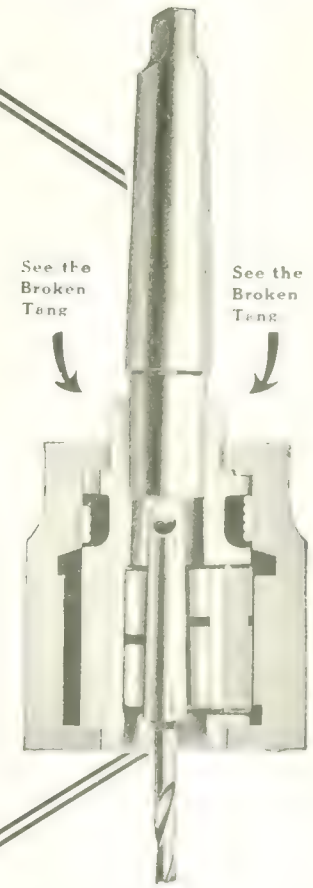
**Write for complete details.**

## Aikenhead Hardware Limited

**17, 19, 21 Temperance Street, Toronto**

## Use M. T. Shank Tools With or Without a Tang

This Automatic Chuck grips by the entire shank — enables you to use numbers 1, 2 and 3 Morse Taper Shank Tools with broken tangs—and that's the least of its advantages.




# Aikenhead's Wahlstrom Chuck

Eliminates waste of time, waste of motion. It acts instantly. It centers the tool itself automatically. It enables your operators to make tool changes in less than two seconds.
And a tool in the grip of this Aikenhead Wahlstrom Chuck can never slip. If the resistance on the tool is great, the holding power of the jaws is great proportionately.
There is an Aikenhead Wahlstrom Chuck for Straight Shank Tools as well as Taper.

**Write for Particulars.**

## AIKENHEAD HARDWARE LIMITED

**17, 19, 21 Temperance St., Toronto, Ontario**

equipment of electric railways and tramways, waterworks, factories, etc., with a [illegible] works at Kilmarnock and large works at Preston for the manufacture of steam turbines, electrical machinery and electric lamps. Recently they have also taken over the control successively of the old-established business of Willans & Robinson, Ltd., of Rugby, well known as builders of steam turbines and Diesel engines, and of the United Electric Car Co., Ltd., of Preston, prominent manufacturers of railway and tramway rolling stock; and in addition have completed a joint manufacturing and selling arrangement with the Phoenix Dynamo Mfg. Co., Ltd., of Bradford, in regard to certain classes of standarized electrical machinery. One effect of this unique combination of engineering interests is that while the combined technical and manufacturing knowledge of the associated firms will be available for all, yet each works can confine its output to those products for which it is best equipped.

## MARINE

The Greenfield Tap and Die Corporation of Greenfield, Mass., have issued a new pipe tool catalogue, No. 38. It is a revised and completed edition of the first catalogue of this number, which was issued some time ago.

**Victoria, B.C.**—That the Victoria Machinery Depot has been offered contracts by the Dominion Government for the building of three steel ships of 5,100 tons each and that it has declined the offer is stated by C. V. G. Spratt, head of the company.

The Vanadium-Alloys Steel Co., of Latrobe, Pa., have just sent out a new stock list of Red Cut Superior high speed steel. As there is such a demand for the various sizes in this line, attention should be paid to the latest lists to be sent out by the company.

The Whiting Foundry Equipment Co., of Harvey, Ill., have issued a catalogue of crane ladles, truck ladles, bottom tap ladles and shank and hand ladles, etc., also a bulletin. The latter is a list of firms in all parts using the cupola made by the Whiting Company.

**Cleveland.**—The great lakes fleet is to begin the 1918 season with a greater carrying capacity than last year, despite the fact that the government has drawn on it for several boats for the war. The tonnage available for 1918 will be 3,503,450 gross tons. This is 14,500 tons greater than at the close of 1917.

**Kingston.**—The ice is out of the harbor. The terrific wind storm of Monday night did the trick. On Monday mariners were of opinion that it would be a week or possibly ten days before the ice would move out, but they guessed wrong. The heavy rain followed by [illegible] to work the ice out, and when citizens awoke on Tuesday morning they were glad to hear the news about the ice getting away.

The Greenfield Tap and Die Corporation have issued a souvenir booklet in connection with the formal opening of their new office building, shipping room and recreation building on March 5. The erection of these two buildings marks the complete amalgamation of the various units and divisions of the Greenfield Tap and Die Corporation with its various plants in different parts of Greenfield. The booklet is a handsome one, the work of W. L. Robbins, advertising manager of the company.

**Ottawa.**—The Dominion Government will resume control of the harbor at Port Dover, will repair damage done to it by storms, and will place it in condition to accommodate cargo and other vessels, Hon. F. B. Carvell, Minister of Public Works told a large delegation which waited upon him. The cost of repairs immediately required would, Hon. William Charlton estimated, amount to from $60,000 to $75,000, and a larger scheme of improvements would cost from $234,000 to $575,000, according to the plan adopted.

**Vancouver.**—The Canadian Explosives Limited has bought the yacht, White Cloud, from Captain Pybus, formerly commander in the C. P. R. transpacific service, and will use the craft as a ferry between James Island, Sydney and Saanichton. She has left Vancouver for Victoria, where she is undergoing some alterations to fit her for the service. The White Cloud was built at Hongkong and attracted much attention when she arrived here because she was rigged after the style of a Chinese junk and carried junk sails. She has a powerful auxiliary engine.

**Toronto.**—Until April 25 the western entrance of the harbor will be closed to navigation while dredging operations are conducted, according to an announcement made by the harbor master. The closing of the Western Gap means that about thirteen minutes must be added to the time which boats coming from Hamilton require for the trip, as they must sail round outside the island and enter by the eastern channel. It is announced that should the weather be stormy, ships may use the western entrance, and on stormy days the order does not apply. Two coal boats from Oswego are expected to arrive next week.

**Detroit.**—In comparison with the similar date last year, there is less ice reported on Lake Superior and Michigan, somewhat more in Lake Huron over the southern portion, in Lake Erie over the eastern portion, and also in Lake Ontario, says the sixth of the season's bulletins on lake ice conditions issued by the United States Weather Bureau in connection with reports from regular and display stations of the Weather Bureau and the Meteorological Service of Canada. During the week the ice has broken up and disappeared from most of the lakes. In Lake Superior the field has moved back to the extreme west end, and extends from Duluth beyond vision. Over the central portion the fields have moved beyond vision. At Whitefish Point the fields in the lake are moving in and out with the winds, and the ice in the bay is breaking up and becoming soft.

**Collingwood.**—The boilermakers and iron shipbuilders in the Collingwood shipyards have reached an agreement with the Collingwood Shipbuilding Company, by which the men obtain an average increase in wages of 25 to 30 per cent., a nine-hour day, instead of a ten-hour, recognition of the grievance committee of the men, and a signed agreement with the company for a year, commencing April 9. This is the outcome of the Board of Conciliation and Investigation, which recently convened in Collingwood. The chairman of the board was Hammett P. Hill, of Ottawa; Fred Bancroft, of Toronto, represented the men, and Capt. J. B. Foote the commany. The agreement provides the following rates of wages for new work, which are increased 2½ cents per hour for old work; new work rates, boilermakers, ship fitters and hand rivetters, 50 cents an hour; holders-on, 54c; heaters, 35c; chippers and caulkers, 50c; reamers, 35c; drillers, 40c; bolting up, 32½c; punch and shear men, 40c; punch shed helpers, 33½c; furnace-men, 50c; slab helpers, 40c; plate hangers, 40c; general helpers, 32½c; acetylene burners, 47½c; acetylene welders, 50c. Twenty occupations are included in the schedule.

**Montreal.**—Notices were yesterday served on the Board of Trade and other business interests by the Montreal Harbor Commission that their charges on wharfage on goods handled over the Montreal wharves and on cars, switched by the Harbor Commissioners' Railway, would be increased by at least 25 per cent. on the wharfage charges, and 50 cents a car on the switching movement of cars handled by the harbor and front railway. This, it was stated, will mean as to wharfage charges that on all general merchandise there will be an increase of at least 5 cents a ton, making the charge 25 instead of 20 cents. On special commodities, such as grain, the wharfage charge is increased from 3 to 5 cents per ton; on flour, from 6 to 8 cents per ton on wood pulp, from 6 to 8 cents per ton; on asbestos and asphalt and whiting, from 8 to 10 cents per ton; on hay, news print, sulphur and tar, from 12 to 15 cents per ton; on pig and scrap iron, from 16 to 20 cents per ton; on lumber and timber, from 8 to 10 cents per 1,000 feet, board measure; and on bricks, from 8 to 10 cents per 1,000.

**Toronto.**—H. W. Cowan, operating manager of the Canada Steamship Lines, announces the following appointments to the different freight steamers on the lines of the company for the season of 1918:—(J. W. Grainger is the mechanical superintendent). Steamer, W. Grant Morden, captain, Neil Campbell; engineer, Robert Chalmers, J. H. G. Hagarty, G. W. Pearson, Charles Robertson; Emperor, D. W. Burke, George N.

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In times like these situations constantly arise which makes rapid delivery of orders of first importance. When in need of chucks on such occasions order

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We are equipped for immediate deliveries on 5", 6", 7½" and 9" chucks.

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**The Briggs Miller handles work no other machine of its size can touch.** It is a manufacturing machine. On account of its rigid construction it will produce accurate work when running at a high rate of speed and feed.

**The Base Tank and Large Gear Pump is the latest addition to its many advantages.** Tank holds 20 gallons of cutting lubricant. Pump never requires priming and will deliver the gallons per minute to the cutters, allowing high cutting speeds and high speed.

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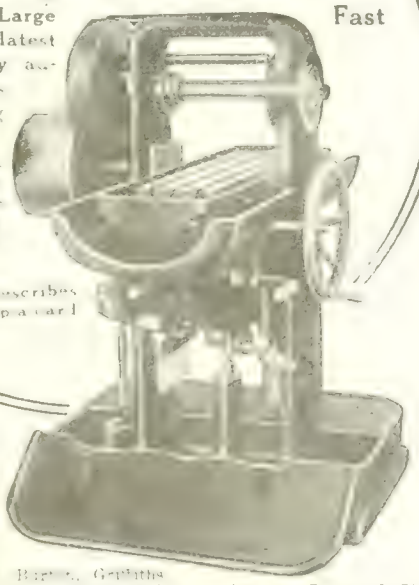

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They do one thing only, and do that one thing well

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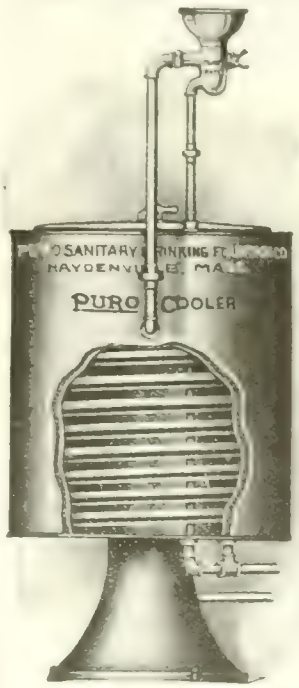
By preventing contamination in drinking water. PURO will do this and also save time and water. Can you afford to be without this investment?

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Prompt Deliveries
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Special Machinery
CUT GEARS
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Smith; E. R. Osler, C. E. Robinson, Wallace Robertson; Midland Prince, A. B. McIntyre, J. A. Pickard; Sir Trevor Drawson, H. Hinslea, W. W. Norcross; Stadacona, George H. Page, W. L. Shay; Martain, R. McIntyre, R. R. Foote; Midland King, P. McKay, James McGregor; W. D. Matthews, N. McGlennon, William Reid; Sarnian, R. Pyette, I. J. Boynton; Cadillac, W. Beatty, Hugh Myler; Calgarian, W. H. Montgomery, A. L. Black; Haddington, R. J. Wilson, Chas. Leriche; Hamiltonian, N. McKay, A. E. Kennedy; Ionic, O. Wing, A. A. Crosthwaite; Wyoming, T. B. Greenway, George Schroder; Seguin, W. Brian, John B. McLaren; Belleville, ——, John Kennedy; Bickerdike, T. H. Johnston, D. S. LaRue; City of Hamilton, O. Patenaude, Wm. Dungan; City of Ottawa, J. L. Baxter, Joseph Aston; Fairfax, M. Heffernan, F. Patterson; Wiley M. Egan, N. Hudgins, Charles LaVallee; Water Lily, John Hudgin, G. Rand.

## INCORPORATIONS

**Lee Coal Co., Ltd.,** has been incorporated at Montreal, to carry on as coal and coke dealers, to deal in copper ores, etc. Capital stock, $25,000.

**Canadian Fluorite, Ltd.** has been incorporated, with head office in Toronto, with capital of $500,000. The company can acquire, own, lease, etc., metals and minerals.

**Grace & Co. Ltd.** have been allowed to increase their capital from $100,000 to $500,000. The powers of the company are also enlarged to build, construct, etc., ships, vessels and tugs.

**Can Conservers of Canada Ltd.** has been granted incorporation in Toronto, to purchase, conserve, collect, make, tin cans, sheet metal goods, labels and canners' supplies. Capital is $100,000.

**Sparling and Reeson, Ltd.,** have been incorporated with head office in Cobourg, the capital stock being placed at $40,000. They can manufacture, buy, sell and deal in merchandise, motor and other vehicles, etc.

**Dominion Metal Exporting Co.** has been incorporated to take over the junk and mercantile business of M. Tessler, J. Gashfield and B. Stanikaff, operating under the above name. Capital is $500,000, and the place of business is at Winnipeg.

**The Buckingham Mines, Ltd.** has been incorporated, with head office in Toronto. Capital one million. Authorized to develop mineral lands and refine ore, etc. Provisional directors, Ira Marks, W. I. Marks, J. R. Curry, H. Burgess and W. Williamson.

**Morris-Knowles, Ltd.** has been incorporated, with head office in Windsor. Capital stock is $40,000. Provisional directors are M. Knowles, J. M. Rice, G. F. Maglott, N. Jacobs and C. W. Tarr. They are to act as consulting and advising engineers.

**Cleanall Soap Co., Ltd.,** has been granted incorporation, with head office in Toronto, to carry on business of soap manufacturers and to buy and sell cleaning supplies, machinery and accessories. Provisional directors are J. O. Paterson, G. O. Paterson and C. E. Paterson.

**The (Canadian) Young High-Velocity Carburettor Co., Ltd.,** has been incorporated at Toronto, with capital placed at $500,000, to make, build, buy, etc., automobiles, motor cars, tractors, tools, machinery, etc. Incorporators H. H. Davis, E. H. Brower, L. A. Landriau, H. B. Spaulding and N. Boynes.

**Grain Growers Auto Tractor Co. of Canada** has been incorporated, with head office in Montreal, and capital of $100,000. The purpose of the company is to make, import or export all kinds of agricultural implements and other devices, etc. The incorporators are J. H. Rainville, J. O. Gagnon, Albert Maynard, A. Brodeur and E. Rainville, of Montreal.

**International De Lavaud Mfg. Corp., Ltd.,** has been granted incorporation at Toronto, to manufacture and deal in all kinds of metal, and carry on machine shop practice, etc.; to deal in metals and materials of all kinds, and to carry on business as general engineers and contractors. Capital is placed at six million. Incorporators, E. W. McNeil, W. D. Toye, V. E. Haye, G. M. Bell, W. E. Eckhardt, H. J. Dawson, C. B. Carte, S. H. Young, E. G. Ahern, C. D. Dyke.

## CATALOGUES

**The Geometric Tool Co.,** of New Haven, Conn., issue their April edition of "Threads," devoted to screw thread cutting. It contains besides machinery news a considerable amount of matter of a patriotic nature. It concludes with the advice "Men are born with two eyes and one tongue, in order that they should see twice as much as they say."

**The James Morrison Brass Mfg. Co.,** under the heading "Bulletin 50," issue a 60-page booklet of marine specialties. As the end of the book is a very handy table giving dimensions of flanges, standard spigots, etc. The book is one that will prove interesting and useful to any one in the trade.

**The Chas. Strelniger Co.,** Detroit, have issued a handsome anniversary number stock list. In March last year they moved to their new store, this being the 34th year since the business was established. The catalogue is a well prepared one, setting forth in generous description and photograph the "Everything for the Shop" policy of the firm.

### TRADE INQUIRIES

THE following trade inquiries have been received by the Department of Trade and Commerce, Ottawa. Further particulars may be obtained from the Inquiries Branch of the Department:—

184. **Sulphuric acid, carbonic acid gas and anhydrous ammonia.**—A firm in St. Kitts, with an aerated water factory, desires to import the foregoing products.

185. **Lubricating oils.**—A firm in St. Kitts, British West Indies, requests to be put in touch with Canadian manufacturers of lubricating oils.

201. **Carbide.**—A Johannesburg com-

### CANADA'S EXPORT TRADE

PRESENT world-wide conditions are anything but favorable to the development of an export trade for Canada owing to abnormal domestic industrial conditions and the difficulties of ocean transportation, yet the Export Association of Canada shows no signs of discouragement, but is, on the other hand, determined to press on with the work along the lines originally adopted. This is the cultivation of trade connections with reliable sources throughout the British Empire and the other allied countries, and the encouragement of Canadian factories to compete for export business in these markets. The report, just published, adds:—"Whether Canada will enjoy tariff preferences after the war is still doubtful; if these materalize so much the better, but whether they do or not, our duty is clearly to organize in this present trying period so that when more normal conditions prevail we may do our share toward filling our munition factories with commercial orders, providing employment for our returning soldiers, and helping our country to arrive at a balance of trade which will enable her to meet her national obligations. Small as may seem the beginning we have already made in this direction, the organization work which we have already accomplished must eventually yield excellent results."


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Successors to
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OVENS
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Cutting-off and rough facing machines for 6-inch shell.
Repair parts for Williams type 6-inch cut-off machines.

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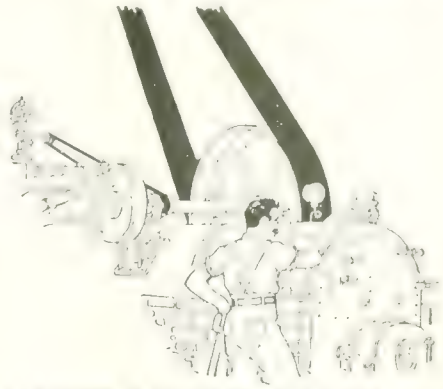
NO LINT
EPHILIAN WIPERS & WASTE CO. LIMITED TORONTO

Scandinavia Belting
Works Well in Hot Places



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GURNEY FOUNDRY CO. LIMITED
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OUR SPECIAL CASTINGS
ARE EASILY MACHINED
INTRICATE CORE WORK OUR SPECIALTY
GREY IRON OR SEMI-STEEL
50 LBS. TO 10 TONS EACH
MARINE OR GAS ENGINE CYLINDERS,
COLUMNS AND BEDS,
MOTOR FRAMES AND SPREADERS.

Will
Give You
Exceptional

**Shell Forging Production**

WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat-treated and ready for use.

It does not stick to the work.

There are many cases where each punch has turned out over 2,000 shells.

It means more shells, per machine per day.

STEEL OF EVERY DESCRIPTION.

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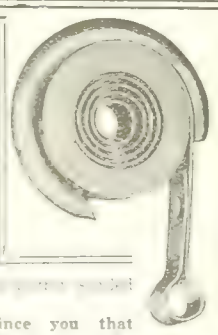
'Barnes-Made'
**Springs**



are unusual in
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experience, unsur-

A trial will convince you that

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## U.S. IMPORTS NOT TO BE CUT OFF

"Late advices to THE FINANCIAL POST from Ottawa indicate that the recommendations of the War Trade Board for restricting imports from the United States into Canada will be held up indefinitely. There is strong opposition from certain members of the Cabinet, it is understood."

Above is a quotation from a brief article which appears on the first page of THE FINANCIAL POST of April 13th. Its importance to merchants and manufacturers in Canada makes this one of the outstanding articles in this week's issue. THE FINANCIAL POST has from the first followed closely every aspect of the exchange situation, and can be relied upon to give the first and most accurate news on this and other important matters affecting Canadian business.

### LACK OF WHEAT MAY SHUT MILLS

In the same issue of THE FINANCIAL POST, on the front page also, appear two tremendously important articles. Under the heading "Lack of Wheat May Force Mills to Shut Down" the information is given that unless the Kansas crop can help out, Canadian mills may be idle for a considerable period this Summer for want of wheat. Side by side with this, however, appears the encouraging news that Canada is sowing three million acres of wheat more for 1918 than were sown for 1917 harvest. This is one of the articles contributed every week to THE FINANCIAL POST by the editor of "Farmers' " Magazine." THE POST has the benefit of the specialized skill of the editors of twelve other business papers each with a distinct field of its own, in the Maclean Business Newspapers, and THE POST'S own editorial staff is expert and represented at strategic centres for securing all important business news.

### BUSINESS NEWS OF THE WEEK

The following headings from this week's issue of THE POST indicate the scope of POST service, though not by any means representing the whole contents of THE POST—

**Valuable London Utilities Wrecked.**
**Strong Protest Entered Against B.C. Legislation.**
News of Securities—Markets Firm.
Government to Pay More for Fish.
New Shipbuilding Plant for Port Hope.
Great New Gun Works for States.
Big Decline in Exports to United States.
Bank Clearings Show Increase on "Short" Week.
Encouraging Farmers to Keep Books.
Price Fixing Will Not Attain Desired Ends.

To get the business benefit of the important articles in THE FINANCIAL POST each week just sign and send this coupon:

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153 University Ave., Toronto.

Send me THE FINANCIAL POST each week till further ordered. I will send subscription price ($3.00 per year) on receipt of bill, or you may draw on me for ....

Name ....

C.M.10

### PITTSBURG MARKET LETTER

Continued from page 420.

movement there is now, and was planned against shell steel orders placed some time ago, there is a fresh tonnage apparently, for it is stated an arrangement has been made whereby Canadian railroads withdraw enquiries for 285,000 tons of rails in the United States, these rails to be found in Canada, while the United States will make more shell steel for consumption in Canada.

#### The Markets

The markets continue extremely dull, as to pig iron, unfinished steel and finished steel. The greatly increased output of pig iron has not resulted in an easier situation, as the needs of consumers appear to have increased as rapidly as the production, and the output is going on old contracts. In unfinished steel there is more enquiry but no more offerings. One large steel interest has bought both ingots and billets in the open market and will buy more if offered. Finished steel shipments have been much heavier, but are readily absorbed. The Steel Corporation's unfilled obligations were 9,056,404 tons at the end of March, showing a decrease of 233,049 tons during the month. This decrease was equal to 18 per cent. of the capacity, and estimating shipments at 90 per cent. the bookings were about 72 per cent., or much more than in February and slightly more than in January. The bookings were chiefly of war material.

Coke shipments in the past week have been slightly heavier and somewhat greater production of pig iron and of steel is therefore in prospect. Foundry coke is still very difficult indeed to obtain.

### BORNEO HARDWOODS

ALTHOUGH Borneo hardwoods are little known among European importers and users of timber, they are going ahead in Oriental markets, and British importers should note this fact for reference when the trade in hardwoods on this side of the world emerges from its present state of stagnation. Timber imports into Hong-Kong amount to about 30,000 ft. a year, more than half of which is hardwood.

British North Borneo produces some excellent heavy woods, the chief being "billian" or ironwood, of which many shiploads go to Hong-Kong and China every year. Being ant-proof, this timber is in request for building purposes in the tropics, and it is also useful for cabinet work and flooring. "Russak" is another hardwood similar in many respects to "billian," but not so heavy. The supply is unlimited. "Sereyah" or redwood, a comparatively soft wood, resembling Californian redwood, has been shipped to Australia for use in railway carriage construction. "Greeting" is a good imitation of black oak.

# Lowering the Cost of Getting Orders

THEY were talking about the high cost of getting orders—were Brown and Jones. They were agreed on some things: train service was interfering with ability of salesmen to call on as many as formerly; hotel bills were adding heavily to the weekly expenses of salesmen; congested freight and express service was interfering with quick deliveries; salaries of men were going up; labor of all sorts, as well as materials, was becoming higher priced.

Then Brown said: "I am giving a good deal of thought to the training of my salesmen. I am endeavoring to make them produce more business—to sell more goods, and to reduce the number of futile calls. I notice that they are giving much attention to this subject in the United States, and that in Canada some firms are paying serious attention to this matter of better salesmanship."

"What are you doing?" said Jones.

"Well, I haven't done a great deal so far, for I am in the initial stages of my studies. But one thing I have learned: it is that my men haven't been analyzing the causes of their failures to make sales. I can't blame them, for I myself haven't troubled myself to dig into this phase of the selling game. Now I am asking myself and my men—Why the failure to get the order?

"I have discovered a good deal. One thing is that my men haven't known enough about the goods they took out to demonstrate them convincingly. This is largely our fault. So we are using time and printed matter to make our men know exactly what they have to offer.

"Another thing we have had impressed on us is that our men haven't been approaching their prospects always in the best way. They have been too keen to sell rather than to serve.

"I saw a thing the other day that is good—by a man named Casson. He said the average salesman's method was "Talk—Argue—Compel.' As against this, he recommended: Listen—Agree—Oblige.

"What he means is that the salesman must get on the side of the buyer if he is to have best results. And so I am doing something to get my men trained to acquire the point of view of the man they canvass—this first. When a salesman postpones his sales talk until he has won the interest and attention of the prospect, he is in a much more favorable position to put across his proposal.

"I read recently an advertisement of the FINANCIAL POST in which it told of Frank Mutton, President of the International Business Machines Company, in which he said that he has subscribed to THE POST for each of his salesmen in order that they may be well informed about business conditions and affairs in Canada—this as an aid in making sales. The idea, I infer, is to make his men quick to get the point of view of the men they are to canvass—to become possessed of a kind and amount of information which will enable them to make themselves interesting to prospective buyers of time-recording machines.

"Now, I have known Mutton for many years—known him to be a super-salesman. In subscribing to THE POST for his salesmen, I saw one of his methods—secrets, if you like. So I got THE POST myself to see how my men could make use of it for the same objects.

"I have subscribed to THE POST for 4 months at the cost of a dollar per salesman, and I have been having my men report to me in writing just how they are finding The POST useful to them. They read THE POST with one question uppermost: What item or article in this issue can be used by me to help me make sales?

"I want to tell you, Jones, that I am delighted with the experiment. The minds of my men have been stimulated. They are "cashing in" on what they read. They relate certain items or articles to certain prospects, and they are approaching their customers with greater confidence, greater art, and with more persistency, born of a surer knowledge of how our product is worth the other man's consideration and purchase.

"My men are bringing in more business, and this offsets the increasing costs of going after business."

A VERY suggestive conversation, is it not? The point of its reproduction here: If you think the idea put into operation by Brown (and Mutton who is paying for 50 subscriptions for men in his employ) is worth your consideration, then investigate THE POST for yourself. Instruct us to send THE POST to you that you may investigate it from the angle—What is there in this paper that my men can use to help them "get next" their prospects with a view to making more sales and in quicker time?

So we suggest to you that you sign the coupon below.

Just what does the FINANCIAL POST aim to do? The answer is: It gives business men information about every important happening in every part of Canada as this happening relates to Business. It follows the various listed and unlisted securities, and gives each week clear and accurate and up-to-the-minute information about them. It tells about the movements and influences affecting such groups of investment interests as Iron and Steel, Textiles, Milling, Pulp and Paper, Transportation, and so on. It has numerous contributed articles of first-class interest and importance. It contains much personal matter—notes and sketches about men of influence or position in the public eye whose doings or sayings have relation to Business. Withal, THE POST is extremely readable. It is edited and prepared by trained journalists—the highest-priced staff of men on any publication in Canada. All this makes THE POST a "different" paper, and a good one. The subscription price is $3.00 a 52 issues—Saturdays; or 4 months for one dollar.

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Rates (payable in advance): Two cents per word first insertion; one cent per word subsequent insertions. Count five words when box number is required. Each figure counts as one word. Minimum order $1.00. Display rates on application.

### REPRESENTATIVES WANTED

TO HANDLE ONE OF THE BEST FACTORY [illegible] a fair amount of attention to this line will be able to make good thing out of it. Give particulars (in [illegible] etc. [illegible] (c17m)

CANADIAN AGENT WANTED TO HANDLE line of drinking fountains made in Canada. Man calling on manufacturing plants, public buildings, etc., preferred. Box 393, Canadian Machinery. (c16m)

## WANTED

WANTED [illegible] Hydraulic Press with 30-ton [illegible] and oil pump to control, complete with accumulator and pump. Canadian Hart Wheels, Limited, Hamilton, Ont. (c17m)

WANTED — IMMEDIATELY ONE SECOND-hand compound rest lathe, back gear 4 ft. to 6 ft. bed. Also one shaper 12" to 18" stroke. Central Tools & Forgings Ltd., Winnipeg. (c18m)

## SPECIAL MACHINERY

H. C. THOMAS, GENERAL MACHINE SHOP, tools, jigs and machine repairs. 301 King St. W., Toronto. Telephone Adelaide 3836. tf

MANUFACTURERS—WE CAN UNDERTAKE work to any specification munition production equipment or otherwise. Write W. H. Sumbling Machinery Co., 7 St. Mary St., Toronto.

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| 1¼ | x | ½ | 2 |
| 1¾ | x | ⅝ | 2 |
| 3" | x | ⅝ | 2 |
| 3⅜ | x | ⅝ | 3 |
| 1" | x | ¾ | 1 |
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# CANADIAN MACHINERY

## AND MANUFACTURING NEWS

*A weekly newspaper devoted to the machinery and manufacturing interests.*

Vol. XIX. TORONTO, APRIL 25, 1918 No. 17


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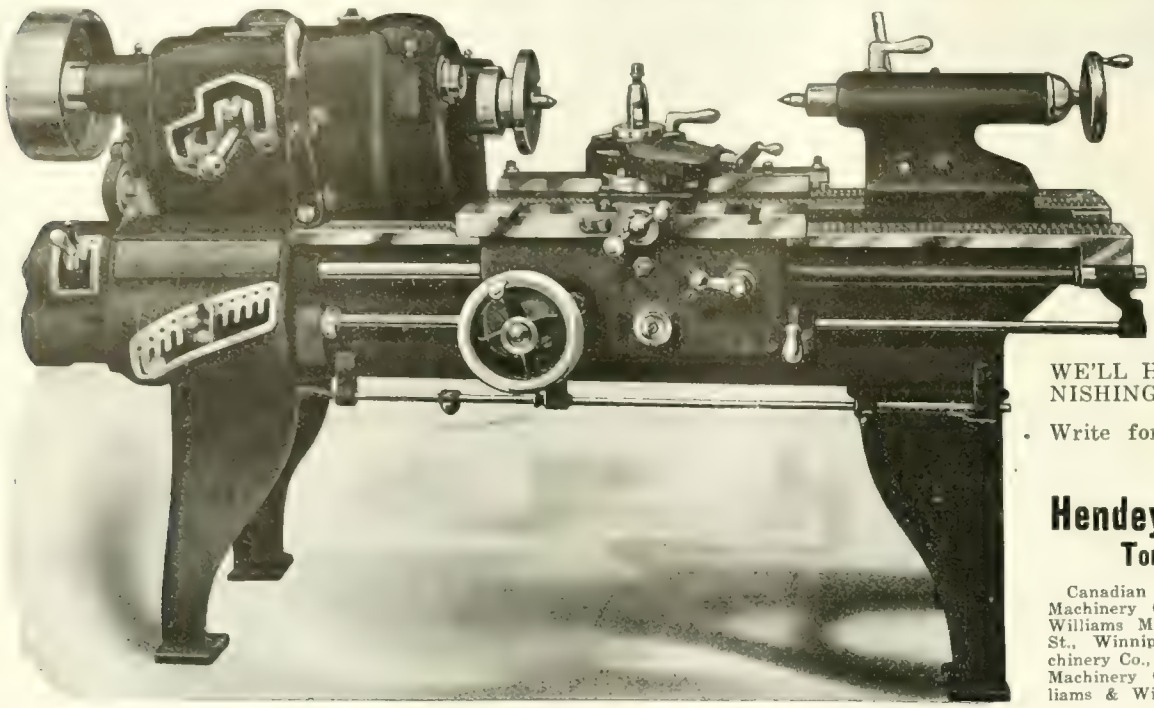

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SPECIAL SHELL MACHINES AND CONVEYOR

# Manufacturing the 75 mm. High Explosive Shell

By J. H. Rodgers * Part II.

### First Government Inspection

As the machining of the interior has now been completed, the shells are given their first inspection by Government inspectors. It might be stated that at each machining operation each shell receives a thorough examination from shop inspectors to eliminate the possibility of defective shells passing on to succeeding operations, a possibility that at all times must be guarded against. The system adopted in this plant has kept the percentage of rejected shells down to a very low figure. In the title cut is shown a view of the shop, giving a clear view of a row of special intermediate turning and facing machines, from which the shells are taken for their first Government inspection. This view is typical of all sections of the shop where the equipment is very compact, but not such as would lead to congestion or confusion.

The conveyers that carry the work from the various machines to the Government inspection bench are shown in centre of the illustration adjoining the side windows, that provide ample light for examination of the finished portions. It will be noticed that small elevated platforms are located at intervals along the top of the conveyer at a suitable height to allow the shells to pass freely beneath. At this point the shells are given a rigid shop inspection, and if passed are placed on the wooden carriages secured to the travelling chain of the conveyer that carries them to the Government inspection bench located at one end of the room shown. Just previous to passing on to the inspection table the shells pass underneath a Durant counter, where they are automatically counted. The inspection at this stage is very rigid, but owing to the care that is exercised by the shop inspectors the number of shells that are rejected by the inspectors is very small. However, as some slightly defective shells occasionally do get past the shop examiners, means have been provided for maintaining a check upon the shells that are rejected and those that are forwarded on to the next department. This is explained in another section of this article.

After passing the bore inspection, the shells are transferred to the floor above, where the nosing is performed. The method adopted for taking these shells to the second storey is illustrated in Fig. 10. Having passed inspection, the shells roll down a slight incline into a pocket in the conveyer framework, from which they are picked up by elevator forks located about every two feet on the elevating chain. As the elevator forks pick up the shell they pass a lever that extends through the screen at the front of the elevator. The lever is fulcrumed on a small shaft, the outer end of which carries the operating lever, by means of which the counter is operated. The appliance is so arranged that the lever is only tripped when a shell is in the conveyer. The counter on either side of the inspection table keeps an accurate check on all shells. These conveyers were installed by A. M. Ellicott, of Montreal, and the counters by the Durant Manufacturing Co., of Milwaukee, Wis.

### Heat Treating Department

From the elevating conveyer the shells pass into the heat treating department, where the nose is swedged in and the shells hardened and drawn. A partial view of this room is shown in Fig. 11. Three 10-hole Mechanical Enginering Co. furnaces are installed for the heating of the nose preparatory to closing in the open end. The shells are heated to about a white heat for a distance of about 2¼ inches back from the open end, the front of the furnace being made with a water-cooled portion made from welded steel plate. It is necessary to exercise considerable caution in the heating of the shell, as it is very important that superficial heating, overheating, or burning of the metal should be avoided. These furnaces have a heating capacity of about 120 shells per hour and are placed on either side of the nosing presses. The presses used are two No. 730½ Brown Boggs straight side geared, each being capable of handling 300 shells per hour. The arrangement of the presses and furnaces is such that continuous operation is obtained, the middle furnace acting as an auxiliary for either press. Special care is taken that no local chilling develops after the bottling process, as such would affect the machining operations.

One of the difficulties that has often been experienced in the closing in operation has been the number of shells that have not been bottled evenly owing to the shell not being set perfectly central when the operation was performed. In order to overcome this objection this firm adopted a special form of base plate to receive the shell when closing the nose. A sketch of this is shown in Fig. 12; the bed of the fixture is secured in a central position on the bolster of the press, and in the upper portion is contained a tapered bush D, that in turn rests upon another bush B, in the bottom of which are four compression springs C. The action of these springs keeps the centring bush in a raised position, so that when the shell is placed in and the press put in motion the shell is forced downwards,

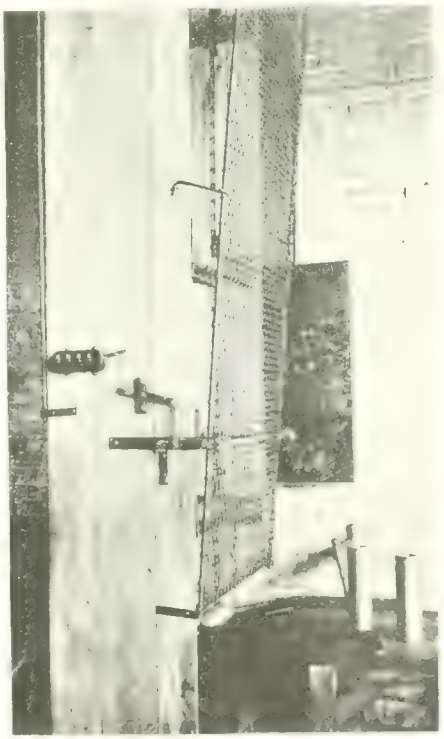


FIG. 10. ELEVATING CONVEYOR AND AUTOMATIC COUNTER

*Associate Editor CANADIAN MACHINERY.

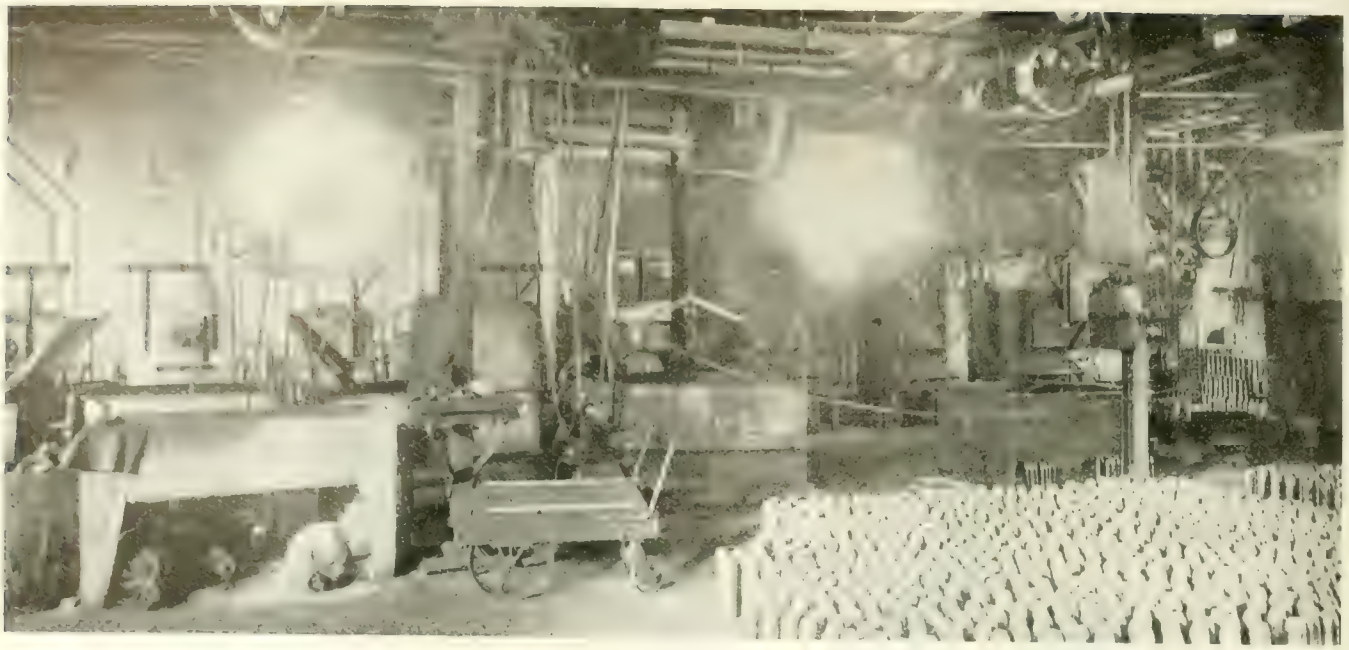


FIG. 11—SECTION OF HEAT TREATING DEPARTMENT SHOWING DOMINION BRIDGE FURNACES

but in perfect alignment until the base rests upon the thrust block E. Two clamps F are placed on either side to prevent the bush from coming out of the die. This appliance has practically eliminated defective shells as a result of faulty nosing.

After the bottling of the nose the shells are uniformly heated all over in

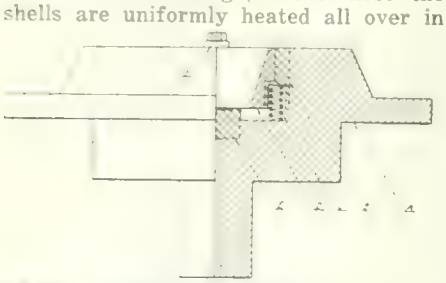


FIG. 12 ASSEMBLED PLATE FOR NOSE SWEDGING OPERATION.

small chambered gas-fired furnaces. Four Mechanical Engineering and nine Dominion Bridge furnaces are installed for this operation, these furnaces also being utilized for the drawing process. The shells are heated to a temperature of between 1,450 and 1,500 deg. F., and then quenched in a bath of oil. Slow heating is essential to even penetration of the heat, and in no instance is the heating of the shells either for quenching or drawing carried on in a hurried manner. Furnaces are not overcrowded with shells, so that the gases have a free circulation to all parts of the fire chamber. A network tray is kept in the bottom of each cooling tank, so that when the shells are raised from the bath they are allowed to drain freely. They are then placed on inclined rests, where further draining takes place, after which they are again placed in the furnaces and drawn to the desired temper, which is attained when the shells have been heated to about 1,150 degs. F. Both the quenching oil and the cooling water are kept in constant circulation by means of circulating pumps located on the ceiling of the hardening room. The total output from the heat treating department averages about 400 shells per hour. When the shells have thoroughly cooled they are subjected to the Brinell pressure test.

### Hardness Test

Following the heat treating operations the shells are taken to the Brinell testing machines, two being installed. After a spot has been flattened, by grinding, on either side of the shell, it is placed on the anvil of the machine, which has been so adjusted that the pressure will always come in a radial line with the axis of the shell. The diameter of the ball that makes the indentation is .3937 inches (10 mm.), and frequent checking is required to see that constant application has not affected its accuracy. The general practice is a 15-second duration under a pressure of 6,600 lbs., which should give a reading under the microscope of between 3.8 and 4.1 mm. As slight variation in the dimensions of the indent may arise from unequal length of time of applied pressure, it is desirable to check the period of time accurately.

### Hydraulic Test

Before the copper bands are pressed on about 10 per cent. of the shells are subjected to an internal hydraulic test. This test serves to detect by excessive expansion any material or physical properties below specifications, and by leakage, defective and porous material, as well as heat cracks resulting from improper heat treatment. The permanent expansion of any shell in excess of 2/3 of the limit prescribed for rejection will act as a basis for rejection.

Careful measurement of the shell is made before the pressure is applied at a point about ½-in. below the bourrelet, and during the fifteen seconds that the shell is subjected to the pressure it is closely examined for physical defects. When the pressure has been removed the shell is again measured and, if there is a permanent set of more than .001 per inch of the calibre, the shell is rejected and

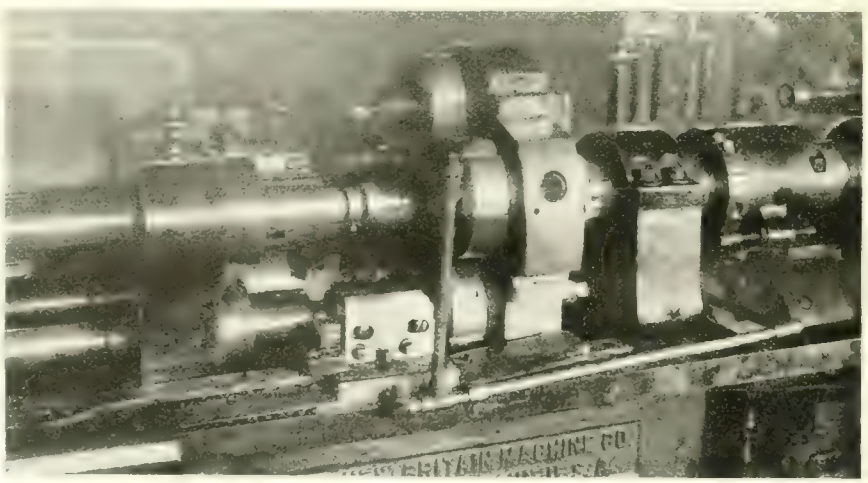


FIG. 13 NEW BRITAIN AUTOMATIC ADAPTED FOR NOSE OPERATION.

stamped by an inspector so as to make it impossible for the same to be used as a service projectile.

### Ringing Test

In addition to the above tests, a ringing test is given to all shells. The shells are supported in a suitable manner to prevent deadening the sound when the shell is struck with a light hand hammer. The sound must be a clear continuous note, and if otherwise the shell is liable to be rejected. This test follows the hydraulic test and precedes the copper banding.

### Machining the Nose

Previous to the machining of the nose bore the face is roughed off in four special facing machines. The boring, tapping and finish-facing is at present performed in four New Britain automatics, a view of this operation being shown in Fig. 13. In this operation the nose is rough bored, recessed, reamed and faced, and tapped with a solid tap, reverse motion being used for its extraction. A sketch of the fixture applied to the turret of the machine is illustrated in Fig. 14. The broken portion A is a section of the head, to the front of which is secured the piece B. The collet jaws C, three in number, have a total length of 5¾ in., and are relieved in the centre so that the pressure comes only on either end for a length of one inch; these jaws are kept in an expanded position by the action of the two ring springs shown. The pressure at the inner end is obtained by the tapered bush D, the outer end by means of the bush E acted upon by the operating chuck ring F. The U-shaped strap G is secured to the back of the head and through the centre is located the screw H, that can be accurately adjusted to the desired position. While satisfactory performance is obtained from this method, it is the purpose of the firm to replace these machines by others specially designed by the plant engineers for this specific operation.

Owing to the heavy work on the initial tapping of the nose and the great tendency of the taps to wear it is necessary that the threads be hand-tapped to insure bringing the same to correct shape and dimensions. The sizing taps are so designed that after they have become too worn for finish tapping they can be utilized for preliminary tapping.

The next operation—that of finishing the nose profile—is accomplished on the special machines designed for rough and finish turning. The intermediate turning, however, eliminates the necessity of turning the body at this time and, therefore, the machines are adapted for finishing the nose profile only. A plan view of the machine is shown in Fig. 15; a nose plug is used for driving the shell and the base end is placed in the ball bearing chuck A, the revolving portion of which is fitted on the shank of the spindle B, the thrust bearing being shown at C. Lateral movement of the spindle is obtained by means of the rod D and the lever E. The reaction of the spring H maintains a constant forward thrust upon the base of the shell. The cutting tool I made of ½-in. Stellite, is held in a special holder and adjusted to position by the screw J. The bracket K that is secured to the top of the cross slide carries the forked block L, in which the forming roller M is located. The generating cam N is bolted to the cast iron beam O; that is in turn supported in position on the two brackets P and P, extending out from the headstock and the tailstock. This method provides additional rigidity to the machine construction. Accurate adjustment of the cam position is obtained by means of the two screws, Q and Q¹. A small block S is placed in the bar O so that lateral adjustment of the cam plate can be made with the screw R. The roller is kept in contact with the cam by the screw T. Facility is provided at the back of the machine saddle for keeping the cross slide in the desired position.

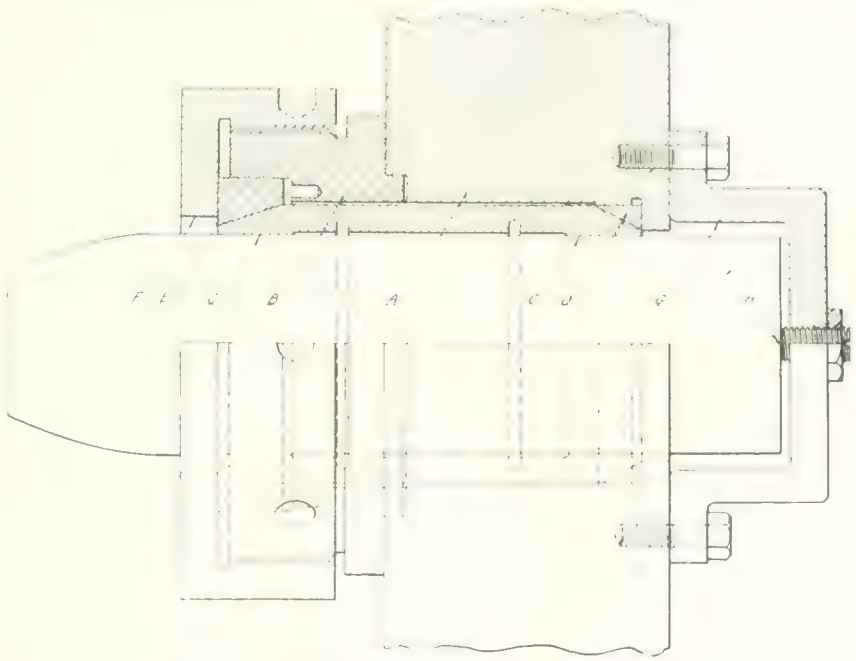


FIG. 14 CHUCKING DEVICE ON THE NEW BRITAIN.

### Grinding the Outer Diameters

Twelve Ford Smith grinders are installed for the grinding of the parallel portion of the body above the copper band, and also the bourrelet. The final mean dimensions at this point is 2.925 in. for the main portion and 2.96 in. on the bourrelet, the tolerance being respectively .01 in. and .02 in. A view of some of these machines is illustrated in Fig.

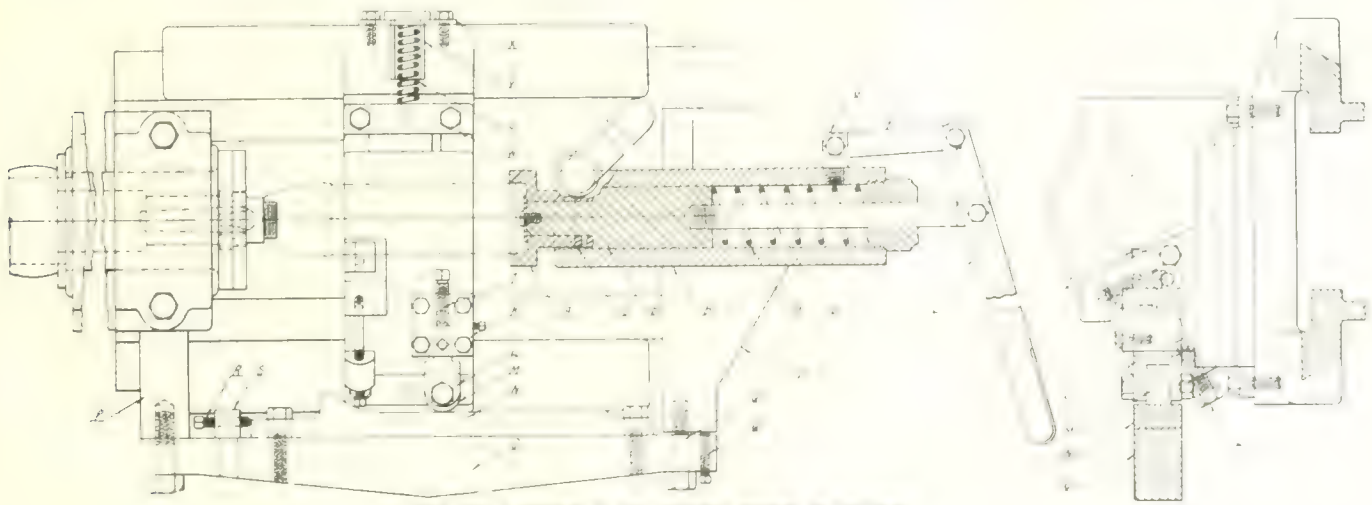


FIG. 15 ASSEMBLY OF FINISH TURN MACHINE

[illegible] Duplex screw pulls another of the [illegible] for carrying the shells to the base grinding machines. A bench is located between each machine for the purpose of removing the shells and preparing them for the grinding operation. Nose plugs are used for driving the shells and, like the nose turning, the base is supported in a ball-bearing chuck. All departments are well lighted in the day-time, and at night are lighted by high-powdered drop nitro-tungsten lamps. Floor space is utilized entirely for production purposes, and as far as possible the motors are located on the ceiling, as well as pumps and other shop accessories.

Grinding the base diameter is performed in eight Ford Smith machines, the dimensions after grinding being 2.925 in. The output from the body grinding machines is approximately 35 per hour, while the capacity of each of the base grinding machines is about 50 per hour.

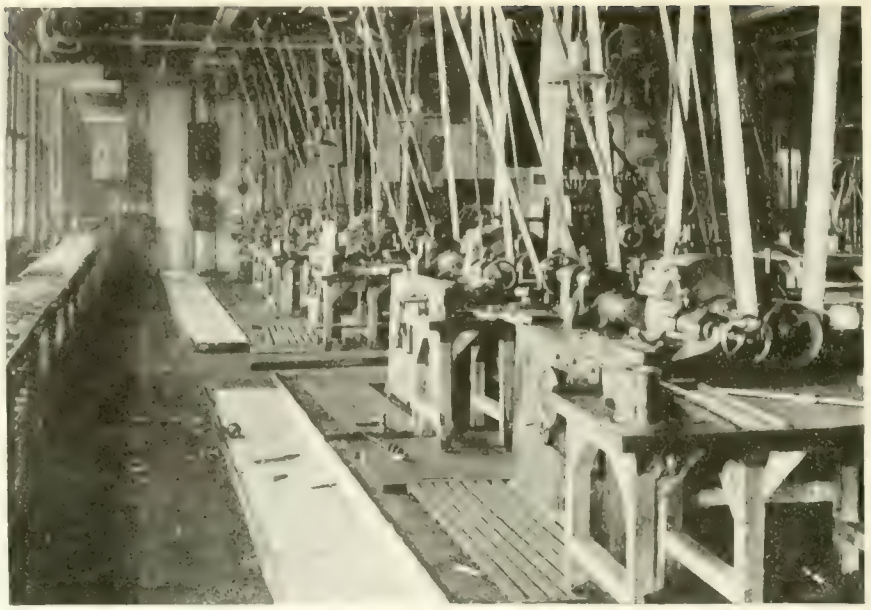


FIG. 16 GRINDING BODIES OF 75 MM. SHELLS ON FORD SMITH GRINDERS. HORIZONTAL CONVEYOR ON EXTREME LEFT.

### Groove, Knurl and Chamfer

After being ground on the diameter, the base is buffed to insure that there are no defects in the metal. For the grooving and knurling operation five Lymburner and seven Stetcher machines are used. The method of machining on these machines differs slightly, although the results obtained are practically identical.

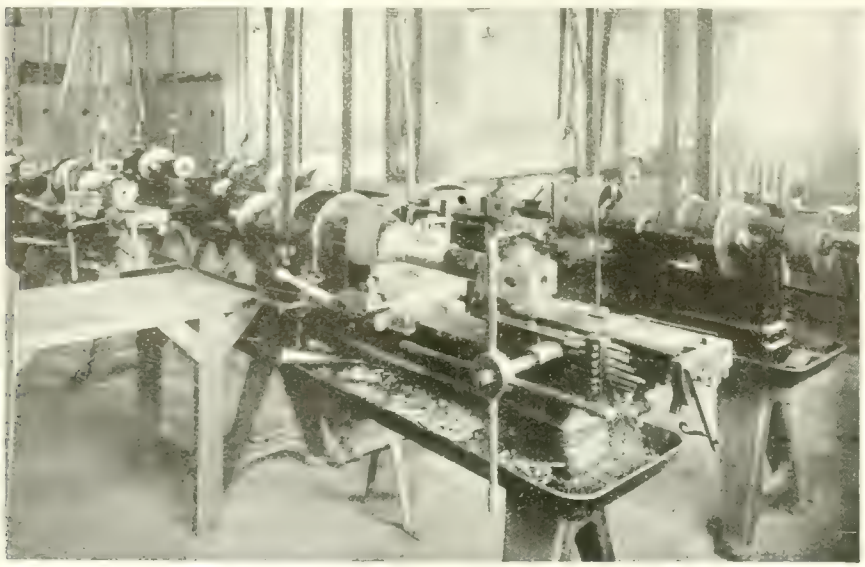


FIG. 17 FOUR STETCHER MACHINES ON THE GROOVING AND KNURLING OPERATION

Four of the Stetcher machines are illustrated in Fig. 17. On these machines the tool holders are located on the cross slide of the machine, the grooving performed at the rear and the knurling by the tool at the front that is forced under the shell. Both operations are accomplished by the movement of the handle shown at the front of the cross slide. The grooving tool is of the milled type and is located in a vertical position, a special clamping arrangement being provided for taking care of the regrinding of the tool.

The attachment adopted for use on the Lymburner machines is illustrated in Fig. 18. The design of this appliance is very interesting and likewise effective. On the front of the headstock two studs, A and B, are fitted; the left-hand one carries the piece C that supports the grooving tool D, which is clamped in position by means of the cap screw E, the vertical adjustment being obtained by the long screw F passing through the lug G on the piece C. The gauging roller H that governs the depth of cut is supported in the small bracket I and adjusted to position by means of the screw J. The back lever K carries the knurling roll L. Lower down in the headstock is secured the stud M on which are two eccentrics, these being keyed to hand levers for operating the respective tools, the eccentrics being connected to the two arms C and K by the adjustable links N and O. On the Stetcher machines the shells are held by the base end in pneumatic chucks, the nose end being supported in special ball-bearing chucks. On the Lymburner machines the shells are held by the body in air-operated chucks.

At the extreme base and also at the back of the groove the edges are chamfered slightly, as shown on the operation sheet. Three machines are used on this operation, and each has a capacity of about 150 per hour.

### Grooving the Base

The machines used for this operation are of Lymburner type fitted with special chuck for holding the shells. In these chucks the shells are placed in from the side, the chuck being composed of two arms extending out from the face plate of the machine. Integral with the two protruding arms is a ring that runs in a steady head. When the shells are inserted they are forced forward by the action of an air-operated ram, the cylin-

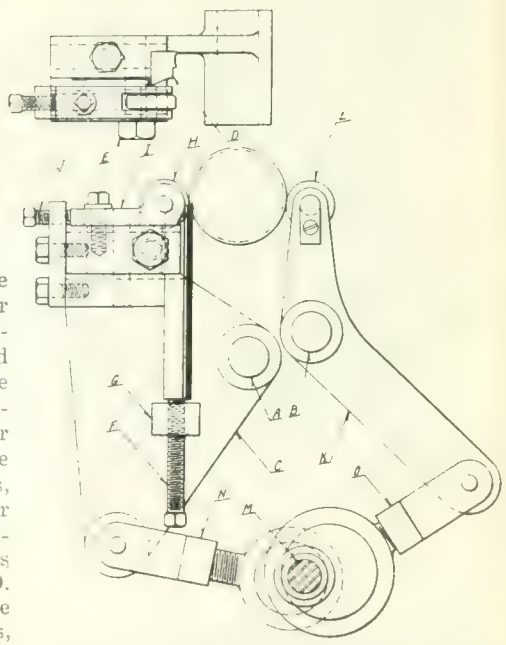


FIG. 18 GROOVING AND KNURLING ATTACHMENT.

der being located at the rear of the machine spindle. The grooving of the base is accomplished by a special attachment, the tools being operated by hand levers. A small V-shaped groove is first put in and then the outer edge is undercut by an angle tool. Six machines are used on this operation, each with a capacity of 65 per hour.

The machining of the shells has now practically been completed, so that after washing the shells in an oakite solution they are ready for the second government inspection. From the washing process the shells are elevated to the floor above for the final operations. As the shells come from the elevating conveyer they receive a light shop inspection, and are then run down a slight incline to the second government inspection table, where they are subjected to a close ex-

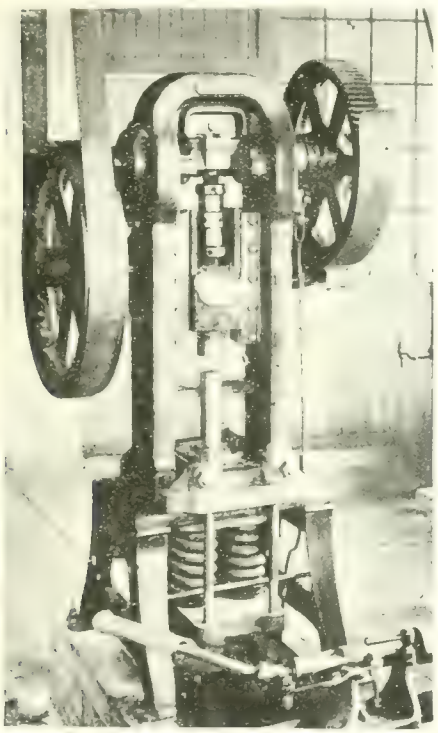


FIG. 18. APPLYING BASE-PLATE ON BROWN BOGGS PRESS

amination for visible defects and also for the gauging of the body and groove dimensions.

The band operations are very similar to those on other shells and require little mention, the machines installed being capable of finishing approximately 8,000 shells in the 24 hours. After milling the groove in the nose, the interior of the shell is sand blasted.

A feature that differs considerably from the practice used on other shells is the method that is used in protecting the shell charge from the propelling gases. The plate that is used in this type of shell is made of sheet steel, and is placed in position by the action of excessive pressure, followed by the rolling of the surrounding metal over the edge of the plate. A view of one of these machines is illustrated in Fig. 19. These presses are Brown Boggs No. 320 straight side type, and are fitted with special dies for pressing the plate into the recess prepared for it. Owing to the slight variation that is possible in the length of the shell it has been necessary to provide means to overcome this. Below the bed of the press is constructed a cushion arrangement that requires about 30 tons to compress the four heavy coil springs. Two presses are supplied to take care of this operation, and each has a capacity of about 200 shells per hour.

A small speed lathe has been adapted to perform the rolling process. The revolving head is fitted with a head that carries three small rollers that roll the metal about the plate when the shell is held in position and pressure exerted from the tailstock. After hand-sizing, the shells are varnished on the interior by means of the spraying process, following which they are taken to the final Government inspection room.

(Concluded)

## ORE, PIG IRON AND STEEL STATISTICS FOR 1917

THE total shipments of iron ores from Canadian mines during 1917 were 192,210 gross tons, valued at $758,261 as compared with shipments of 245,730 tons valued at $715,107 in 1916. The 1917 shipments included 176,890 tons from mines in Ontario and 15,310 tons from mines in Quebec, and of the latter amount a considerable tonnage was from old stock piles. The ores comprised 176,450 tons of hematite and roasted hematite and siderite, 11,300 tons of magnetite and 4,440 tons of titaniferous ores. The principal operating properties were the Helen and Magpie mines of the Algoma Steel Corporation, all of the ores mined being first roasted before shipment. Mine operators reported 151,080 tons of ore exported to the United States and 41,120 tons shipped to Canadian furnaces. The Customs Department shows exports of iron ores 146,450 tons, valued at $660,673 and imports amounting to 2,010,490 tons valued at $5,124,889. The total quantity of iron ore charged to blast furnaces in 1917 was 1,943,430 tons, of which 82,210 was of domestic origin and 1,861,220 tons imported. The imported ore included 780,600 tons of Newfoundland ore and 1,080,610 tons of Lake ore. Shipments of iron ore from Wabana mines, Newfoundland, in 1917 by the two Canadian companies operating there were 788,820 gross tons, as against 903,760 tons in 1916, all of which went to Sydney and North Sydney in Cape Breton.

### Pig Iron

The production of pig iron in blast furnaces during 1917 was supplemented by a small production of high-grade low-phosphorus pig-iron in electric furnaces made from shell turnings and other steel scrap. The total production from both sources (not including the output of spiegeleisen, or other ferroalloys) was approximately 1,171,789 net tons (1,046,240 gross), final returns not yet having been received from all manufacturers of electric pig iron. Of the total 1,156,789 tons were produced in blast furnaces and the remainder in electric furnaces. In 1916 the production, all made in blast furnaces, was 1,169,257 net tons (1,043,979 gross tons). The small increase in pig iron production in 1917 was therefore due entirely to the electric furnace production, there having been an actual falling off in the blast furnace output. The production in Nova Scotia in 1917 was 472,147 tons as against 470,055 tons in 1916. In Ontario the production by blast furnaces in 1917 was 691,632 tons as against 699,202 tons in 1916. By grades the 1917 production included: Basic, 14,092 tons; Bessemer, 961,656 tons; foundry and malleable, etc., 181,041 tons; electric furnace pig (subject to revision), 15,000 tons. The total 1916 production included: Basic, 953,627 tons; Bessemer, 31,388 tons; foundry and malleable, etc., 184,242 tons. The blast furnace plants operated were the same as in the previous year, viz.: The Dominion Iron & Steel Co., Sydney, N.S.; the Nova Scotia Steel & Coal Co., at North Sydney, N.S.; the Standard Iron Co., Deseronto, Ont.; the Steel Company of Canada, Hamilton, Ont.; the Canadian Furnace Co., Port Colborne, Ont., and the Algoma Steel Corporation, Sault Ste. Marie, Ont. Pig iron was made in electric furnaces by the Canada Cement Co., Ltd., Montreal, Que.; Frazer, Brace & Co., Shawinigan Falls, Que.; British Forgings, Ltd., Toronto, Ont.; Electric Foundries, Ltd., Orillia, Ont.; and Turnbull Electro Metals, Ltd., St. Catharines, Ont. The total production in electric furnaces of pig iron, ferroalloys and steel ingots and castings was in 1917 about 99,000 net tons.

### Steel

The estimated production of steel ingots and direct steel castings in 1917, final returns for all operations not yet having been received, was 1,736,514 net tons (1,550,459 gross tons), of which 1,690,170 tons was ingots and 46,344 tons direct steel castings. The total production in 1916 was 1,428,249 tons, compared with which the 1917 production shows an increase of 308,265 tons, or 21.6 per cent. The total production of electric steel was probably not less than 50,000 tons as against 19,639 tons in 1916 and 5,625 tons in 1915. The exports of steel ingots or billets, ingots and blooms during the nine months ending December (such exports not being separately classified previous to April, 1917) were 41,558 tons, valued at $1,831,917. The record imports of iron and steel ingots and billets during the year was 20,429 tons, valued at $1,378,576. This item is also much lower than the United States trade record, which shows exports to Canada during eleven months ending December, 1917, of 143,209 gross tons (160,394 net tons) of billets, ingots and blooms of steel valued at $11,418,033.

A WHITE metal, which takes a brilliant polish and holds it on exposure to the atmosphere, is claimed to be possessed by an alloy of bismuth, mercury, tin, zinc and copper, recently patented.

BELT clamps having spring balances between the top two pair of clamps should be used for weighing the tension of the belt accurately, each time it is tightened. —Belts.

# PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

## GUARDING PLANER FEED GEARS

By D. H. M.

PLANER feed gears have never been regarded as especially dangerous. Inspectors have passed them by as being too small for their attention but nevertheless a man can get a bad pinch in them, if nothing more. A great many planers have both feed rods carried out at the side, as is the one in the photo, and on the squared ends the hand feed and the power feed unit is used at will. The power feed unit is slipped on either rod according as the cross feed, or the vertical feed is wanted. The sector gear in the back drives the feed on either rod. It is customary for the planer hand to feed by hand up to the point where he has a correct setting and then he "clicks" in the power feed by tipping the latch at the outer side of the unit. In doing this, he is very apt to be bending over the work with his right hand back of him on the feed parts. He clicks on the feed while in this position, depending on his sense of feeling and his familiarity with the planer to guide him aright.

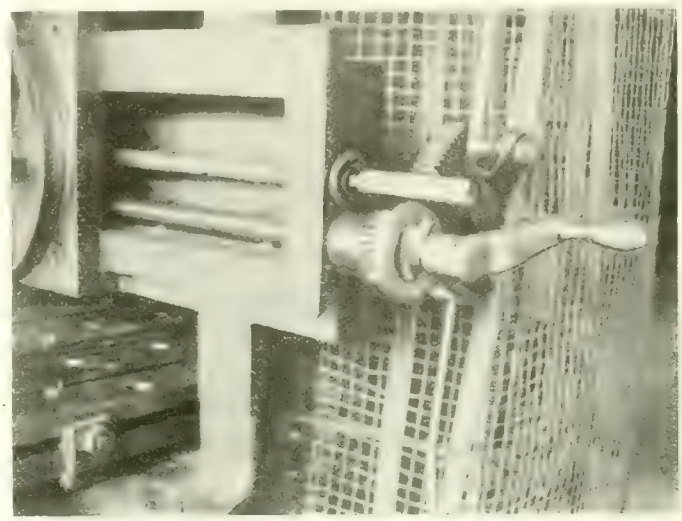
It is at this stage that some sort of a guide is a safeguard against getting pinched. The flange shown in the photo is an effectual guard for these gears. It is shrunk on the shoulder of the the unit and is as large as the clearance will allow. With it, it is impossible to get caught in the gears except by deliberate attempt, for it covers the meshing region and is large enough to keep the fingers away from danger no matter in what direction they may come in contact with the flange. And the latter is an integral part of the mechanism, no matter which feed is being used.

The consistency (?) of the factory laws in regard to guards is shown by the same photo. The driving belts were ordered entirely enclosed as shown, but the inspectors passed the gears as "all right." The belt guards would have been just as safe if they had enclosed only the pulleys, but no, they must be six feet from the floor; at which height they formed a fulcrum for the belts when they broke—as all planer belts do at times—and several men were badly scared when belts slapped them over the head. Without the guards, the belt simply dropped to the floor. It was necessary to carry the "guards" to the ceiling before the machines in that department could be really called safe.

## LITTLE KNOWN FACTS ABOUT GRINDING

By Howard W. Dunbar

WITH variable work speeds we are enabled to secure a wider range of wheel service than variable wheel revolutions could ever possibly give. We secure very satisfactory and nearly uniform results from wheels varying from 2,000 to 5,500 s. f. p. m. and a variation from true grade within practical wheel making limits. Therefore, the necessity for variable revolutions for the wheel, or very close accurate limits of speed and grade of the wheel, are unnecessary.



GUARDING PLANER FEED GEARS.

### Variable Work Speeds

Occasionally it becomes necessary, for obvious reasons, to provide a change in the wheel revolution, so that when a large wheel is worn down to a relatively small one we can bring the surface speed of the wheel back more nearly to the maximum limit; but the latest light on this subject leads us to believe that the most efficient wheel for standard cylindrical grinding is one in which the hole is of such a size that its surface speed will be approximately 4,000 feet when it is worn out, representing the low limit, and 6,000 feet when the wheel is new or full size, representing the high limit.

The normal speed is then selected so that the average life of the wheel gives the highest possible efficiency.

We are many times asked why we do not provide grinding machines with means for variable wheel spindle speed. The answer is very plain—the wide range of work speeds supplied accomplishes all that variable spindle speeds could ever accomplish and much more in a simpler way at less expense. The means necessary to provide a graduated change of speed for the wheel spindle must of necessity be more complicated and expensive than means to provide for change of speed in the work drive mechanism. Again, a given range of work speeds produces a wider range of effect than a much greater range of wheel spindle speed could possibly give. To illustrate: To obtain the same range of effect at variable wheel spindle speed as we obtain with work revolution, utilizing from 20 to 138 revolutions per minute, we would require a change in spindle speed from 169 revolutions per minute to 1,233 revolutions per minute, or a surface speed from 6,400 feet, the highest speed that is considered safe, to 890 surface feet per minute, this latter being so slow that the wheel would wear away rapidly and be useless if the grade was soft enough to be effective at 6,400 feet per minute.

### Maintain Uniform Conditions

When we have adjusted the work speed to obtain the best results great care should be exercised to maintain a constant revolution of the wheel with no slippage of belts, or momentary slowing up, due to lack of power. With irregular speed minute particles of material being ground adhere to the wheel face, which causes the wheel to cut less freely, with the result that the production is delayed and more power is required. It is not an uncommon thing to see a wheel under heavy cuts slacken in speed sometimes to one-half the normal, and frequently very nearly stop. The disadvantage of this is not clearly understood. Machines should not continue in operation with insufficient and irregular power. The quality and production of work suffers because constant power is not provided, if soft enough wheels are not used for the power available.

It seems wisest and most convenient to maintain the wheel spindle speed constant and make all variations to suit conditions by the adjustment of work speeds, which is much more convenient and effective.

We do not advocate variable revolutions for the wheel; we prefer to use variable speed for the work.—*Grits and Grinds.*

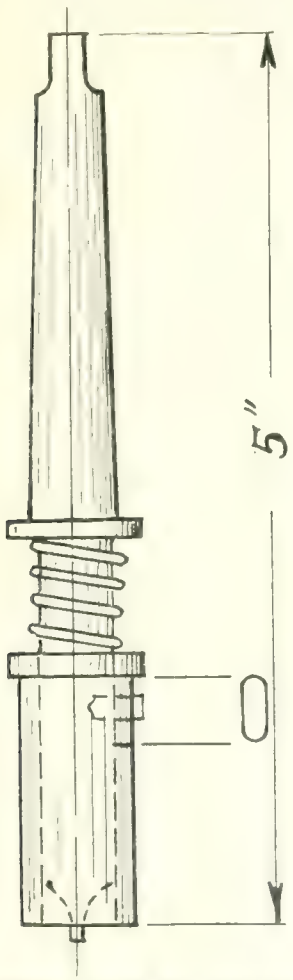
## AIR OPERATED SCREW-DRIVER

By G. M. Dick

IN the shipping of munitions, most of the covers are fastened on the boxes by means of wood screws. The operation of driving in the screw occupies quite a large percentage of the time taken to

pack a box, and also quite a little strength if done by hand.

A screw driver operated by compressed air has been used for some time past in a munition factory and has




SCREW DRIVER BIT FOR USE WITH AIR DRILL.

given good results. The accompanying drawing gives the details of this device which is used with the ordinary compressed air drill. A bushing on the stem acts as a guide on the head of the screw.

## AN OIL FILTER

By John Port

SO many oil filters have been described that I hesitate to describe another. The one here shown has proved very satisfactory in operation and has many advantages over a number of home-made filters in operation to-day.

The tanks made from galvanized iron can be obtained from any tinsmith for a few dollars and the taps and pipes can be installed by any operating engineer. The filter can be made any size according to the size of the plant. So far as cleaning dynamo or engine oil is concerned the filter will work like a charm just as shown.

If it is desired to filter lard oil, cylinder oil or any other heavy oil it will be necessary to instal a steam pipe in the compartment B, below the waste, to keep the oil thinned.

One feature should be noted in the design of this filter, all pipe-work in the various sections should preferably be of the same size and ½ in. galvanized iron pipe has been found satisfactory in this respect.

The oil to be filtered is put into tank A, passes to the bottom of tank B, up through the waste and into tank C, and from there through the water to tank D, where it passes out of the tap E.

There is a coupling and a large iron washer at H; this holds up the perforated iron screen. Tank A acts as a cover for B and lifts out, taking the screen pipe and waste from B when cleaning is required. By removing the locknut at K the pipe can be removed and the tank C lifted out for cleaning tank D.

When cleaning out the tanks any oil therein should be saved and refiltered.

It is quite safe to use oil filtered with this machine as very little dirt will get past tanks A and B. These two last-named tanks will require cleaning more frequently than C and D.

This filter will do as good work as many manufactured at four times its cost.

## THE USE OF FUEL UNDER BOILERS

By Mark Meredith.

A MATTER of the utmost current interest to those responsible for the efficient conduct of power plants is that of boiler fuel, which is probably the heaviest item of expenditure in the cost of production. Assuming that ordinary bituminous coal is the fuel used for this purpose, the various causes of waste incidental to its use, the methods that must be adopted, and the essential conditions to be maintained in order to burn efficiently the various solid and volatile constituents of raw bituminous coal are too well known to require comment.

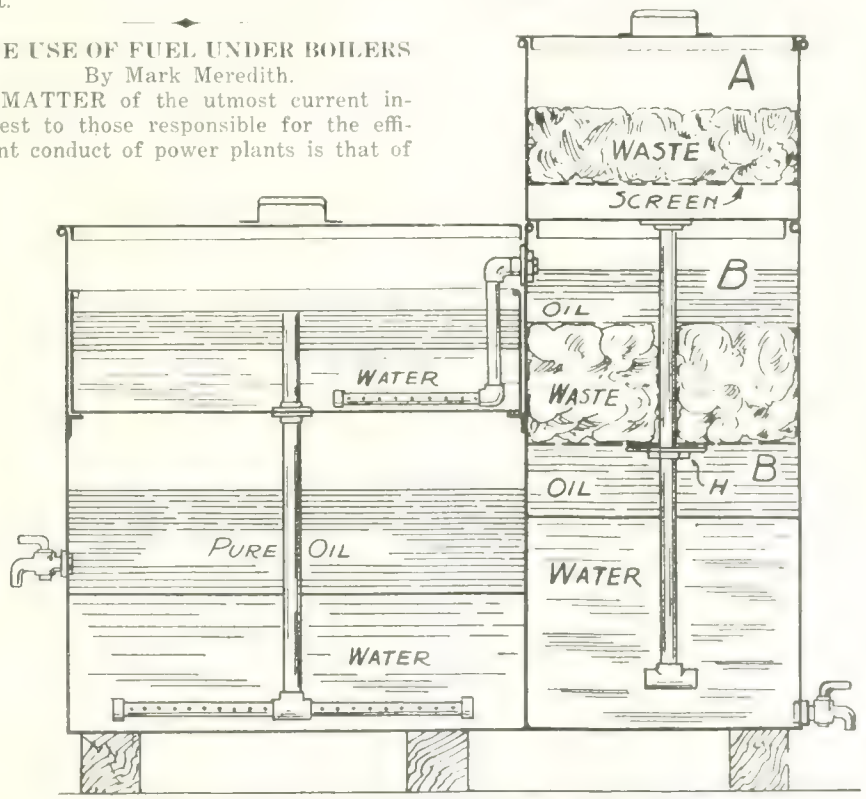
Compliance with these conditions in practice is not easy. The stoker usually has other important duties to perform in addition to firing the boiler, and to supply him with a fuel which has been shown to require expert attention and constantly varying amounts of air for its efficient combustion is simply to invite unnecessary waste. In order to avoid risk of prosecution for causing black smoke the stoker will leave the furnace door partly open after firing fresh coal, and, while attending to other duties, the open door is forgotten. Very considerable waste is often thus caused by the continuous inrush of cold air to the furnace.

Some further explanation as to why it should be necessary to maintain the conditions indicated in order to obtain, without undue emission of smoke, anything like the full steaming capacity of a boiler when using bituminous coal may be of interest. It is simply because this class of coal contains anything up to 30 per cent. by weight of smoke producing volatile combustible matter, the remander being chiefly fixed carbon and ash.

The volatile matter needs for its complete combustion about double the amount of air that is required for the fixed carbon, which is smokeless; and yet both volatile and fixed constituents must be burned simultaneously in the same furnace.

To so regulate the air supply to the furnace, that each constituent obtains only the necessary amount of oxygen for its combustion and no more, would, therefore, appear to be a physical impossibility, and is certainly an achievement beyond the ability of an ordinary stoker.

The obvious thing to do in order to avoid this serious source of waste is to obtain suitable fuel containing a minimum of volatile matter. This is procurable only in the form of smokeless gas coal. The best grades of Welsh smokeless coal contain as little as 5 per cent. to 10 per cent. volatile matter, and are




SECTION THROUGH FILTER SHOWING ARRANGEMENT.

for use in the Royal Navy; but to many the fancy prices charged for it must be prohibitive.

chemical composition as the best quality anthracite, but it is infinitely more easy to burn in steam boilers, and contains only from 1 per cent. to 5 per cent. volatile matter. Coke is now abundantly procurable in most British towns and cities at about half the cost of the latter fuel. Where restrictions as to smoke emission from boiler chimneys are severe gas coke is now extensively used for steam raising on hand-fired and mechanically-stoked boilers of all types; but so strong is the adherence to old customs that it is within knowledge that many steam users are still unnecessarily using inefficient bituminous coal, or the more expensive smokeless Welsh, thus unduly monopolizing railway transport, while fuel better suited to their requirements is produced practically at their doors.

Gas coke has the advantage of being a most efficient manufactured solid fuel. It requires a minimum excess of air and little or no skilled attention in order to secure practically complete combustion, while no secondary air admission over the fire is either necessary or desirable. In official tests over 10 lbs. of water have been evaporated per pound of coke in ordinary Cornish boilers. Where the boiler capacity is limited or inadequate, broken coke, about walnut size, must be used in order to obtain the maximum steam output with the best economical results. In other cases, where the natural draught is insufficient, it may be necessary to fit steam-jet blowers under the fires; these are simple, readily applied and inexpensive, and they increase both the furnace efficiency and the capacity of the boilers.

A factor of prime importance, bearing upon boiler furnace efficiency, is the item of excess air. Boiler furnace efficiency is gauged by the percentage of carbon dioxide ($CO_2$) present in the waste gases. In burning bituminous coal 16 per cent. $CO_2$ is the maximum attainable, and 8 per cent. $CO_2$ (which corresponds to 130 per cent. excess of air) is good average practice. With coke fuel, 20 per cent. $CO_2$ the highest possible, is not only obtainable, but is often approached in actual practice, 16 per cent. $CO_2$ (30 per cent. excess air) being a common result for steady periods of working.

## BALL-BEARING APPLICATION TO VERTICAL MOTOR

THE largest motor-driven pumping unit at the main sewage plant of the City of Toronto, on Morley Avenue, is equipped with a combined radial and thrust ball-bearing unit shown in section in the above illustration.

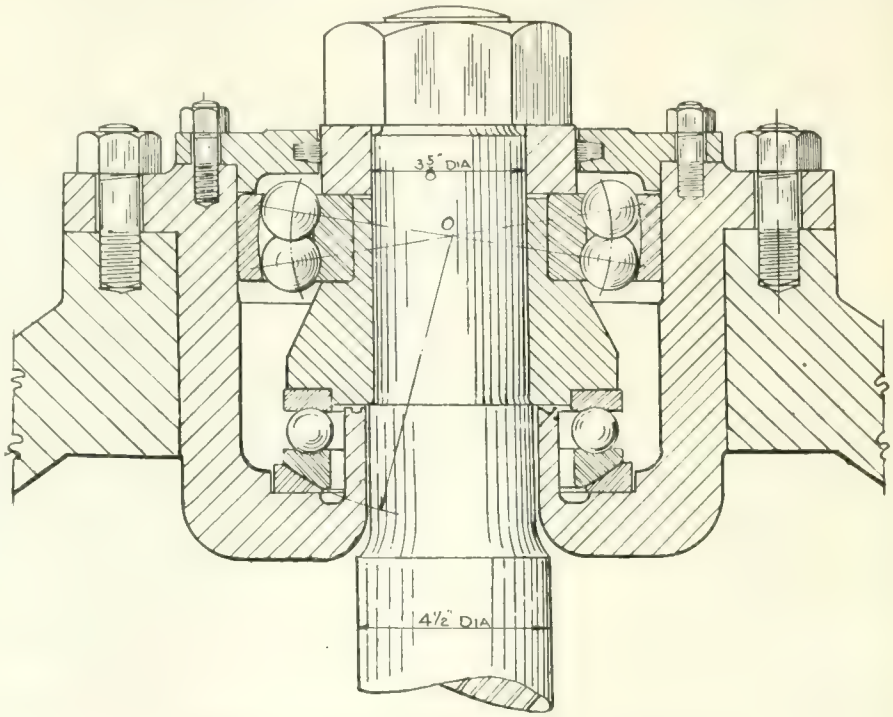
It will be seen that the shaft and bearings are self-aligning about the centre of the radial bearing at O. The complete bearing, while holding the shaft in its lateral and vertical position to fine limits, relieves the shaft and top bearings of binding strains set up by inaccurate erection.

The motor, which is of 200 h.p., has a speed of about 200 r.p.m. and a shaft of 4½ in. diameter. The thrust bearing has a vertical load capacity of 10,000 pounds at this speed, and the radial bearing a capacity of 15,000 pounds. Provision is made to protect the bearings from the intrusion of dirt, and also against the leakage of grease by the use of felt washers, thus avoiding the possibility of oil-soaked windings.

The use of ball bearings for this work has several advantages such as power saving, few bearing troubles, economy and cleanliness in operation and ease in starting.

Starting troubles form one of the greatest sources of annoyance with a vertical motor equipped with plain bearings, the film of oil separating the bearing surfaces being broken when the motor is at rest, permitting the bearing surfaces to come together. In starting, before the oil can be circulated and the oil film re-established, the metallic friction may flake or start some imperfection in the bearing. Ball bearings roll (not rub) and, not being dependent upon the immediate circulation of the lubricant, are not subject to this difficulty.

This particular application was of a special design installed by the S. K. F. Co., of Toronto.




BALL BEARING APPLICATION TO LARGE VERTICAL MOTOR

## UNITED STATES MACHINERY AND TOOL BUILDERS TO HOLD WAR CONVENTION

THE enormous problem of manufacturing and supplying machinery and tools sufficient for the carrying out of the Government program for the production of ships, shells, guns and aircraft will be the subject considered at the great "War Convention" of the machinery, tool and supply industry of the country to be held in Cleveland the week of May 13.

One thousand men who are bearing the brunt of the unprecedented demand for machinery will gather from all parts of the country to lay out a plan, with the aid of Government officials, to keep the great munition program going at top speed. The big war convention will be a joint meeting of four great national associations, the American Supply & Machinery Manufacturers' Association, the National Supply & Machinery Dealers' Association, the Southern Supply & Machinery Dealers' Association and the National Pipe & Supplies Association, which will meet together in order to co-ordinate their efforts toward one goal, "More Ships, More Shells."

"No industry has a greater responsibility at this moment than the machinery men," said H. W. Strong, president of the National Supply & Machinery Dealers' Association. "We must have men, but behind the men must be ships and munitions, and behind the ships and munitions, machinery—more machinery—still more machinery. We are in this fight to a finish. The Germans have convinced us that the only way out of the war is straight through, and the American machinery industry is ready to carry on to a knock-out."

The part played by drills in the game of war is shown by the computation that 70 drilled holes are required in every three-inch shrapnel shell, in every rifle 90, machine gun 350, torpedo 3466, war plane 4089, war truck 5946, war ambulance 1500, 3-inch field gun 1280, gun caisson 594 and anti-aircraft gun 1200.

"'Carry on' will be the watchword of the convention," said R. F. Valentine, president of the Manufacturers' Association.

INCREASING the temperature tends to increase the length of the belt and so to decrease the tension.—Belts.

# Worm Gearing: Principles of Design and Manufacture II*

By Francis J. Bostock

*For many years the manufacture of worm gears was conducted by means of empirical and more or less rule of thumb methods and as a consequence efficiencies were low and unsatisfactory. Improved methods of design and manufacture in recent years have effected such improvements that the worm gear is to-day one of the most efficient methods of power transmission. Considerable interest attaches to the description by the writer of the various machines and methods used in the production of worm gears.*

## Manufacture

IN ordinary machining one is dealing with plane or circular surfaces, but in worm gear one has to manufacture curved helical surfaces, which is, without doubt, a most difficult manufacturing operation to carry out. It will be readily understood that as an error of one-thousandth part of an inch prevents two like surfaces from touching, an error of only that amount will materially alter the contact bearing between the gears. The difficulty in eliminating that one-thousandth is enormous, especially when it is necessary to make several thousand gears absolutely interchangeable: therein all the curved surfaces have to be identical.

With your permission the author wishes to show you how such interchangeable curved surfaces are made, and in doing so he will be describing the methods and processes carried out by Messrs. David Brown & Sons (Hudd.), Limited, Huddersfield, with whom the author has pleasure in associating himself. The whole of the machines and appliances to be shown have been designed and built by the firm to enable them to produce large quantities of interchangeable work with rapidity and accuracy.

## Worm Milling

The worms are usually supplied solid with their shafts and are supported in their cases by two ball journal or plain bearings, placed on either side of the thread. In order to guarantee concentricity and uniformity of size a practice is made of grinding all worms on the outside diameters of the threads and journals before the cutting operation.

The worm-milling machine, illustrated in Fig. 7, consists essentially of three main castings—the bed, head and horizontal table. The bed is T-shaped, and provides ample bearing surface for the sliding table and head. This well-proportioned head slides at right angles to the work, is extremely rigid, and after being fed to the correct depth, measured by a micrometer, the worm is caused to travel spirally in front of the cutter, thus milling a thread space for each longitudinal travel of the table. The cutter spindle is carried in a swivelling cover, which enables it to be set at any angle to suit the spiral of the worm to be cut. A very special feature of this construction is the manner in which objectionable overhang, so common in other machines, has been overcome. This eliminates vibration during cutting.

The table is of unique design, being supported in an exceptionally long V-slide forming part of the bed, so arranged that all stresses and thrusts due to cutting are properly taken care of, and that it can smoothly traverse the bed, even under the heaviest of loads. It carries on the right-hand extremity a patent collet chuck and dividing head, whilst a self-centering roller steady can slide along its surface.

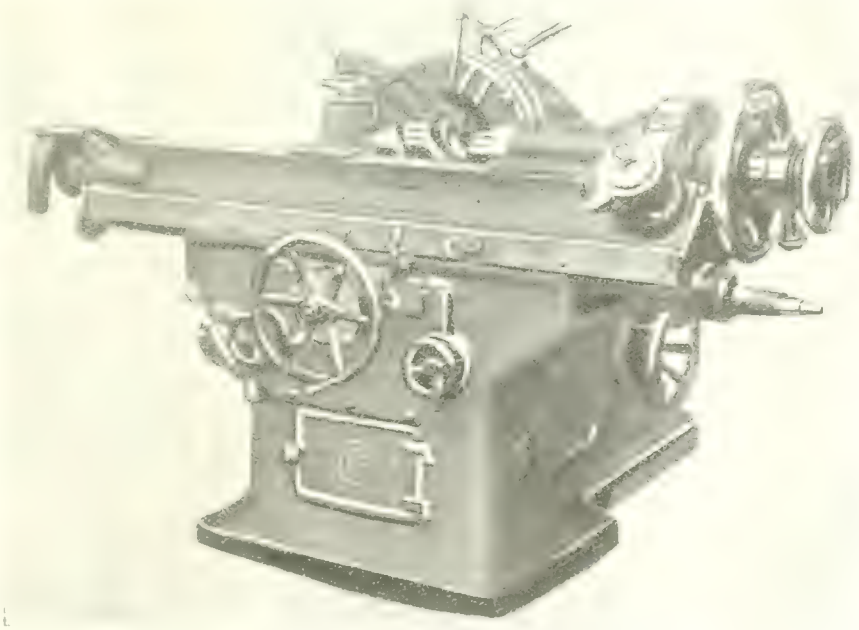


FIG. 7. WORM MILLING MACHINE.

The main drive is from a single pulley, which is provided with an internal friction clutch operated by a lever situated in front of the machine. After passing through a four-speed gear-box the drive separates, in one case passing through mitres to the cutter head and in the other case through a feed gear-box, automatic trip gear, and change gears to the lead screw; at the same time, by passing to the dividing worm and wheel, slowly rotating the work past the cutter at the requisite lead. As the drive is designed to pass through an index plate to the dividing worm, it renders it a simple matter to index the worm to the required number of threads.

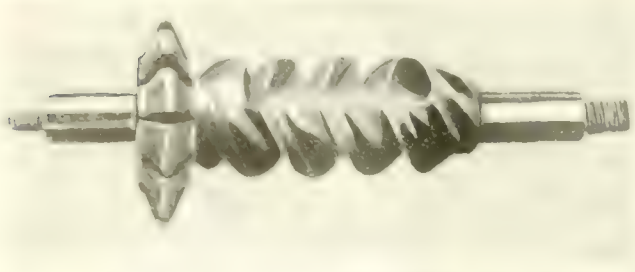
The worm is carried in the special collet chuck, which is made from hardened and ground high-tensile steel. The operating mechanism consists of an outer sleeve, which is conical at one end to receive the collets, the other end being screwed to suit a hand wheel and slotted to accommodate two toggle levers. An inner sleeve engages at one end with the collets, and is at the other end adjustable in its length by means of a screwed sleeve and a smaller hand wheel. This hand-wheel sleeve, which gives preliminary adjustment, is fitted with a hardened steel washer, against which the toggles bear, so that when the large hand wheel is screwed along its sleeve it causes the toggles to press against the washer, thence to the work, so gripping it with an immense increase in leverage. The operation of tightening or releasing the work requires but a few moments. The work being truly gripped at one end, is supported at the other end by means of a sliding adjustable self-centring roller steady, which enables it to be firmly held, at the same time giving entire freedom of rotation.

## Cutter Form Generation

The rotary worm cutter at first sight appears to be quite a straightforward matter, with its contour made to correspond with the space of the worm thread. Such, however, is far from being the case, as its actual contour is quite different from the thread space which it cuts in the worm blank, as can be readily observed in Fig. 8. This apparent paradox is caused by the interfer-

*A paper read before the Manchester (England) Association of Engineers. Part I. appeared April 11.

worm threads, and will be readily under-



SECTIONAL VIEW OF WORM TEETH SHOWING FORM CAUSED BY INTERFERENCE OF CUTTER TEETH WITH SIDES OF WORM THREAD.

thread space it would likewise have to be made spiral in shape, which would be an absurdity, for it would no longer revolve. As a rotary cutter must be made circular in shape, and as a circle and a spiral cannot coincide, it is obvious that the contour of the circular cutter cannot coincide with the thread space of the spiral worm.

It will be remembered that the base of the worm thread system is a straight line. In the system of cutter generation a straight-edged tool is set to an angle corresponding to the pressure angle of the worm to be cut, and is then made to traverse in a spiral path coresponding exactly with the spiral of the worm. Thus a generating tool is mounted in a worm-milling machine in the same position and manner as the worm which has to be cut, its straight edge accurately representing one side of the worm thread. When it has generated one side of a white metal blank it is indexed to the other side, thus forming the contour of the required cutter.

### Worm Inspection

The usual method of gauging gear teeth is by means of gear-tooth calipers, which, whilst being satisfactory for ordinary measuring purposes, are too slow and not sufficiently accurate for quantity production. All measuring devices should be quick in action and show a magnification of the error, thus enabling the smallest discrepancy to be made easily apparent. Instead of the gear-tooth calipers a bench instrument, like the one shown in Fig. 9, is used; two suitable bars are placed under the worm and a third is placed on the top, the worm is then rolled under a clock indicator, a reading of two-thousandths of an inch indicating an error of less than one half-thousandth in tooth thickness.

For testing the accuracy of the pressure angle a knife-edge protractor is placed along the side of the thread and the angle read to plus or minus a few minutes. This is carried out in a worm-gear testing machine, illustrated in Fig. 10, which has been designed to enable the various testing operations to be performed on both worms and wheels. These can be tested separately as individual pieces, or in combination when mounted together at the specified centre distance. The bed consists of two slides at right angles, one carrying a pair of adjustable centres and the various testing appliances, whilst the other slide carries an adjustable arbor adapter, which is controlled by a micrometer screw, enabling it to be set at any required distance from the other slide, so giving correct centres for the worm and wheel under test. This machine is most conveniently operated, as it can be worked from either side, thus allowing the operator to be in the most advantageous position to carry out all the necessary tests. Other instruments are used on it for testing concentricity and lead.

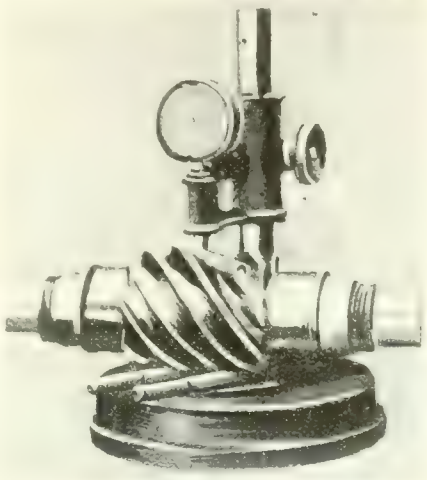


FIG. 9. METHOD OF GAUGING PITCH DIAMETER OF WORM.

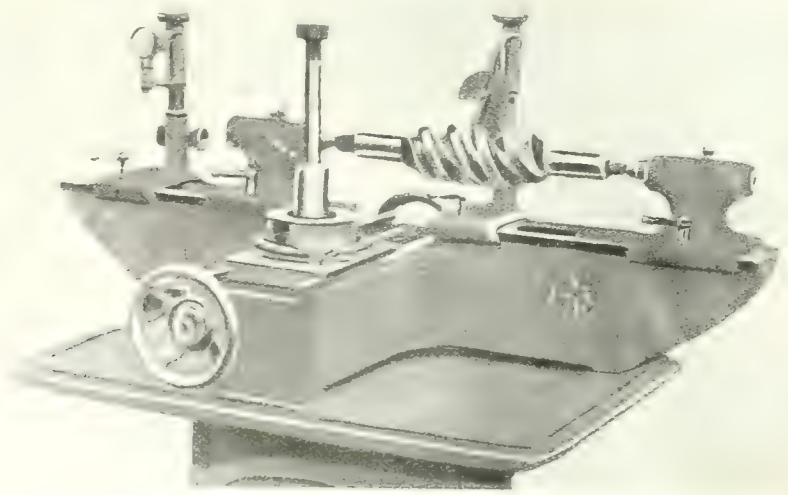


FIG. 10. MACHINE FOR TESTING ACCURACY OF PRESSURE ANGLE BY MEANS OF KNIFE-EDGE PROTRACTOR, GIVING RESULTS TO PLUS OR MINUS A FEW MINUTES.

The process of case-hardening worms is exactly the same as for other work, but although every precaution be taken, some little distortion is bound to occur. They therefore require straightening so that their pitch diameter runs true; for this purpose a clock indicator on a testing machine is used in conjunction with the straightening press, and by means of a ball placed in the space this operation can be accurately and quickly performed.

(To be continued.)

## STANDARDS AND STANDARDS

IN a series of "Special Articles," the *Board of Trade Journal*, under its new management, is giving its readers useful summaries of the reports of Departmental Committees. In the issue for February 7th the report on Standardization is dealt with. We are told that "the principle of standardization is approved by the committees, and their reports show that effective standardization cannot be achieved without the closest cooperation amongst manufacturers." No other finding was to be expected; standardization is the catch-word of the day. It used to be "specialization," which is a better thing, for it provides for that very flexibility which standardization has, inevitably, a tendency to destroy. A firm may specialize in a particular kind of machine tools and yet introduce frequent developments and improvements; if it standardizes a particular pattern it will hesitate to make changes. The fact is that standardization is a rather misused word; it is employed too indiscriminately. You may set up a standard for length, or weight, or time, and so on, but if you do, you employ it only as a reference; or you may establish standard sizes for plates and wires, screw threads, taper-pins, rolled sections, and so on, because there is sufficient variety to allow of great modification in the grouping together of such standard parts. A designer may select from standard rolled sections one that will always come sufficiently near to his calculated proportions to meet reasonable practical requirements, or he may find in the lists of screws some size that fits his needs. We may put it in another way. Molecules are the standard details of the chemist.

He may group them together and make, for example, certain dyes. If he was told that he must always assemble them in a few specified forms, the world would have few aniline colors. It is because he is continually trying new groupings of his standard parts that new dyes are being continually found. Machinery is in a like case. Let us by all means standardize our molecules—our nuts and bolts, and wires and rods, our plates and rolled sections—but let us beware of too much standardization in the manufacture of ships, and tools, and locomotives and machinery in general. We know perfectly well the commercial advantages, but engineers have always fought against being mere manufacturers, and we hope they will continue so to fight. The committees censure the great railway companies because each locomotive engineer designs his own engines in his own way. They suggest that if the locomotive men would but put their heads together they could reduce the present variety to a dozen types. And so no doubt with ships and marine engines. Heaven defend us from that dull day. There will be no interest left in mechanical engineering, when standardized men, in standardized workshops, operate standardized machine tools turning out standardized products for distribution by a standardized selling agency to a standardized public. That is standardization run rampant. It may mean commercial life; it certainly means intellectual death.—*"Random Reflections" in The Engineer.*

## CONSERVE TIN

THERE is a widespread belief that the cost of genuine babbitt can be cheapened without injury to its quality by the addition of lead, and also that the quality of a lead base metal can be improved by increasing the tin content—this latter idea being based no doubt on the principle that if a little tin is good more tin is better.

Without knowledge of the effect produced in alloying certain kinds and proportions of metals, it is an easy matter to fall into grave errors in compounding babbitts. Notwithstanding that these intermediate grades of babbitts are constantly being used and recommended by various manufacturers, it is a fact that no babbitts based on such formulas have ever been popularized because they can only be used successfully under most favorable conditions or forced lubrication, and they can generally be counted on to fail under heavy pressures, high speeds and scant lubrication. They will not stand up under a crucial test chiefly because of their low fusibility which makes them highly susceptible to the influence of frictional or initial heat.

These intermediate grades of babbitts seem to be most desirable as far as outer appearances go; they will also stand the usual physical tests of hammering, cutting and bending. But when these alloys are put in service, they sooner or later give trouble which is generally attributed to some mechanical defect or to the lubrication, as users are in the dark as to any other probable cause.

Apparently there is a never-ceasing demand for such alloys because each person or concern has to go through the same troublesome experiences for themselves until they are finally forced to return to the use of either a genuine babbitt or a lead base alloy before they get relief from their babbitt troubles, and in a majority of cases they turn to some well known advertised brand as offering the best security.

As stated before, the chief trouble in using these intermediate grades of babbitts is caused by their low melting points, and the examples given further on will make clear the extent to which alloys of tin, lead and antimony are influenced by certain mixtures.

The melting point of a strictly genuine babbitt and also a strictly lead base babbitt, are both around 500° Fahr. This is about as high a melting point as can be obtained in a babbitt alloy. The melting point of a babbitt is always lower than the arithmetic mean and variations from certain rules in mixing reduces the melting point below the melting point of the most fusible metal in the alloy.

As an illustration, take a mixture of 87 per cent. lead and 13 per cent. antimony; the melting point of lead is 619° Fahr. and of antimony 834° Fahr. It would be most natural to suppose that adding antimony to lead would bring the mixture to a higher point than lead, and as the mean melting point figures 645° Fah., it would not be unreasonable to expect to obtain at least the melting point of lead, but as a matter of fact the melting point of this alloy is 477° Fahr. This is the lowest melting point of the series of lead and antimony mixtures, and forms what is termed an eutectic.

When we come to tin and lead mixtures, we have two eutectics or low melting points—one around 60 per cent. tin and 40 per cent. lead, which melts about 336° Fahr.; the other around 60 per cent. lead and 40 per cent. tin, which melts around 412° Fahr. This last mixture is known commercially as "wiping solder" and is used for that purpose by plumbers because it remains in a pasty stage in cooling throughout 70° Fahr.

The foregoing illustrations show why babbitts made along these lines are foredoomed to give trouble if there is put upon them any stress that raises the temperature, or the lubrication is lacking in either quantity or quality. The admixture of certain other metals in babbitt alloys or the presence of certain impurities also contribute towards bearing troubles.

Apparently there are only two grades of babbitt metals worth considering for bearing purposes—a genuine babbitt, the other a properly balanced lead base metal. Of these two compounds the lead base metal is in most general use on bearings that are well seated or soldered to their backings. There seems to be ample evidence that lead base metals wear longer, run cooler, absorb less power and are less dependent upon lubrication than a genuine babbitt; they also stand up well under heavy pressures and high speeds and appear not to be affected injuriously by grit and dust, and contrary to the general belief, a genuine babbitt will not withstand heavier pressures than will a lead base metal. The chief virtue of a genuine babbitt is its malleability, which enables it to withstand distortion under shock from pounding on loose shell bushings. Babbitt users who are prejudiced in favor of genuine babbitt or the intermediate grades, can undoubtedly use a high grade lead base metal on a majority of their bearings with both benefit and economy and at the same time help conserve the tin supply, which is most important at this time.

## PNEUMATIC HAMMERS AND HEALTH

IN accordance with its plan of eliminating as far as possible preventable diseases among workers in various industries, the United States Public Health Service of the Treasury Department has begun an investigation of the effect on the health of workers of pneumatic hammers as used in cutting limestone.

It has been learned that inconvenience is felt by workers in this industry in using the air hammers in soft stone because of a temporary numbness of the fingers whenever the hand becomes chilled. No serious consequences resulted from this disorder but it appeared well to find the reason of the condition and to see if it could not be remedied.

### Two Causes Discovered

The most important cause was found to be the higher vibration rate of the hammers when used in soft stone, and the second cause the tight and strained grasp which the workers had to use. Cold weather brought out the symptoms, but was not in itself a cause of the condition.

By using a shank of larger diameter, which would permit a more comfortable grasp by the worker, it is believed that a good deal of the strain on the muscles would be relieved. If the shank were enlarged by using a tight-fitting covering of asbestos or some similar substance, the cold would not be intensified as at present by the metal, and the handle would act as a shock absorber.

THE following average weights per brake horse-power for various classes of engines were given in a paper by Mr. P. N. Everett, recently read at Newcastle-on-Tyne:—Triple expansion steam engine for cargo boat (no boilers or auxiliaries), 130; triple expansion, including boilers and auxiliaries, 450; Diesel engine for cargo boat (no auxiliaries), 250; Diesel engine with all auxiliaries, 400; turbines, for cross-channel boat, with boilers and auxiliaries, 200; Diesel engines for submarines, 50; steam reciprocating engines for destroyers, 35; turbines for destroyers, with boilers, etc., 30; petrol engines for motor cars, 15; petrol engines for racing boats, 7½; aero engines, 2½.

# PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

## SPINDLE IGNITION TUBE MULTIPLE DRILLING MACHINE

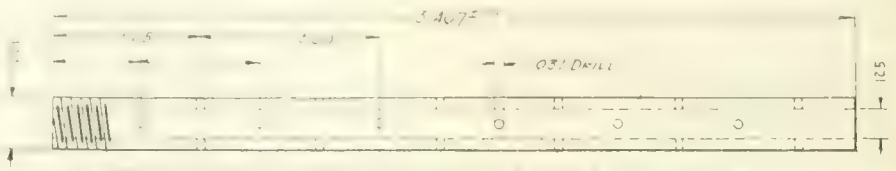
THE machine illustrated by Figs. 1 and 2 was designed specially for drilling in one operation the twenty-four .031 holes in the wall of the primer ignition tube shown in the accompanying line drawing. The machine is hand and foot operated and the drilling is done by two six-spindle multiple drill heads located 90° apart on the upper half of a vertical face plate. The spindles in one head are offset to a position midway between those in the other head.

Each head drills diametrically through both walls of the tube. The drills are held in small taper threaded collets in

12 SPINDLE MULTIPLE DRILLING MACHINE.

the chuck end of drilling spindles, and the drilling heads provided with full ball bearings are driven by an endless woven canvas belt at the back of the machine. A screw belt tightener is used to obtain the proper driving belt tension.

The feed for the drilling heads is operated by a long hand lever mounted on a sleeve pinion which meshes through an intermediate gear to a ring gear located concentrically in the vertical face plate to which the drilling heads are attached. The ring gear is mounted on ball bearing so as to make the feel of hand lever as sensitive as possible. The ring gear is connected to the drill head feed sleeve by means of double pinions, the pinion for feed sleeve having friction clutches so that it is possible to locate each head individually to its proper drilling position, also to facilitate the

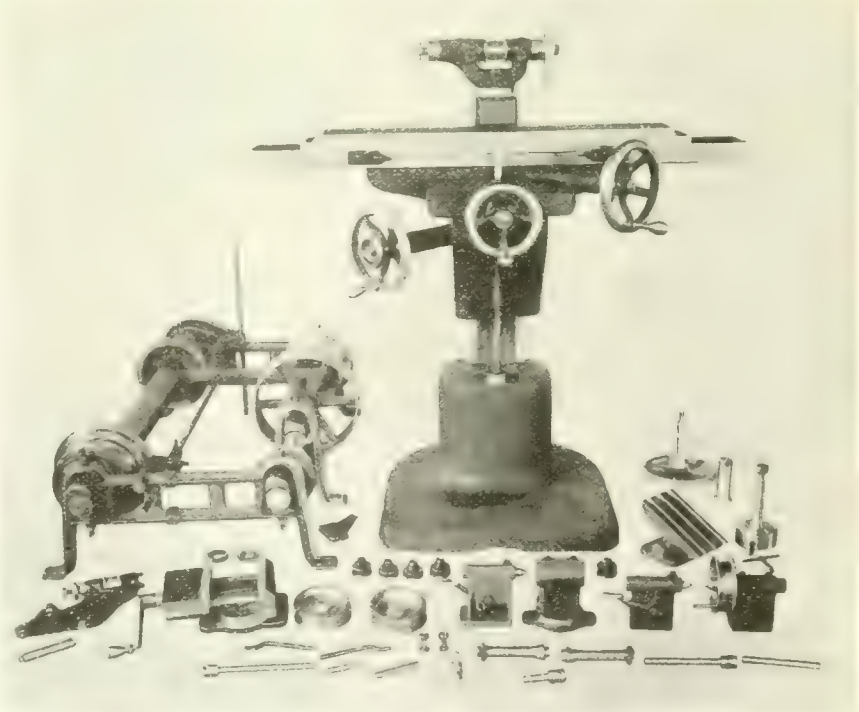



SAMPLE OF WORK DONE BY MULTIPLE SPINDLE DRILLING MACHINE.

putting in and taking out of drills. The feed lever has a spring return.

The drilling spindles run at 4,800 r.p.m. Special means are provided for insuring generous lubrication to all high moving parts. An unskilled operator can drill seven tubes per minute. A cutting fluid similar to Cut-rite is used and is supplied by a rotary pump. The tube to be drilled is held and located in its drilling position by means of self-opening and closing jig. The jig is mounted upon a slide, the friction of the slide being to carry the tube from the loading position to the drilling position and vice versa. The slide is operated by a foot lever, the depressing of which moves the slide to the loading or out position and also automatically opens the jig and releases the tube. When the drilled tube is taken out and a blank one put in, the foot lever is released. The releasing of the foot lever first causes the jig to close and then moving it to the drilling position at the intersection of drilling heads. The tube is held at the ends by means of 45° cups. The jig has drill guide bushings and an open top which permits the quick loading and unloading of the jig, also a free access of the cutting fluid to the drills.

A thumb-spring lever is used automatically for lifting the front end of tube out of the jig so that the operator can easily take hold of it. The machine is driven by a 3 h.p. Westinghouse electric motor mounted in the base of machine. A ball-bearing belt, tightening pulley is used for motor belt. This machine is manufactured by the Langelier Mfg. Co., Arlington, Cranston, R.I.



UNIVERSAL GRINDER WITH STANDARD EQUIPMENT.

## UNIVERSAL GRINDER

THE Universal grinder illustrated herewith and manufactured by the Manhattan Machine and Tool Works, Grand Rapids, Mich., has been developed as a result of the increasing demand for

rapid and accurate output occasioned by the present war.

The swivel head swings centrally with the drive pulley, and is mounted on a 4-inch neck. This neck projects 4½ ins. into the column at the joint, resulting in a very stiff construction and one that keeps the head from rising. A graduated dial is provided, and ample oil chambers take care of the lubrication. An eight inch wheel can be used to the very bottom.

The table has a longitudinal travel of 22 in., a vertical travel of 2 in., and a transverse travel of 8 in., which is quite ample for all ordinary requirements. One end of the table is graduated in degrees and the other end in taper per foot.

Two sets of head and tail stocks are provided, one for chucking work and one for long work.

The three-point bearing on the internal attachment provides a non-vibrating construction which is of considerable advantage on precise work. With this attachment it is possible to use wheels from 4 inches down.

The swivel vise-jaws are 1¼ in. by 5 ins., and open 5 ins. This vise is flat and very convenient in use.

The long ways upon which the saddle is mounted makes a very rigid construction. The saddle is operated by a conveniently located hand wheel and screw convenient to the operator's left hand.

## A NEW TOTE BOX RACK

The rack shown in the accompanying illustration is manufactured by the New Britain Machine Co., New Britain, Conn., and accommodates the tote boxes manufactured by the same firm.

Although especially valuable for stock and assembling room use, the time and space-saving capacity of this rack is such as to recommend its much more extended employment in many factories. While simple in design and comparatively light in weight, its construction is such as to afford ample stiffness to withstand any load that may be placed in it.

The front uprights are flat steel; those at the rear angles. Angle runners upon which the boxes slide are electrically welded to each pair of uprights. These welded members are connected by cross ties at the front, the back being closed in and stiffened by sheets bolted to the angle upright.

TOTE BOX RACK SHOWING RUGGED CONSTRUCTION

standard units, as illustrated. They may, however, be expanded horizontally to any extent and upon special order will be built to accommodate a greater number of boxes in each tier. Units are frequently placed back to back with a common sheet metal division between. Particular attention is drawn to the safety feature illustrated. When a box is hauled out, if forward end is permitted to sag slightly, the raised rear end will come in contact with front cross tie, permitting loading or unloading in this exposed position without danger of box sliding out.

Shipment may be made either assembled or knocked down. Erecting is a simple and rapid operation. The method of procedure recommended is to bolt the back sheets to the uprights, one at a time, beginning with the left end, as you face the front of the rack. This done, the cross ties are next inserted and bolted to the uprights, working also from the left end toward the right. Lastly, the top is put in place.

## ERRATUM

IN the issue of April 11, and on page 388, the name of the manufacturers of the 25-in. double back-geared lathe there described was unfortunately omitted. The Sidney Tool Co., Sidney, Ohio, are the manufacturers of this product.

## FRENCH WOMEN AND NIGHT WORK

THE need for intensifying the production of war munitions and material has, since the beginning of the war, led in France to a relaxation of the laws and regulations concerning the maximum duration of the working day, concerning the labor of women and children, and concerning night work. Especially as regards night work for women, frequent exemptions from the law have been granted. But serious social disadvantages soon became apparent, according to a United States Consular report from Paris, as the result of these exemptions and the public authorities began restricting their number.

### Night Work Gradually Reduced

A circular dated June 29, 1916, prescribed certain limits for the employment of women at night. Then gradually employers themselves undertook to restrict further the night employment of female labor, with the result that an investigation begun by the Ministry of Labor on May 31, 1917, shows that female labor at night has been reduced to almost insignificant proportions. The investigation embraced 787 private industrial establishments employing at night 58,784 women, or 36 per cent. of the total number of women working in these establishments. Of the above number 519 were under 16 years of age and 1,576 were between 16 and 18 years of age. The average duration of night work was 10 hours.

### Improved Regulations Made

It is reported that improvements have been made everywhere in the conditions and circumstances affecting the night work of the women. Husband and wife are employed at the same hours, so that they may take their meals together, there are eight-hour shifts, so that night work is required of each shift only one week in three; women are intrusted with the lighter kinds of work; the rest periods have been made more numerous; female workers living in the same quarter of the town are grouped together in the factory.

### Other Improvements Soon to Be Effected

In the belief that in the interest of the family further modifications might be made in the same direction without jeopardizing the requirements of the national defence, the committee in charge of female labor conditions gave expression to a certain number of desiderata which will soon be carried into effect. It is urged that no girls under 18 years of age be employed at night, and that night work for women in no case be permitted to last longer than 10 hours. It is also urged that night work for females of all ages shall be suppressed whenever the conditions affecting the supply of raw materials, of motive power, and of labor are such as to make it possible to obtain the same output by means of day labor alone; that when the output of a factory is decreased night work be curtailed first of all for women.

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## MAN-POWER DEMANDS AND THE SUPPLY

THE claims of essential and useful industries will not be of much avail in retarding the progress of the new order-in-council which has been rendered necessary through the sluggish operation of the cumbersome Military Service Act.

The evidence offered at exemption applications during the past winter was sufficient to convince the most sanguine that neither the cause nor its helpers would receive a square deal.

Events move steadily and unrelentingly and however slow they may seem in their individual occurrence, their ultimate results are daily becoming more evident with a certainty which none can gainsay.

Certainly there will be few employers who can say they suffer unjustifiable loss through being deprived of individuals up to twenty-three years of age. The specialized nature of munitions production consists chiefly in the object for which the articles are being made.

The real munition makers are the designers of the jigs and fixtures, special machines and tooling outfits. Such work requires an experience such as few men of twenty-three or under are likely to have. Their work has been chiefly that of pulling down high piece-work wages made possible by the knowledge and skill of these older men, many of whom are drawing less money.

That many of these younger men have had no previous experience except on farms, etc., has not altogether endeared them to the great body of general machinists. They have been after the job from purely mercenary motives while many older, conscientious skilled mechanics who have joined various branches of the service were more justified in hanging onto their good jobs. The young profiteer has had his day.

## STEEL DEMAND WILL CONTINUE BRISK

THE question of steel supply is of such ever-increasing gravity that too much importance cannot be attached to the recent agreement arrived at between the Canadian Government and the Dominion Iron & Steel Co. for the erection by the latter of a plate mill.

When the proposal was first put forward some months ago we expressed the opinion that present benefits might be offset later by having to meet renewed competition from the States.

Events continue to show, however, that present benefits are so absolutely essential that future conditions can very well be left to themselves. The immense war program of the United States is gradually assuming definite shape and one of its features is the constantly increasing requirements in tonnage, not only for shipbuilding and munitions, but for military construction work.

Some few weeks ago it was thought that the completion of certain projects would relieve tonnage requirements, but the opposite has been the case.

Steel shipments have risen to 60,000 tons per week of which about 60 per cent. is plates, and in discussing the question of steel supplies for the future, J. Leonard Replogle, Director of Steel Supplies, in the course of a recent controversy, stated that domestic shipyard requirements plus engagements made by United States to its Allies would make such a total as would continuously strain the capacity of the plate mills.

Prospects of a sufficiency of steel plate in Canada are thereby weakened, while the wisdom of the Government's action is accordingly strengthened. Long before the time plates are flooding the market, the new mill will have justified itself, not only as a war measure but as an economic feature of Canadian industry.

## SHOULD CANADA HAVE HER OWN CLASSIFICATION SOCIETY?

THE certainty of a great merchant marine being possessed by the United States in the near future and, presumably permanently afterward, has already given rise to an agitation in favor of an American classification society so that the insurance business resulting from marine activity may be handled by native companies.

A special committee on merchant marine of the Boston Chamber of Commerce recently addressed a report to the Senators and Representatives in Congress, in which they stated that one essential of complete success in American shipbuilding and navigation was a thoroughly American inspection, survey and classification service capable of performing for the United States a work which Lloyd's has long rendered for the British Empire.

In voicing a demand for attention from the officials of the United States Shipping Board, Winthrop L. Marvin states that "under the law creating it, the Shipping Board will hold its huge merchant fleet only temporarily, as a trustee for the American people, with the avowed purpose of transferring it to citizen owners to be operated by private enterprise as soon as possible after this present war has ended. And the Shipping Board is under obligation to arrange for the inspection and insurance of these hundreds of American ships in such a way that after the war they can remain under the American flag as carriers of peaceful commerce.

"Such a prospect is not very bright if their classification remains under the control of that nation which will be their chief competitor."

In view of the instances of discrimination cited by Mr. Marvin, the parallel of Canada's shipping situation is immediately suggested. Discussion is however limited by the ultimate intention of the Canadian Government as to whether it will operate the new fleet on a permanent basis.

Such a circumstance might possibly result in it carrying part of its own insurance so as to offset any effort of Lloyd's in favor of British owned vessels, but the discouraging effect on private ownership of such a policy will doubtless be given full consideration at the proper time.

The advent of a Canadian merchant marine under government auspices should carry with it the germ of a future Canadian Bureau of Shipping, which, by placing some of the burdens and handicaps of the past on the shoulders of the country as a whole, would do much to insure the continued benefit of our new fleet in the hands of private owners, should the Government's present action be limited to a certain after war period.

REGULATIONS have now been approved by order-in-council whereby the registration of the man and woman-power of Canada will be effected. Every person over sixteen years of age will be affected and provision is made to add those who afterward attain the age of sixteen or are discharged from active service.

# FOUND THAT EDITOR WORKED IT SAME WAY

**Arthur F. Boyer Submitted One of His Problems to CANADIAN MACHINERY for Solution**

ARTHUR F. BOYER, foreman machinist for the T. McAvity & Sons, Ltd., St. John, N.B., believes in making use of every source of information he can lay his hands on when he meets with a difficult or out-of-the-ordinary problem. In his work he is called upon to lay out a good deal of work for which there is no particular precedent or custom. Especially has this been so in recent years. Parts are called for that have never been thought of before. War business has called for shapes and tricks that were not known before.

ARTHUR F. BOYER

Mr. Boyer is not easily down-on any of these matters. At the same time he wants all the information he can secure.

For instance a few months ago, he was called upon to turn an oval from steel with a major axis of 7½ inches and a minor axis of four inches. He saw that there were several ways of accomplishing this, but was anxious to make certain that he had accomplished the work in the easiest way. So he put down the particulars, and forwarded a sketch to CANADIAN MACHINERY. "This paper," said Mr. Boyer, "went very fully into the whole matter, and shortly issued a diagram showing what they considered as the best way, going again into the matter at a later date. It was some satisfaction," remarked Mr. Boyer, "to see that CANADIAN MACHINERY arrived at practically the same method I had followed in turning out this work."

Mr. Boyer was born in Devonshire, England, in March of 1862, but moved to Canada with his parents when he was a mere lad. Attending the day schools at St. John, he was early apprenticed to the machinist trade. It was only natural that he should turn to the machine shop, as his father was in the firm of Byers and Boyer. He was only 14 years of age then, but kept up his studies while he served his time. Subsequently he worked with Campbell & Fowler, where he remained for four years, then going to Campbell Bros., where he remained for eleven years.

In 1889 Mr. Boyer entered the employ of the McAvity people, having been with them continuously for 29 years. He reads technical papers and trade journals of all sorts, and in them finds new material and the ideas of others who are facing the same problems that he is. "For either the trained man or the young mechanic, just starting there is no better reading matter," stated Mr. Boyer to CANADIAN MACHINERY. "They keep you closely in touch with the latest models in use, and the difficulties others are meeting with and how they are solved."

# EMERY SHIPMENT FROM GREECE GETS THROUGH

E. W. SAWYER, manager of Dominion Abrasive & Wheel Co., Ltd., Mimico, speaking to a representative of CANADIAN MACHINERY regarding the output from shops making their line of goods, remarked that they had not been able to run to capacity for some time back.

"On the outbreak of the war," said Mr. Sawyer, "the supply of emery was almost cut off. It used to come largely from Turkey and Greece. Of course we got no more from Turkey and the supply from Greece went largely into the hands of the French. Manufacturers from United States and Canada have made representations to the Allied governments with the result that one shipment of some 2,000 tons of emery from Greece has reached United States, and the Canadian firms will get a share of this, only it will not amount to much. The authorities do not want to use tonnage to ship anything that is not being used directly for war purposes. That provision should make it easier for us to get material, as fully 75 per cent. of our output goes to munitions shops and the balance to agricultural implement makers. As a matter of fact," concluded Mr. Sawyer, "we have not been running over fifty per cent. capacity for months past as we can't get the material. The makers of artificial abrasives cannot begin to turn out enough to keep the factories going at full speed. It is likely that more emery shipments will be made soon. They can't come too rapidly or too often to suit the makers of abrasive wheels."

## The Little Things Count The Most

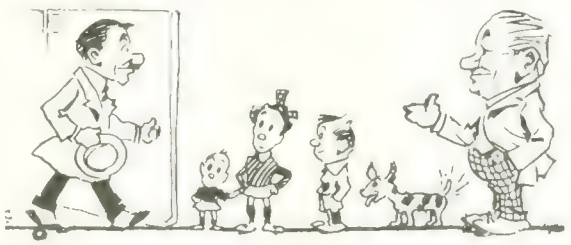
OLD JONES, he didn't have no cash to sprinkle on the turf, in fact he didn't own a thing on all this dreary earth—his son was just a wholesome chap, with little surplus cash, he grew to husky manhood on prunes and crust and hash.

His daughter likewise never dressed in hunks of silken cloth, nor did she ever get a chance to cut a sizzlin' swath.

And Jones had never made a pile or grabbed a sheaf of stocks, in fact he spent most of his time most mighty near the rocks—he didn't have no wallet fat nor yet a purse what's stout, nor would he leave a big estate to legalize about.

He moved not in the topmost heap, he was of humble mind, of quiet and simple point of view, his manner clean and kind.

But he helped to shuffle round the house and do jobs here and there; he helped to turn dark into light, and wallop out dull care. And in his kindly way he'd take old



trouble by the skin and boot him from the premises and whack him on the chin.

He paid his way right straight along, he didn't owe a cent—his way ran on in pleasant paths, he camped with sweet content.

His was a happy little home, it lived within the law, a smile was wreathed about his face, it trickled o'er his jaw—his friends they found a welcome there, they liked to drop around, they never got an earful of a harsh or raspin' sound.

So it's little things that count the most, and don't miss that, me boy—they hatch a lot of wholesome fun and rear a peck of joy—they put the roller on your grief and chase away your fears, and sprout a pile of love and mirth instead of briny tears.—ARK.

# The Demand for Munitions Still Keeping Business Brisk for Both Tools and Supplies

## Demand for Steel at the Mills is an Unending One—Jobbers Are Winding Up a Very Good Month's Business—English Agents in Canada in Hard Way to Keep Business They Book Here.

HEAVY buying of all lines in any way affected by war business keeps interest centred in that direction. More and more business in the iron and steel world in both United States and Canada is being forced into the war groove. If edges are cut off in volume, the trimming falls on the non-essential lines.

The labor situation causes a little uneasiness, not because of any impeding May-day strikes, but because there is not sufficient skilled labor for new work contemplated. The turning out of munitions keeps up a constant demand for men who can take charge of machines working to very fine dimensions, and while labor can be found to operate the machines it is a hard matter to get men to get out the tools, gauges, etc.

Smaller sizes in tubes are needed in Canada. Boilers need repairing to help out the power situation, and tubes are called for. Dealers say that the situation is not improving, nor do they see any chance for better conditions soon.

The demand for supplies for munitions plants is brisk and jobbers report inquiries for all the standard lines. One Toronto firm has 75 lathes nearing completion for a munition plant.

Canadian agents for English firms are reporting difficulties in securing the shipment of their orders, with the result that orders are cancelled and odd shape shipments are left on their hands.

# RIVER NAVIGATION WILL SOON COME TO HELP OF MONTREAL MILLS

Special to CANADIAN MACHINERY.

MONTREAL, Que., April 23, 1918.—Industrial conditions in this district have shown improvement during the past week and general manufacturing activity has been quite brisk. The movement on the various railroads is more regular in character and deliveries, both locally and from points in the States, indicate a better condition in transportation generally. The early opening of river navigation is assured owing to the recent movement of the heavy ice and the channel below Montreal is practically open. It is expected that within the next few days the buoys will all be placed in position for the season's activity. The intimation that 12-inch American shell contracts had been placed with a local firm was the result of negotiations that had been under way for some time; it appears, however, that owing to difficulties in connection with the forgings, these contracts have not materialized. Orders for the 9-inch have, however, been placed with a firm in Montreal and also with a firm in New Brunswick. The demand for machine tools has been quite active and general sales have been good. Steel requirements have been as insistent as ever with the market in domestic material almost nil. The coal situation is still acute. It is thought that little or no anthracite will be shipped from the States to points west of Winnipeg.

### Steel

Conditions throughout the steel industry in and about Montreal are little changed from that of last week, and production continues unabated in all the mills of the district. The shortage of pig iron is still pronounced, but sufficient is coming through to meet the immediate requirements of the manufacturers. Available scrap for electric steel production has been scarce during the past few weeks, but the better delivery of the past week has given relief to this situation. Activity in freight car construction is quite brisk in all car shops in this locality. The inability to get delivery of domestic steel from points in the States has almost eliminated the possibility of structural work of an ordinary character being carried on, as every facility is being provided to stimulate production for war purposes and other immediate essentials. The difficulties of obtaining sufficient ship plates for maximum operations has greatly delayed the construction of steel vessels. Three steel vessels are expected to be launched from the yard of the Canadian Vickers Company during the coming month; these are of 8,000 tons displacement. Some anxiety is being shown in industrial circles owing to the possibilities that may develop as May Day approaches. One firm in Montreal has had trouble with its machinists going out on strike, this having been in force now for about a month. No definite settlement has yet been reached and the firm is still handicapped for skilled men. Shipbuilding activity promises to show an increase this summer; negotiations are under way whereby a number of prominent men of Montreal contemplate the erection of a plant in or near Halifax. Another berth is to be added to the plant of the Canadian Vickers and it is expected to be completed about the fall of this year. Local dealers are not over-impressed with existing conditions, and although plate prices are quoted lower than they have been for several months past, the available supply is, if anything, more limited than ever. Heavy plates coming from the States are exceptionally hard to get owing to the heavy demand for these in the American shipyards.

### Metals

Little variation has been manifest in the metal situation, and with the exception of tin the market has developed no features of importance. Better delivery has resulted from the improvement in transportation conditions, and consumers are obtaining supplies with less difficulty. Copper is steady under the ruling quotation. Tin is the dominating factor of the market, the uncertainty of the permit question retaining a very strong condition. Spelter is quieter with a lower tendency. Lead is not active and has a weaker undertone. Antimony has declined on poor demand. Aluminum is steady but inactive.

Copper.—The market continues to be steady in character and sales are above normal. Little but essential requirements are allowed to come through and domestic activity has been reduced to the minimum. Brass interests are regular buyers. Nothing definite has as yet been announced as to any change contemplated in the price that will be effective during the coming three or six months, but certain factions of the trade are looking forward to a slightly higher price than that now ruling. Dealers here continue to quote 29 and 30 cents on a steady but firm market.

Tin.—The abnormal uncertainty that prevails in this market continues to retain this metal in a very strong position. The great difficulty in getting permits and the resultant uncertainty of delivery makes this market a very nervous one, and consumers are showing considerable anxiety as to their future operations, owing to their inability to obtain supplies for early future requirements. Announcements from England show the market there to be in an exceptionally strong position, with quotations £8 per ton higher than the previous week. Local dealers report a very

steady demand but are unable to give consumers any definite delivery on metal owing to the lack of knowledge pertaining to the shipment of metal from England and other sources. Local quotations show an advance over last week of 4 cents per pound, the price asked being $1 per pound.

### Machine Tools and Supplies

Considerable interest was shown in the machine tool industry a week ago over the announcement that contracts were likely to be placed for large American shells. It has developed, however, that no orders for the 12-inch will be placed at the present time and this has had the tendency to create an easier market for the heavier tools. Orders for the 9-inch and further contracts for the 4.7 and the 6-inch are assured, and manufacturers and dealers are looking forward to renewed activity. Enquiry has been good for general equipment, and dealers report very good business. Activity in small tools and general supplies is brisk, particularly in connection with requirements for munition and marine plants. Delivery on many lines is as backward as ever and it is not thought that much relief will be given to the machine tool trade by the opening of water highways.

### Scrap

The situation in old materials continues to be uneventful. Dealers report an uncertain condition with slight activity in brass scrap, which has shown a little strength. Prices in general are unchanged and the market is comparatively quiet.

## NEW PLANTS BEING BROUGHT INTO SHAPE

### Munitions Work Still Keeps Tool and Supply Centres Engaged

TORONTO.—Despite the tendency in some places to think that the munitions business has seen its best days in Canada, the demand for tools and supplies for this line of work continues to keep business brisk for the dealers and manufacturers. New equipment is under the process of finishing now for greater production of several of the lines of larger shells, a number of lathes being about ready for shipment.

The production of the 12-inch shell means new equipment for this work alone. There has been some speculation among the trade regarding the chances of plants that had done up to the 9-inch shell turning over and equipping their machines for the 12 inch contracts. This is not an easy matter, and means quite an outlay for chucks, etc. Not only so, but one of the elements entering into such a shifting just now is the supply of men sufficiently skilled to do the work. They are scarce, and that means a long wait in the process, which all wish to avoid since speed enters into the situation to a very great extent.

## POINTS IN WEEK'S MARKETING NOTES

Tubes, 2 inches and smaller, are needed for boiler repairs, but it is almost impossible to secure them.

New equipment is being turned out for the fitting up of new plants to handle shell orders.

Canadian agents of English firms report more than usual difficulty in the filling of orders.

Conditions at Pittsburg show that there are new demands for steel and there seems to be no let-up to the variety and quantity called for.

The appointment of C. M. Schwab as head of the Emergency Fleet Corporation is having a far-reaching effect in the steel mill circles.

Forging capacity of U. S. plants cannot keep up with ability of shops to machine shells.

The rate of production of pig iron, steel ingots and finished steel for the month of April is reckoned about 85 per cent. of capacity.

Machine tools, cranes and other equipment is being bought heavily for U. S. Ordnance Department.

Many of the large guns ordered in United States will be mounted on railroad trucks.

United States Government may have to recruit labor for the manufacture of heavy machine tools.

Shortage of cars to the mines is blamed for the shortage in coke production, especially in the Connellsville district.

Lake shipping is helping trade toward more speedy delivery in Toronto and lake district.

Cars of material are arriving more readily from the rolling mills than for some months past.

### Iron and Steel

Supplies of plate are arriving freely in Toronto yards, orders coming through in much better time than they have been doing for many months past. The opening of the navigation season is making it much quicker to turn this stock over to the consumer. Trade is good all through, and several local dealers stated to CANADIAN MACHINERY that the month which is just drawing to a close had been one of the most satisfactory for a long time. Although the channels in which they may do business are very much restricted the demand has increased to a very great extent along these particular lines. This is especially true of steel plate. In fact this article is well on toward representing three-quarters of the business being transacted through local dealers at the present time.

"We could dispose of a lot of tubes right now if there were any way of getting them," stated one dealer this morning. "There is a very pronounced tendency to get steam plants into shape in places where electric power has been used. This is due to the demand for power. In some cases tubes are needed for the repairing of these boilers, and it is imperative that they should be repaired, but there are no tubes in sight at the present moment. The two-inch size would move out quickly but they are hardly to be had at all."

There are no price changes this week. The market seems to be firm, with no indications of a change either up or down.

### Scrap Metals

Wrought iron pipe was marked up from $13 to $17 by Toronto buyers today. That is the only price change recorded. The advances noted in these columns last week are still holding. These advances are generally accepted as indicating that there is a movement in the lines mentioned and that the dealers are in the market to replenish their stocks at the new values. The advance in wrought iron pipe is caused by the run on No. 1 wrought and No. 1 railroad rod. Bar iron mills are busy and calling for this line of material. The yards of dealers in scrap metals are not by any means overstocked, and there is still a call for scrap metals owing to the scarcity of pig iron, relief for which does not seem to be immediately in sight.

### Old Country Trade

Toronto representatives of English firms dealing in high-speed lines are having their own troubles at the present moment and not a few losses are falling to them as a result. Canadians are not giving what may be termed as import orders just now, nor have they been doing so for some time past. Here is the experience of one Toronto dealer who has a good connection. "Some thirteen weeks ago I placed an order for a Canadian firm with my people in Sheffield. The goods are on the way, we know that, but farther than that we do not know. The Canadian buyer tells me if delivery is not made in a week or so more he will have to cancel his order. This same thing has happened before. What happens? The stock passes back on my hands. It is not the line or style that a man will stock because the shapes are out of the ordinary and for special work. I will have to sell them as best I can or keep them indefinitely. Canadian customers will not place import orders for standard lines, but want to pursue a hand-to-mouth policy, with the agency taking the chances." Stocks of

[illegible] steel are depleted in all centres.

**Tools and Supplies**

Business is up to the good standard that has been maintained during the past [illegible]. Deliveries are more prompt, but trade still follows the abnormal war industries, and a large amount of new equipment is being brought near completion for this purpose. One might imagine that there is enough machine capacity on the floors of the existing plants now to take care of all the war business that is offering, but this is not the case. It has been found in many cases that when a plant turned from the machining of one size to a larger size shell that the equipment would not handle the work, even after the making of the necessary changes. Very few of the munition plants were equipped with the idea of carrying any overload, and all this has meant business for the machine tool interests.

The demand for chucks of the larger sizes is brisk. Drills, etc., are also in good demand. Prices are firm, the lists showing no changes at all over the quotations of the last few days.

**Non-Ferrous Metals**

There have been no incidents worthy of mention in the local market or trading for these lines. Copper is still listed around $28. Tin nears the $100 mark. Supplies are very small, and the market price hardly gives a correct idea of the money that can be secured by a seller who is really in a position to deliver the article. Demand continues satisfactory in all lines with the prices at former levels.

## LOOKING TO CANADA FOR OUTPUT OF CARS

**And U. S. Board Will Work With Dominion Regarding Labor Measures**

Special to CANADIAN MACHINERY.

WASHINGTON, April 23.—A great step forward in the shipping programme of United States was taken this week when Charles Schwab, head of the Bethlehem Steel Corporation, was made director-general of the Shipping Board.

It is generally conceded that Schwab is one of the greatest industrial leaders of United States, and if he can not push the shipping programme through to a rapid completion nothing can be done which will speed up the programme.

Edward N. Hurley and Charles Piez will continue to hold their positions with the Shipping Board, but from now on Schwab will be the highest authority. The first step taken by the new director-general was to insure an adequate steel supply for ships. For several weeks there has been a controversy between the Shipping Board and the Railroad Administration concerning priority of steel. Railroad Administration officials desired steel for cars and the Shipping Board has been anxious to secure steel for ships. A final agreement has been reached giving the Shipping Board priority over steel for everything but warships. The Railroad Administration has been forced to reduce its programme, which called for 1,250,000 tons of steel plates for locomotives and cars. With a large programme for freight cars on its hands the Railroad Administration is now confronted with a lack of steel to carry out this programme. Officials are extremely anxious to secure the cars, declaring that they will be absolutely necessary to maintain traffic and to insure the nation against further traffic congestion. It has been suggested that the programme may be carried out with wooden cars substituted for steel cars.

**Looking to Canada**

Again officials of the Railroad Administration are turning their eyes to the Canadian market, and if they find it possible it is probable that they will open negotiations within a short time with the Canadian Government in effort to secure permission to place some contracts for steel cars with Canadian manufacturers. If they find this impossible they will attempt to secure a loan of steel plates from the Canadian Government.

**Moves the Offices**

Another step taken by Schwab, which is expected to increase the efficiency of the Shipping Board, is the removal of a large part of the staff to Philadelphia. This city has been the headquarters since the inception of the Shipping Board, but Philadelphia is the logical centre of the shipbuilding industry on the Atlantic coast. Schwab will direct operations from Philadelphia in the future and headquarters will be maintained in Washington only for the purpose of carrying on the legal and business end of the work. The administrative work will be directed from Philadelphia.

An agreement has also been reached between the Shipping Board and the Railroad Administration for special cars to bring needed lumber to the Atlantic Coast from the Pacific Coast. By May 1 eighteen additional wooden ships are to be launched, which will make a total tonnage of 63,000 tons in wooden ships completed thus far. Additional contracts for 20,000 tons of wooden shipping have been let.

**Wants More Power**

Chairman Hurley, of the Shipping Board, has this week written to members of Congress asking for wider powers. He declares that under existing conditions it is impossible for the United States to effectively commandeer ships in foreign or neutral ports. It is understood here that this measure is aimed partially at a small number of ships which have been plying from Canadian ports, and have thus been able to escape Government requisitioning.

**Helping the Canadian**

In order that Canadian industries may not be hampered by the export license law the War Trade Board has this week, after conference with members of the Canadian War Mission, issued a list of articles which may be exported to Canada without securing special export licenses. The list includes all sorts of brass, copper, nickel, aluminum and a long list of chemicals used in the industries.

Closely following the appointment of Schwab as director-general of the Shipping Board there has come a well-founded rumor that Henry Ford has been asked by President Wilson to accept a similar position with relation to aircraft. In view of the pressing need for speed in the aircraft programme the Aircraft Board is at the present time casting about for further factories, which may be able to add to the capacity for manufacture. It is suggested that some Canadian factories may be asked to manufacture parts, in exchange for which the United States may be able to reciprocate by manufacturing other commodities for the Canadian Government or by releasing a larger quantity of steel.

**Working With Canada**

The National War Labor Board met for the first time this week. Within a

## MIDDLE WEST OF CANADA ON VERGE OF ERA OF DEVELOPMENT AND GROWTH

Wm. Garlock, of the Garlock-Walker Machinery Co., Toronto, says the middle west of Canada is in better shape than it has been for some time past. He has just returned from a trip to the Pacific coast, having called at Fort William, Port Arthur, Winnipeg, Saskatoon, Prince Albert, Regina, Calgary, Edmonton, Vancouver, as well as several western U. S. points.

"The cities at the head of the lakes are busy in ship and car building. The Winnipeg labor market seems fairly balanced, but with some out-of-works. The lumber country of the north, around Prince Albert," continued Mr. Garlock, "is busy. They have cut a lot of timber there during the winter and there's a good year ahead. I was surprised at the great attention that is being paid now to the prevention of fire in the timber limits, and the regulations that have to be complied with in the matter of clearing up the land after taking off the timber. People have put off building so long that they can't put it off any longer, and they have the money to see it through now."

Regarding the ship-building industry at the coast, Mr. Garlock was not too certain about the stability of the impetus that this industry had given to business. Conditions, of course, are much better than they have been for some years. Much was also heard there of the project to open a steel plant at the coast.

"But give the middle west a good crop this year," concluded Mr. Garlock, "and it will come into its own in a way that will surprise the rest of the Dominion."

short time the members of the board will meet with Canadian labor officials, and attempt to settle upon a labor policy which will work in harmony with that of the Canadian Government, in order that there may be no shifting of labor across the border, a situation which has caused not a little trouble in the industrial cities bordering upon the Great Lakes.

C. A. Greathouse and Arthur E. Holden have been appointed representatives of the United States to study industrial occupational work in Canada for partially disabled soldiers.

## VERY HEAVY ORDERS PLACED IN U.S.

### Ordnance Department Work Keeps Production of Tools at Top Notch

Special to CANADIAN MACHINERY.

NEW YORK, April 23.—Ordnance makers, shipbuilders, railroads and manufacturers of aircraft, motors, tanks, as well as the United States Government, have been in the market during the last week for machine tools, cranes and other machinery. No large single orders were placed, but in the aggregate buying was considerable.

Among the very large prospective contracts is one for the equipment of the mammoth machine shop which will be built at the projected Government arsenal, which it is expected to be built in the Pittsburg district. Since last September when the U. S. Government began negotiations with the United States Steel Corporation for the building of a large gun forging plant at Gary, Ind., the Ordnance Department of the army also entered into the preliminary negotiations with the corporation for a large supply of steel to be furnished to a Government arsenal which would exceed in size any other Government plant in the country. The corporation has agreed to furnish the steel either by building an open hearth plant in the vicinity of the arsenal or by bringing the steel from a nearby plant already in operation. The machinery for the shop to be built at the arsenal will require the expenditure of several million dollars and as the tools will be of a very heavy type the orders will have to be placed in the near future to insure their installation by the time the plant is ready, which means some time in 1919.

#### Large Gun Orders

The speeding of the Government program for the manufacture of all munitions of war is expected to bring large orders for guns into the market in the next two weeks. Many of the cannon ordered will be mounted on railroad trucks but it will require from ten to twelve months even to obtain the large tools required for such work. Both the guns and the shells to be fired from them will run from eight to sixteen inches.

Government work is being delayed because manufacturers of heavy tools, notably gun-boring and gun-turning lathes, have been unable to fulfil contracts because of the shortage of labor. At Detroit 20,000 to 30,000 skilled workmen are needed, and Government assistance is being asked. Important work for both the War and Navy Departments is being held up because of the lack of machinery. Many men have been lost through the army drafts and it is believed that the Government may find it necessary to recruit labor for manufacturers of heavy tools.

#### Capacity Cramped

The Wright-Martin Aircraft Corporation, New Brunswick, New Jersey, has been buying tools against recent inquiries and options covering 500 machines that are required to execute a Government contract for Hispano-Suiza aviation motors. The corporation expects to increase capacity by either leasing an established factory or by building a new plant at Philadelphia, Atlantic City or Poughkeepsie, N.Y.

Among the shipbuilders the New York Shipbuilding Corporation at Camden, N.J., is buying punching machines and the Atlantic Corporation has bought some tools for its yard at Portsmouth, New Hampshire. The American International Shipbuilding Corporation has purchased cranes at Bedford, Ohio, for the Hog Island yard and the Tennessee Co. has purchased 15 cranes at Pittsburg for the Chickasaw Shipbuilding Co. at Mobile, Ala.

The Pennsylvania lines east and west of Pittsburg and the Louisville and Nashville have been buying shop equipment and the Chicago, Burlington & Quincy has a large list of tools pending.

The Du Pont Engineering Co., Wilmington, Del., is buying additional equipment for the Government powder plant at Nashville, Tennessee, as the War Department has ordered the plant capacity doubled. The Quartermaster's Department has been buying machine tools in Philadelphia for the Aberdeen Proving Ground. Some large foreign orders are pending.

## ABOUT READY TO LAUNCH "CONCRETIA"

### Initial Trials Will Soon Be Given to the New Type of Vessel

Special to CANADIAN MACHINERY.

MONTREAL, April 23.—During the winter months the Atlas Construction Company has been busily engaged in puting the finishing touches to the concrete boat "Concretia." Mr. Jarvis, the secretary of the company, stated that in the course of a few weeks or probably earlier, the boat would be ready for her initial trials. Every hope is entertained that these will be successful.

#### Enlarge Capacity

Canadian Vickers Limited are preparing plans for another shipbuilding berth to facilitate greater production of steel vessels. The new addition will be constructed to accommodate ships up to 10,000 tons displacement and will be erected adjoining the present buildings. It is expected that the new berth will be completed by the fall of this year.

#### Building Three

During the past winter good progress has been made on the steel vessels under construction by the Canadian Vickers Limited, and three vessels of about 8,000 tons each are nearing completion; one of these boats is for the Norwegian Government, while the other two are on the old contract of the Imperial Munitions Board. It is anticipated that all of these will be launched before the end of May. Some delay has been experienced during recent months owing to the difficulty of obtaining plates in sufficient quantities for maximum operations.

## THERE IS NO END TO THE CALL FOR STEEL

### New Demands Quickly Cropping Up Keep the Pittsburgh Mills Very Busy

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., April 23.—As reflected in previous reports, the steel trade has hitherto been disposed to feel that the authorities at Washington had a tendency to exaggerate the danger of a shortage of steel for war purposes, the steel trade feeling that all war requirements would not total more than 50 per cent. of the output. The steel producers did not, of course, contend that there would be a plentiful supply of steel for all purposes, their attitude being that the remaining 50 per cent. could hardly supply the non-war or ordinary commercial demand. There were those in the trade, not producers, who held other views as to this, and felt that if 50 per cent. of the production were left for all commercial purposes dissociated from the war, it would probably constitute a fairly comfortable if not an actually excessive supply.

There has lately been a change of view on the part of the steel producers as to Government requirements. The requirements are appraised at a greater tonnage than formerly. There are two new factors in the general problem of trying to determine how the supply of steel is going to fit in future months. First, while it was formerly thought that many of the early war requirements in steel would disappear, not to be replaced by others, it is now seen that new requirements are constantly appearing. The early orders, of course, involved much steel that would be used in construction work, and it was argued that when this construction was accomplished, that class of war steel demand would disappear. Actual developments, however, have been that when these cases of construction work are taken care of the military authorities find other projects, and thus there seems to be no end.

Second, the shipbuilding work promises to take more steel, regularly, than was recently supposed. When, a few weeks ago, the shipbuilding interests called for more steel, the steel producers' analysis of the situation was that they were calling for steel at a greater weekly rate than they could possibly use, and all that would be necessary would be

the fabricating shops and the shipyards stocked up, whereupon the authorities would themselves be quite content to have the rate of shipment reduced. It has developed in the past week, indeed, that about three weeks ago there was an actual controversy on this subject. J. Leonard Replogle, Director of Steel Supplies, took the side of the steel producers to the extent of showing what was to him the obviously large quantity of steel that had been shipped from the mills for account of shipbuilding, shipments having risen to about 60,000 tons a week, of which about 60 per cent. was plates, but he very positively took the side of the shipbuilding interest when it came to a matter of steel supplies for the future, insisting that the domestic shipyard requirements, plus the engagements the Government had made to its Allies, would make such a total as would continuously strain the capacity of the plate mills.

### The Call for Plates

It was about the beginning of this month that the steel mills undertook, by instructions from Washington, to increase their shipments of war steel, and particularly of plates, but their attitude at the time was that they would not need to do this for long. Now they show an expectation of this pressure continuing indefinitely.

The appointment of C. M. Schwab as Director-General of the Emergency Fleet Corporation has served to strengthen these views as to the future requirements of shipbuilding. The entire steel trade has confidence that however much improvement in performance the shipyards have lately recorded, Mr. Schwab is going to add greatly to those results. There is every prospect that Mr. Schwab's appointment will count, from his personality, his great knowledge of shipbuilding, and the almost unlimited authority he has been given in this new position. Mr. Schwab leaves all his personal affairs. Long ago, with no thought of anything of this sort, he had announced that the managements of the Bethlehem and associated properties had been so aligned that he could drop out at any time and the work would go right long.

### The Shell Steel Program

It has developed that most recent accounts have exaggerated the volume of shell steel buying that is contemplated for the second half of the year. Some estimates have been printed, running up to 4,000,000 tons for the second half, which appeared to be based upon authentic information, but it turns out that they were estimates based partly upon mistakes. The tonnage to be bought in the present buying is much less than 4,000,000 tons. However, the rate of producing shells has increased materially, and it will increase more. Some of the shell steel bought for delivery by June 15 will run well over July 1 in delivery, partly on account of changes in specifications and partly by reason of the shortage of forging capacity, as there has not been enough forging capacity to keep all the shell making factories busy. By this time that situation has been remedied as to all sizes 6-inch and under, and it will probably be remedied shortly as to the larger sizes as well.

### Production

The rate of production, in pig iron, steel ingots and finished steel, has not increased very materially over the average rate maintained in March. There has been a slight increase, perhaps, but hardly enough to balance the fact that at many mills the stocks accumulated, which were drawn upon when the railroads loosened up, are now largely exhausted, so that without any increase in production shipments would now be less than those being made from three to six weeks ago. As a general average, it may be said that production all along the line, since March 1, has been at about 85 per cent. of capacity. Roughly speaking, this represents approximately the tonnage produced in 1916 and 1917, but whereas the production during the major part of 1916 represented the existing capacity, at the present time the same tonnage is only about 85 per cent. of capacity, because the capacity has been so materially increased.

The chief restrictive influence in production continues to be shortage of coke. This is now confined chiefly to beehive, the by-product ovens being in nearly every instance well supplied with coal, so that they can operate full. The movement of beehive coke is restricted particularly in the case of Connellsville, the Connellsville region shipments last week and week before having been somewhat below the average in March, when of course there was a great improvement over the early weeks of the year. The railroads appear to be making strenuous efforts to furnish more cars to the coke region, but with indifferent success thus far.

The Carnegie Steel Company this week operated 49 of its 59 blast furnaces, ten being entirely out of blast. The company's banked furnaces have all resumed, but on Monday two of them had a close call, some coke arriving just in time to avoid banking. For over two weeks the Republic Iron & Steel Company has been seeking a supply of coke to blow in an idle furnace, and without success thus far. A merchant furnace interest in the Shenango valley, which has hitherto depended entirely upon Connellsville coke, has made a deal whereby it secures by-product coke from elsewhere and pays for it in pig iron. However, expectations are that production will gradually improve from this point. A little more complaint is being heard of labor shortage in the central west.

## TRAINING THE MEN FOR SKILLED LINES

**Unique Methods Being Followed by Educational Board in Buffalo**

Special to CANADIAN MACHINERY.

BUFFALO, April 23.—The need for skilled mechanics in Buffalo has led to the adoption of extraordinary advertising methods by the Educational Board here.

For example, here is the message on a hanger displayed in the street car windows: "War Trade Instruction. Evening Classes Re-open April 8. Your country needs trained men. Buffalo's industries need skilled mechanics. Courses: Machine shop practice: drafting tool design, tool forging, oxy-acetylene welding, gas engine work, automobile repairing, airplane woodworking, radio and buzzer work, practical electricity, industrial chemistry, photography."

Four vocational and six high schools are equipped for this class of instruction.

It would appear that Buffalo at least is adopting a plan whereby the supply of trained mechanics would be made dependable. The method of advertising and the plan of education is probably the more interesting in view of Robert Donaldson's statement (Canadian Machinery, April 4), that "Canada has never trained enough men for particular work."

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A MEETING of the Ontario section of the A.S.M.E. was held at 8 p.m., April 18, at the Engineers' Club, Toronto. Professor Angus presided and the local members and a number of visitors and prospective members were favored with a very interesting paper on the "Heat Treatment of Low Carbon Steel," by Mr. W. M. Wilkie of the steel department of the Imperial Munitions Board.

The discussion that followed the paper bore principally on the trouble encountered by the producers and users of shell steel. Among the engineers present were a number of those connected with local munitions plants, and their remarks based on actual experiences and the solution of various troubles under war time conditions were very interesting.

Before the paper was read the meeting appointed Mr. W. P. Robinson of the Northern Crane Works, Limited, to be chairman of the committee on increased membership, reappointed the secretary, C. B. Hamilton, as delegate to the joint committee of technical organizations (Ontario branches) and appointed a nominating committee of two, Messrs. Flettermeyer and Ward, to prepare a slate for the elections of section executive which will take place by letter ballot within the next few weeks.

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THE original microphones employed by the Allies for the detection of the submarine depended upon the hum of the engines and motors and operated quite satisfactorily until the Germans saw fit to mount their motors on sound absorbing bases. However, the later systems employed have reached a high state of perfection, and not only detect the presence of the submarine, but also find its exact position, and this whether the German craft are running at top speed or resting on the bottom.

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago | 37 50 |
| Standard low phos., Philadelphia | |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 32 00 |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | | |
| Victoria | | 50 00 |

## FINISHED IRON AND STEEL

| Per lb. to Large Buyers. | Cents |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 5 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 5 75 |
| Chequered floor plate, 3-16 in. | 12 20 |
| Chequered floor plate, ¼ in. | 12 00 |
| Staybolt iron | 8 50 |
| Bessemer rails, heavy, at mill | |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | *3 50 |

F.O.B., Toronto Warehouse

| | |
|---|---|
| Steel bars | 5 50 |
| Small shapes | 5 75 |

F.O.B. Chicago Warehouse

| | |
|---|---|
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

## FREIGHT RATES

Pittsburgh to Following Points

| | Per 100 lbs. C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 38.1 | 50.5 |
| Halifax | 39.1 | 51.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

## METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $30 00 | $28 00 |
| Electro copper | 30 00 | 28 50 |
| Castings, copper | 29 00 | 28 00 |
| Tin | 100 00 | 99 00 |
| Spelter | 10 00 | 10 00 |
| Lead | 9 50 | 9 00 |
| Antimony | 17 00 | 16 00 |
| Aluminum | 50 00 | 50 00 |

Prices per 100 lbs.

## PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¼ | $ 9 00 | $ 9 00 |
| Heads | 9 65 | 9 25 |
| Tank plates, 3-16 in. | 9 50 | 9 10 |

## WROUGHT PIPE

Effective Feb. 5, 1918.

Standard Buttweld

| | Per 100 feet | |
|---|---|---|
| ⅛ in. | $ 6 00 | $ 8 00 |
| ¼ in. | 5 16 | 7 29 |
| ⅜ in. | 5 16 | 7 29 |
| ½ in. | 6 55 | 8 12 |
| ¾ in. | 8 28 | 10 41 |
| 1 in. | 12 24 | 15 39 |
| 1¼ in. | 16 56 | 20 82 |
| 1½ in. | 19 80 | 24 89 |
| 2 in. | 26 64 | 33 49 |
| 2½ in. | 42 72 | 53 53 |
| 3 in. | 55 85 | 70 00 |
| 3½ in. | 70 84 | 87 86 |
| 4 in. | 83 93 | 104 10 |

Standard Lapweld

| | | |
|---|---|---|
| 2 in. | $ 29 60 | $ 36 08 |
| 2½ in. | 44 46 | 54 70 |
| 3 in. | 58 14 | 71 53 |
| 3½ in. | 72 68 | 90 62 |
| 4 in. | 86 11 | 107 37 |
| 4½ in. | 97 79 | 122 56 |
| 5 in. | 114 00 | 142 82 |
| 6 in. | 147 80 | 185 28 |
| 7 in. | 192 80 | 241 57 |
| 8 L in. | 202 50 | 253 75 |
| 8 in. | 233 30 | 292 32 |
| 9 in. | 279 50 | 350 18 |
| 10 L in. | 259 20 | 324 80 |
| 10 in. | 333 70 | 418 18 |

Prices—Ontario, Quebec and Maritime Provinces.

## WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

## OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 22 50 |
| Copper, heavy | 22 50 | 22 50 |
| Copper wire | 22 50 | 22 50 |
| No. 1 machine composition | 22 00 | 21 50 |
| New brass cuttings | 16 00 | 14 00 |
| Red brass turnings | 18 00 | 17 00 |
| Yellow brass turnings | 12 50 | 12 50 |
| Light brass | 10 00 | 9 50 |
| Medium brass | 12 00 | 12 00 |
| Heavy brass | 15 00 | 14 00 |
| Heavy melting steel | 24 00 | 21 00 |
| Steel turnings | 12 00 | 12 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 27 00 | 20 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 23 00 |
| No. 1 machine cast iron | 31 00 | 30 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 20 00 | 17 00 |
| Car wheels, iron | 26 00 | 30 00 |
| Steel axles | 38 00 | 35 00 |
| Mach. shop turn'gs | 9 00 | 8 50 |
| Cast borings | 12 00 | 12 00 |
| Stove plate | 19 00 | 19 00 |
| Scrap zinc | 6 50 | 6 50 |
| Heavy lead | 7 50 | 7 00 |
| Tea lead | 5 00 | 5 75 |
| Aluminum | [illegible] | [illegible] |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, ⅜" and less | 10 |
| Carriage bolts, 7-16 and up | net |
| Coach and lag screws | 25 |
| Stove bolts | 55 |
| Plate washers | List plus 20 |
| Elevator bolts | 5 |
| Machine bolts, 7-16 and over | net |
| Machine bolts, ⅜ and less | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | 10 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | add 25 |
| Nuts, square blank | add $1 50 |
| Nuts, square, tapped | add 1 75 |
| Nuts, hex., blank | add 1 75 |
| Nuts, hex., tapped | add 2 00 |
| Copper rivets and burrs, list plus | 30 |
| Burrs only, list plus | 50 |
| Iron rivets and burrs | 25 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 37½ |
| Wood screws, O. & R., brass | 32½ |
| Wood screws, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

## MILLED PRODUCTS

| | Per Cent |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil. Head Cap Screws | net |
| Flat But. Hd. Cap Screws | plus net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. & Semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2 in. | plus 10 |
| Studs | net |
| Taper pins | 40 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | list plus 20 |
| Collar screws | list plus 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | 65 |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add 7 00 |

## BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $47 50 |
| Open-hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.

F.O.B. Pittsburgh.

## NAILS AND SPIKES

| | | |
|---|---|---|
| Wire nails | $5 25 | $5 20 |
| Cut nails | 5 70 | 5 65 |
| Miscellaneous wire nails | | 60% |
| Spikes, ⅜ in. and larger | | $7 50 |
| Spikes, ¼ and 5-16 in. | | 8 00 |

## ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 41 |
| Plumbers' [illegible] | [illegible] |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila rope | 0 33 |
| New Zealand hemp | 0 36 |
| Transmission rope, Manila | 0 45 |
| Cotton rope, ½ in. and up | [illegible] |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | net |

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | 0 47 |
| Solder, guaranteed | 0 50 |
| Babbitt metals | 18 to 70 |
| Soldering coppers, lb | 0 53 |
| Lead wool, per lb. | 0 16 |
| Putty, 100 lb drums | 4 75 |
| White lead, pure, cwt. | 16 05 |
| Red dry lead, 100 lb kegs, per cwt. | 15 50 |
| Glue, English | 0 35 |
| Tarred slater's paper, roll | 0 95 |
| Gasoline, per gal., bulk | 0 31½ |
| Benzine, per gal., bulk | 0 30½ |
| Pure turpentine, single bbls., gal. | 0 71 |
| Linseed oil, raw, single bbls. | 1 95 |
| Linseed oil, boiled, single bbls. | 1 98 |
| Plaster of Paris, per bbl. | 2 50 |
| Sandpaper, B. & A. | list plus 20 |
| Emery cloth | list plus 20 |
| Sal Soda | 0 03½ |
| Sulphur, rolls | 0 05 |
| Sulphur, commercial | 0 04½ |
| Rosin "D," per lb. | 0 03 |
| Rosin "G," per lb. | 0 03½ |
| Borax crystal and granular | 0 12 |
| Wood alcohol, per gallon | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

### CARBON DRILLS AND REAMERS

| | Per Cent. |
|---|---|
| S.S. drills, wire sizes up to 52 | 40 |
| S.S. drills, wire sizes, No. 53 to 80 | 40 |
| Standard drills to 1½ in. | 40 |
| Standard drills, over 1½ in. | 40 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 |
| Bit stock | 40 |
| Ratchet drills | 15 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 40 |
| Sleeves | 40 |
| Taper pin reamers | net |
| Drills and countersinks | list plus 40 |
| Bridge reamers | 50 |
| Centre reamers | 10 |
| Chucking reamers | net |
| Hand reamers | 10 |

### COLD ROLLED SHAFTING

At mill ..... list plus 40%
At warehouse ..... list plus 50%
**Discounts off new list. Warehouse price at Montreal and Toronto**

### IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 8 00 | $ 8 00 |
| Sheets, black, No. 10 | 10 00 | 9 50 |
| Canada plates, dull, 52 sheets | 9 00 | 8 65 |
| Can. plates, all bright. | 9 50 | 9 50 |
| Apollo brand, 10¾ oz. galvanized | ..... | ..... |
| Queen's Head, 28 B.W.G. | ..... | ..... |
| Fleur-de-Lis, 28 B.W.G. | ..... | ..... |
| Gorbal's Best, No. 28 | ..... | ..... |
| Colborne Crown, No. 28 | ..... | ..... |
| Premier, No. 28 U.S. | ..... | 8 95 |
| Premier, 10¾ oz. | ..... | 9 25 |
| Zinc sheets | 20 00 | 20 00 |

### PROOF COIL CHAIN

B

¼ in., $12.35; 5-16 in., $11.85; ⅜ in., $11.50; 7-16 in., $10.90; ½ in., $11.20; 9-16 in., $11.20; ⅝ in., $11.10; ¾ in., $11.00; ⅞ in., $10.90; 1 inch, $10.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $15.50; 3-16 in., $11.70; ¼ in., $8.40; 5-16 in., $7.40; ⅜ in., $6.35; 7-16 in., $6.35; ½ in., $6.35; ⅝ in., $6.35; ¾ in., $6.35.

**Prices per 100 lbs.**

### FILES AND RASPS.

| | Per cent |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 40 |
| Black Diamond | 40 |
| J. Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 37½ |
| Disston | 50 |
| Whitman & Barnes | 50 |

### BOILER TUBES.

| Size | Seamless | Lapwelded |
|---|---|---|
| 1 in. | $36 00 | $..... |
| 1¼ in. | 40 00 | ..... |
| 1½ in. | 43 00 | 36 00 |
| 1¾ in. | 43 00 | 36 00 |
| 2 in. | 50 00 | 36 00 |
| 2¼ in. | 53 00 | 38 00 |
| 2½ in. | 55 00 | 42 00 |
| 3 in. | 64 00 | 50 00 |
| 3¼ in. | ..... | 58 00 |
| 3½ in. | 77 00 | 60 00 |
| 4 in. | 90 00 | 75 00 |

Prices per 100 ft., Montreal and Toronto.

### OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | |
| Royalite, per gal., bulk | 18 |
| Palacine | 21 |
| Machine oil, per gal. | 26½ |
| Black oil, per gal. | 15 |
| Cylinder oil, Capital | 49½ |
| Cylinder oil, Acme | 39½ |
| Standard cutting compound, per lb. | 0 06 |
| Lard oil, per gal. | $2 60 |
| Union thread cutting oil antiseptic | 88 |
| Acme cutting oil, antiseptic | 37½ |
| Imperial quenching oil | 39½ |
| Petroleum fuel oil | 13½ |

### BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30-5% |
| Standard | 40% |
| Cut leather lacing, No. 1 | 1 95 |
| Leather in sides | 1 75 |

### TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 06 |
| Emery glue | 15 to 20 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 35 |

**Prices Per Lb.**

### ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | .08½ |
| Grits, 80 and finer | .06 |

### BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 38 |
| Brass sheets, 24 gauge and heavier, base | 0 43 |
| Brass tubing, seamless | 0 46 |
| Copper tubing, seamless | 0 48 |

### WASTE.

| White. | Cts. per lb. | | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 18½ |
| Peerless | 21 | X Empire | 17¼ |
| Grand | 19¾ | Ideal | 17¼ |
| Superior | 19¾ | X press | 16 |
| X L C R | 18½ | | |

**Colored.**

| | | | |
|---|---|---|---|
| Lion | 15 | Popular | 12 |
| Standard | 13½ | Keen | 10½ |
| No. 1 | 13½ | | |

**Wool Packing.**

| | | | |
|---|---|---|---|
| Arrow | 25 | Anvil | 15 |
| Axle | 20 | Anchor | 11 |

**Washed Wipers.**

| | | | |
|---|---|---|---|
| Select White | 11 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING.

Standard ... 10% Best grades .. 15%

### ANODES.

| | |
|---|---|
| Nickel | .50 to .54 |
| Cobalt | 1.75 to 2.00 |
| Copper | .44 to .46 |
| Tin | .49 to .56 |
| Zinc | .23 to .25 |

**Prices Per Lb.**

### COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | 42 50 | 43 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 46 00 | 44 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 48 00 | 48 00 |
| Copper sheet, planished, 16 oz. base | 57 00 | 45 00 |
| Braziers,' in sheets, 6x4 base | 45 00 | 44 00 |

### LEAD SHEETS.

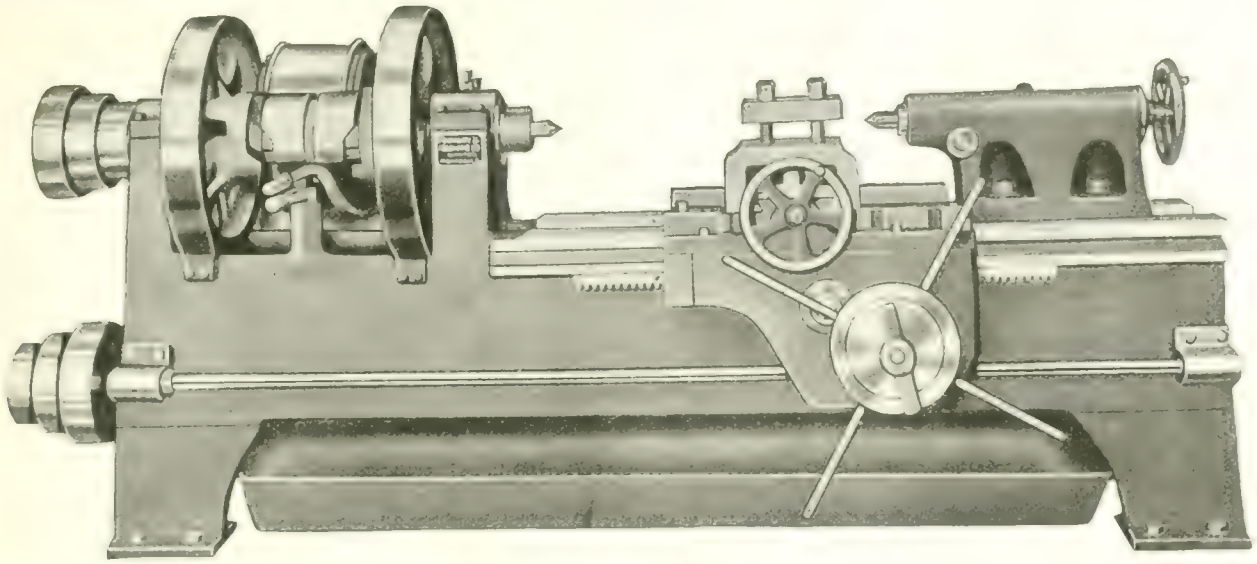
| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $13 25 | $13 25 |
| Sheets, 3½ lbs. sq. ft. | 13 25 | 13 25 |
| Sheets, 4 to 6 lbs. sq. ft. | 12 50 | 12 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS.

| | |
|---|---|
| Acid, boracic | $ .15 |
| Acid, hydrochloric | .05 |
| Acid, hydrofluoric | .14½ |
| Acid, nitric | .10 |
| Acid, sulphuric | .05 |
| Ammonia, aqua | .08 |
| Ammonium carbonate | .15 |
| Ammonium, chloride | .11 |
| Ammonium hydrosulphuret | .40 |
| Ammonium sulphate | .07 |
| Arsenic, white | .12 |
| Copper, carbonate, anhy | .35 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .70 |
| Iron perchloride | .20 |
| Lead acetate | .16 |
| Nickel ammonium sulphate | .12 |
| Nickel carbonate | .35 |
| Nickel sulphate | .15 |
| Potassium carbonate | .75 |
| Potassium sulphide (substitute) | .20 |
| Silver chloride (per oz.) | .65 |
| Silver nitrate (per oz.) | .55 |
| Sodium bisulphite | .10 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .41 |
| Sodium hydrate | .04 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | .14 |
| Tin chloride | .60 |
| Zinc chloride | .60 |
| Zinc sulphate | .09 |

**Prices per lb. unless otherwise stated.**



# The MONTREAL Heavy-Duty Rough Turning Lathe

## Description

**BED** is of heavy massive construction, wide and deep, well braced with box section girths, ways are flat, provision is made at rear side for attaching profiling attachment when needed.

**HEADSTOCK**—Cast integral with bed giving great rigidity and permanent alignment. Two gear ratios are obtainable through gearing and change is made instantly by means of jaw clutches. Drive is by 8" belt on backgear shaft through friction clutch. On account of the integral construction the gears can be of large diameter and full advantage has been taken of this feature. Bearings are of best bronze, ample oiling facilities are provided, covers are furnished for gears.

**CARRIAGE** is very heavy, with wide bridge, has long bearing on ways, will not spring under heaviest cuts, plain heavy duty rest with graduated collar, hand feed to cross slide.

**APRON**—One piece double wall type giving support to both ends of shafts. Gears are of steel or semi-steel, worm wheel of bronze. External friction plate of large diameter giving great power for feeds.

**FEEDS**—Three provided through felt from spindle.

**TAILSTOCK** of massive design with long nose making it unnecessary to extend tailstock spindle for ordinary work. Spindle is of large diameter. Four clamping bolts are provided to secure tailstock to bed.

**OIL PAN** of heavy gauge sheet steel.

**PUMP**—Trahern Rotary Pump provided for supplying lubricant to tools.

No countershaft is furnished as friction and jaw clutches are part of machine, drive is direct from line shaft.

## Specifications

| | |
|---|---|
| Swings over bed | [illegible] |
| Swings over carriage | 11" clear |
| Distance between centres | 12' |
| Length of bed | [illegible] |
| Width of bed | [illegible] |
| Depth of bed | [illegible] |
| Width of ways | [illegible] |
| Height from floor to centres | [illegible] |
| Front spindle bearing | [illegible] |
| Rear spindle bearing | [illegible] |
| Spindle nose | [illegible] |
| | [illegible] |
| Diameter tailstock spindle | [illegible] |
| Taper in spindle and tailstock | [illegible] |
| Ratio of gearing in headstock | [illegible] |
| Diameter of cut gear | [illegible] |
| Drive pulley | [illegible] |
| Length of carriage on ways | [illegible] |
| Width of bridge | [illegible] |
| Feeds per rev. of pinion | [illegible] |
| Approx. weight | [illegible] |


# The A. R. Williams Machinery Co.
LIMITED

64 West Front Street Toronto, Canada

# Daylight Saving Seems to Make Very Little Difference to the Industrial Plants

## CANADIAN MACHINERY Asks Heads of Manufacturing Concerns How the New Scheme Was Received—More Benefits Will be Derived From It Later On.

DAYLIGHT saving has not made much difference to industrial plants—in fact it makes much difference to the men working there. It is fair to say however that there has been no trouble in the bringing into effect of the new schedule and that in a few weeks time it will work more satisfactorily than it does at present.

It will be remembered that when it was attempted to bring it to pass last year there was a mild form of revolution. Sir George Foster brought the matter up in the Ottawa House, but it got no farther. It was a dead one from the very start, owing to the amount of unrelenting opposition that developed toward it in the House. A number of municipalities tried it out, but with indifferent success, as part of the community was on daylight time, with the rest of the folks telling them they were crazy for having tinkered with their watches.

CANADIAN MACHINERY has asked a number of manufacturers how the change was made in their plants, and the following answers have been received:

International Malleable Iron Co., Ltd., Guelph.—"The plan of daylight saving was inaugurated in our factory at the appointed time and no confusion resulted. Working conditions have not been upset in any way, but on the other hand, probably owing to the dull mornings during the present week, no decided advantage has yet been apparent. While our employees have not yet registered any objections, and the successful operation of the shop has not been interfered with, our experience so far does not tend to make us enthusiastic over the change, as no actual saving of light has been shown. We have found it necessary to have artificial lighting early in the morning, whereas previous to Sunday last this was not necessary. But we think the plan will work out entirely satisfactorily, and prove a benefit to almost everyone during the summer months, the only criticism which we heard from our employees being that they think it is being extended over too long a period. Some of them think that April 14th is a little early to start, and that it should not be continued beyond September 30th.—W. H. Burgess, General Manager.

—

The Preston Woodworking Machinery Co., Preston, Ont.—"Daylight saving has gone into effect in our plant without any noticeable difference between it and the time by which we went formerly. Nobody seems to make any comments on it, so from this we would take it that everybody is perfectly satisfied."—A. M. Kerr, Sec.-Treasurer.

—

Nicholson File Co., Port Hope, Ont.—"As far as the operation of our factory is concerned the daylight saving does not make any difference, as at the present time there is full daylight during the ten hours the factory runs, under either system. It does, however, give the men more time to look after their gardens after working hours."—E. M. Thurber, Res. Manager.

—

Dominion Forge & Stamping Co., Ltd., Walkerville, Ont.—"As yet we have not changed our factory time to conform with the new "daylight saving" schedule. The factories in general in this district disapprove of the change for the reason that many of our employees live across the river in Detroit, and a discrepancy in time between their homes and factory is inconvenient. For this reason alone we do not approve of the change but as a general proposition, where there are not two different times conflicting, we consider it an advantage.—Pearson Wells, Secretary-Treasurer.

—

The Ford-Smith Machine Co., Hamilton.—"We have found that it makes absolutely no difference here. In the main, the men feel that daylight saving offers them nothing of moment, and we think that the few objections we have here are just a matter of conservatism, and we should hear the same complaint in regard to any change of whatever nature it might be. We are running night and day in this plant, and the night gang come on at six at night, and work until seven the next morning. These men have already asked (since daylight saving was put into force) that we allow them to come in at seven o'clock at night during the hot weather of the summer, instead of six. We shall probably agree to this change. Otherwise we see no difference here, and as far as the firm is concerned we do not think it makes any difference to us in any way.—P. Ford-Smith, President and Manager.

—

Goold, Shapley & Muir Co., Ltd., Brantford, Ont.—"Daylight saving went into force last Monday, without any friction, and we have little or no grumbling from the employees. In fact the majority are strongly in favor of it.—John Muir, Mgr.

A. B. Jardine & Co., Hespeler, Ont.—"We do not find that daylight saving makes any appreciable difference in our works."—John Jardine.

—

Dominion Steel Foundry Co., Ltd., Hamilton.—"The change was made without confusion or disturbance and so far without complaint."—A. G. Wright, Secretary.

—

The John Bertram & Sons Co., Ltd., Dundas.—"In this conection I would state that there is no question of the benefit which will be derived to manufacturers from the change recently made. I have heard amongst our employees no adverse criticisms of the plan and consequently think it is working out all right."—Henry Bertram, Treasurer.

—

The William Kennedy & Sons, Ltd., Owen Sound.—"Same seems to work out quite satisfactorily. The only objections which we have had are from a few men who have been in the habit of coming back at 5 o'clock in the morning to remove freshly cast iron castings from the sand, castings which have been cast the evening before. However, we do not expect that this inconvenience will last long."—T. D. Kenendy, Director.

—

MacKinnon, Holmes & Co., Ltd., Sherbrooke, Que.—"The Daylight Saving Act was put into effect in this locality without the slightest inconvenience, and is proving a boon to all."—Geo. D. MacKinnon, General Manager.

—

Hamilton Bridge Works Co., Ltd.—"In connection with this matter, would advise that we have yet to hear of any complaints on the adoption of the daylight saving. As far as we can see there is no complaint in regard to it. Would further state that daylight saving has been adopted by all the Allies, and, after due deliberation, we feel that all those who have the interest of the Allies at heart should adopt it without comment, and objection."—W. B. Champ, Managing Director and Secretary.

—

The Canadian Blower & Forge Co., Ltd., Kitchener.—"We have found this to work out very well as far as our plant is concerned. The men do not object to it, and all seem to like it. This city is peculiar in that most of our workmen own their own homes, and take a decided interest in conservation of food supplies, and practically all have their own gardens. The additional time in the evening is much appreciated by them owing to the fact that it enables them to give

Continued on page 58.

# THE A. R. WILLIAMS MACHINERY CO. LTD

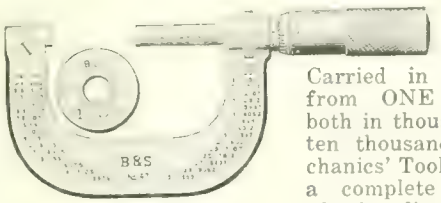
64 FRONT ST., W. TORONTO, ONT.

SALES SUPPLY DEPARTMENT SERVICE

## Machine Shop Superintendents, Tool Makers, Mechanics and Purchasing Agents

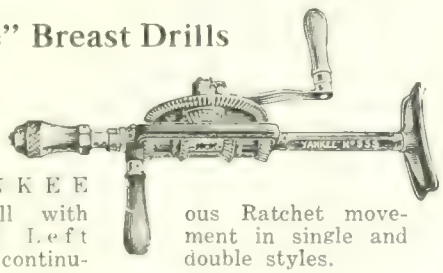
We are in a splendid position to supply you with every requirement in the tool line

### MICROMETERS



Carried in stock sizes from ONE INCH up, both in thousands and in ten thousands; also Inchanics' Tools, as well as a complete assortment of other lines.

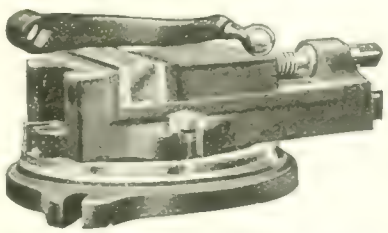
### "Yankee" Breast Drills



in stock at all times. We have the YANKEE Breast Drill with Right and Left Hand and continuous Ratchet movement in single and double styles.

### "Universal" Combination Pliers

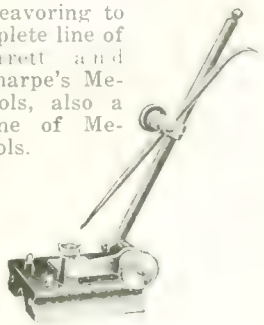
Forged of High Grade Tool Steel perfectly tempered and carefully machined. Consists of Screw Driver, Reamer, Flat Nose Plier, Pipe Wrench, Wire Cutter, etc.



**"Williams" Combined Stationary** and Swivel Milling Machine Vise, with removable jaws. Depth of Jaw 1⅜". Width of jaw 5". Vise opens 3". Weight 45 lbs. List price, $25.00.

### MECHANICS' TOOLS

We are endeavoring to carry a complete line of both Starrett and Brown & Sharpe's Mechanics' Tools, also a complete line of Mechanics' Tools.



### "Yankee Screw Drivers

they are strong, durable, well-balanced tools. The fastening of blade and handle is such that they cannot be loosened in use, or even usual abuse.

### "Yankee" Hand Drills

These Tools are built mechanically on lines of a Tool rather than as a piece of Hardware. They are strong and substantially built for hard work and durability.

### Trahern Pumps

For water, Oils and Cutting Compound The most RELIABLE Pump at the most REASONABLE Price. Buy the Pump with a reputation behind it. We have them right in stock.

**Complete line of TRANSMISSION EQUIPMENT, POWER HOUSE, MILL and FACTORY SUPPLIES always in stock.**

Phone or write Supply Department for No. 40 Catalog and Prices.

THE A. R. WILLIAMS MACHINERY CO., LTD., TORONTO, ONTARIO


*If any advertisement interests you, tear it out now and place with letters to be answered.*

## WM. NEWMAN JOINS THE U. S. FLEET CORPORATION

**Well Known Toronto Architect Takes Responsible Position on War Work**

With the reorganization of the plant of the United States Fleet Corporation at Hog Island, Philadelphia, the largest shipbuilding company in the United

WILLIAM NEWMAN

Naval architect and works manager of the Polson Iron Works, Toronto, who has left that company to join the United States Fleet Corporation.

States, Toronto loses Wm. Newman, naval architect and works manager of the Polson Iron Works & Steel Shipbuilding Company, who will in the course of a few days become connected with the American company.

"I am leaving for the coast in a few days," said Mr. Newman, "but the chances are that I will remain in the East when I make my final decision as to where I will locate myself."

### Given a Purse of Gold

Upon severing his connection with the Polson Company, Mr. Newman was made the recipient of a handsome purse of gold presented by Col. J. B. Miller on behalf of the company.

---

that much additional attention to this work."—G. S. Capwell, Sec.-Treas.

The Brown, Boggs Co., Ltd., Hamilton. —"As far as our works are concerned there is no apparent difference and the extra hour in the evening is certainly very enjoyable and appreciated."—W. E. Blandford, Sec.-Treas.

### In Montreal Shops

Mr. Mead of the Canadian Vickers Co. says that the change was effected with very little trouble and no noticeable difference was apparent on Monday morning when about 2,500 men started to work an hour earlier (by daylight) than they had done two days before. He could not see how any serious objection could be made to such a move even under normal conditions.

Lymburners Limited are working 24 hours every day, three shifts of eight hours each, and very little difference was noticed on the Monday of the change, one of the Sunday shifts working an hour less to avoid confusion on the appearance of the following shift. Mr. F. McDonald, the production engineer, intimated that the change was made effective without the least trouble.

Mr. McCleery, superintendent of the John McDougal Caledonia Iron Works, said that the daylight saving was put into force without much difficulty, but intimated that while the men would have an additional hour of daylight in the evening to their own account, it would have little effect on the saving of light to the plant as for the hour in the morning they would require to use the light that was saved during the closing hour.

As many of the factories in this vicinity have organized recreation clubs the men are very well pleased with the recent change as it enables them to have the additional hour for their sports. Considerable interest is being shown in the cultivation of spare lots about Montreal and many factory employees and also those of the office staffs have accepted the daylight saving with satisfaction, realizing that they will have much more time for home gardening.

## TUNGSTEN ORE DISCOVERED IN MANITOBA

SCHEELITE has been found in the Falcon Lake district, Manitoba, near the molybdenite deposits discovered last fall. This tungsten ore was found by a prospector who had attended the evening classes for prospectors at the University of Manitoba. The ore was brought to the instructor, Mr. J. S. DeLury, by Mr. J. MacMillan and was identified as scheelite. It is noteworthy that the molybdenite discovery last fall was also made by a prospector who attended the evening classes at the university.

## RECLAIMING WASTE

A CORRESPONDENT in the "Practical Engineer" states that the high cost of waste and rags used throughout the machine shop makes it necessary to cast about for means to reduce charges for this material, so there was devised a washing arrangement, which was made up of some old pipe fittings. A piece of 12-in. pipe was arranged with companion flanges on each end, a steam inlet in the side, and a drain at the bottom. A screen was then placed in the pipe about 4 in. above the steam inlet. The oil waste was placed in the washer above the screen by removing the companion flange, and then the whole mass was boiled by turning in the live steam, the condensation dripping down through the waste and carrying the oil and dirt off through the blow-off valve. While this crude washing did not turn out perfectly clean waste, it nevertheless, took out such a large percentage of the oil, grit and dirt that the waste could be used for practically all purposes. The expenditure for new waste was thereby cut down by one-half to one-third each month.

## NOW GETS POSITION OF GENERAL SUPT.

**R. M. McCleery Was Designer for the Caledonia Iron Works**

**R. M. McCleery,** who for the past several years has been holding the position of chief draughtsman and designer for the John McDougall Caledonia Iron

R. M. McCLEERY

Works, has been promoted to the position of general superintendent. Mr. McCleery has had a wide and varied experience in general engineering and marine work.

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YOUTH is not a time of life; it is a state of mind. It is not a matter of ripe cheeks, red lips and supple knees; it is a temper of the will, a quality of the imagination, a vigor of the emotions. It is the freshness of the deep springs of life. Youth means a temperamental predominence of courage over timidity, of the appetite for adventure over the love of ease. This often exists in a man of fifty more than in a boy of twenty. Nobody grows old by merely living a number of years. People grow old by deserting their ideals. Years wrinkle the skin, but to give up enthusiasm wrinkles the soul. Worry, doubt, self-distrust, fear and despair—these are the long, long years that bow the heart and turn the greening spirit back to dust.

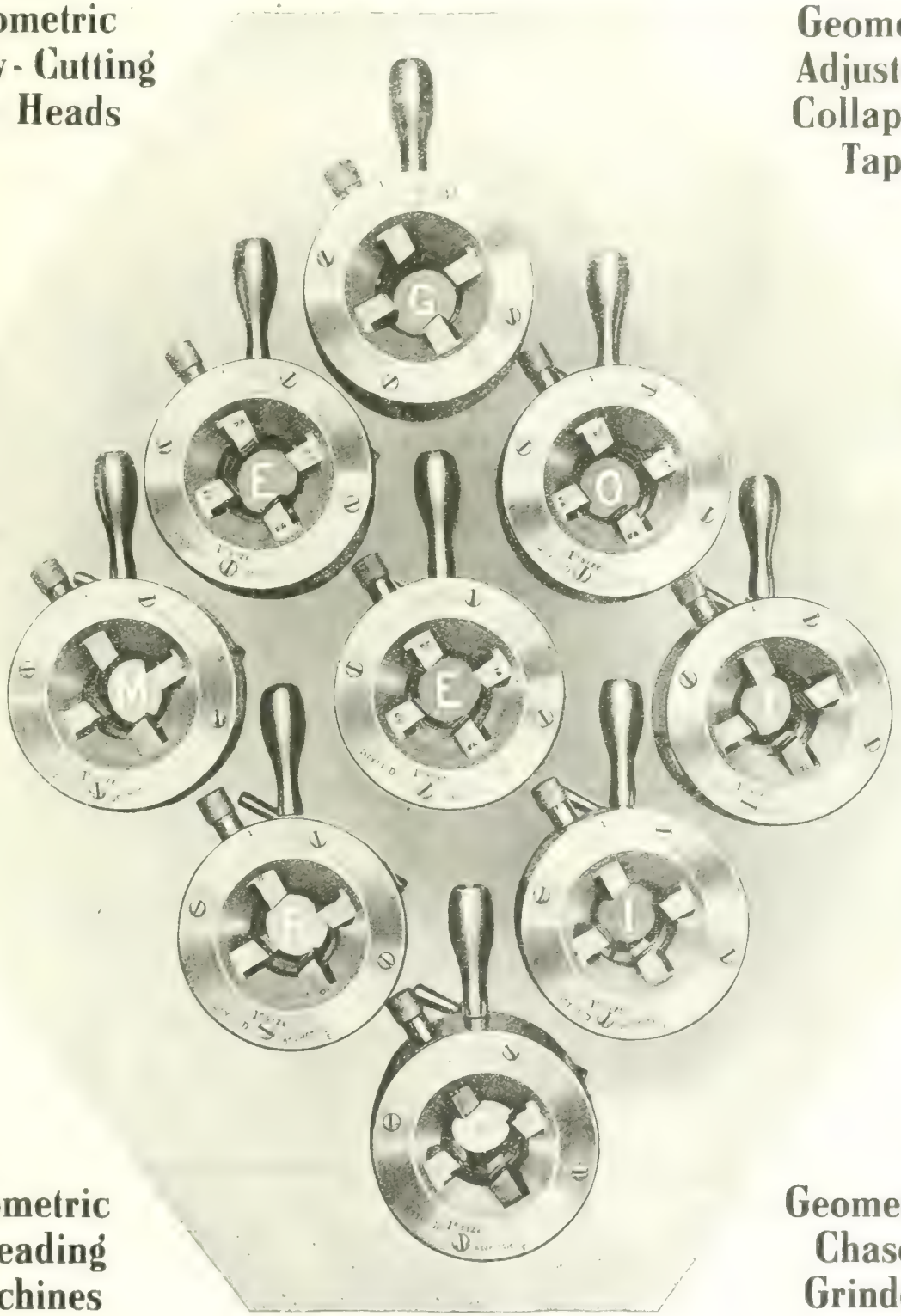
Whether sixty or sixteen, there is in every human being's heart the lure of wonder, the sweet amazement of the stars and at star-like things and thoughts, the undaunted challenge of events, the unfailing childlike appetite for what next, and the joy of the game of living.—American Iron and Steel Institute Bulletin.

# GEOMETRIC

The Magic Name Among Manufacturers of Screw Threads

**Geometric Screw-Cutting Die Heads**

**Geometric Adjustable Collapsing Taps**



**Geometric Threading Machines**

**Geometric Chaser Grinders**

WE CAN HELP YOU

The Geometric Tool Company, New Haven, Conn., U.S.A.

*CANADIAN AGENTS:*

Williams & Wilson, Ltd., Montreal. The A.R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B.

# INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

## MUNICIPAL

**Chatham.** The water commissioners of Chatham have decided to instal two additional filters at the filtration plant.

## TENDERS

Sealed tenders will be received until 4 p.m., on Monday, April 29, 1918, for the construction of a breakwater at Margaree, Inverness County, N.S. Plans and forms of contract can be seen and specification and forms of tender obtained at this Department and at the offices of the District Engineers at Halifax, N.S.; North Sydney, N.S., and on application to the Postmaster at Margaree, N.S.

**Ottawa.**—Sealed tenders addressed to the undersigned and marked "Tender for Dredge No. 114, or Tug St. Paul," etc., as the case may be, will be received until 4 p.m., Thursday, May 2, 1918, for the purchase of Dredge P.W.D. "No. 114," Tug "St. Paul," Dump Scow No. 50, Dump Scow No. 32, Dump Scow No. 33, lying afloat in Burlington Bay, Hamilton, Ontario, near the International Harvester Co. dock. Tenders may be submitted for any one of the above items or plant, or for all the plant.

Dredge P. W. D. "No. 114": wooden hull, 25 ft. beam, 75 ft. long, 7ft. 6 in. depth, in poor condition; locomotive boiler about 100 lb. pressure, 4 ft. 2 in. diameter, 16 ft. 2 in. long. Engine single 14 in. x 16 in. Tug "St. Paul"; wooden hull 52 ft. x 16 ft. x 9 ft. draft; engine 12 in. and 24 in. x 18 in.; boiler Fitzgibbon type 6 ft. x 7 ft. x 12 ft. pressure about 130 lbs. Tug in fair condition. Scow No. 50; six pocket wooden hopper scow, capacity about 460 cubic yards. 132 ft. long, 26 ft. 6 in. beam, 8 ft. 9 in. depth. In poor condition. Scow No. 32; two pocket wooden hopper scow, about 105 cubic yards capacity, 70 ft. long, 19 ft. 6 in. beam, 7 ft. 4 in. depth. In good condition. Scow No. 33: two pocket wooden hopper scow, about 105 cubic yards capacity, 70 ft. long, 19 ft. 6 in. beam, 7 ft. 4 in. depth. In good condition. Sale is subject to an upset price.—R. C. Desrochers, Secretary, Ottawa:

## PERSONAL

**Charles Watt**, who has successfully filled the position of general superintendent of the shell department of the Canada Stove and Foundry Company, of St. Laurent, P.Q., has resigned his position with the firm.

**Herbert Johnson**, who for the past six months has been Canadian sales agent for the Armstrong Whitworth Company of Canada, has been appointed to the position of general superintendent at the [illegible].

**Mr. William Newman**, architect of the Polson Iron Works, Toronto, was presented with a purse of gold by the company. The presentation was made by Col. J. B. Miller on behalf of the firm. Mr. Newman is leaving to accept a position in the United States.

## TRADE GOSSIP

**Will Spend Money.** The Winnipeg Electric announces the expenditure of $317,000 to increase its rolling stock.

**Peacock Brothers**, of Montreal, contemplate the erection of a plant for the manufacture of Weir feed water pumps for marine service.

**To Make Report.**—C. H. Kellogg from Oklahoma is in Medicine Hat to look over the Ansley mine. He believes there is a large body of coal there.

**Will Enlarge Plant.**—The British Forgings, Ltd., have been granted a permit by Toronto for an $80,000 addition to their forge shop, in the Ashbridge's Bay industrial area.

**Vancouver.**—The coast cities, Victoria, Vancouver and New Westminster, are "coming back," according to very reliable reports from the coast. Shipbuilding and other basic industries are causing the boom in trade. It is estimated that the population of Vancouver has been increased by 12,000 in the past year.

**Direct Advertising.**—The Wm. Kennedy and Sons, Ltd., of Collingwood, wanted men for their shell shop. They advertised, not in a condensed way, but four columns wide and abuot 3½ inches deep. Their appeal was made in the local papers. The real value of the advertising columns is becoming more and more recognized.

**Opened in Montreal.**—Charles P. Archibald and Company have recently opened an office at 164 St. James St., Montreal, to handle all classes of railway, marine and pulp mill supplies, together with all kinds of general machinery. Mr. Archibald, who is in charge of the sales, continues to represent the Ottawa Car Co., in addition to his new enterprise.

**To Vote on By-law.**—The ratepayers of Tillsonburg will vote on the 6th of May in regard to the contract between the city and the Huntley Mfg. Co., which recently suffered loss from fire, and which was considering offers to remove elsewhere. The town discharges the mortgage held against the plant, and pays over the insurance money and makes other concessions. The voting is to ratify the agreement.

**The Future of Steel.**—Nothing has yet come of the proposed merger between Nova Scotia Steel and Coal and Dominion Steel. Officials of the Nova Scotia Co. are not worried about a statement that has found circulation to the effect that they might find difficulty in maintaining their dividend in after-war markets. They rely on their pre-war record, and to the favorable developments following the opening at their Wabana property. The future of the steel business, the Scotia directors are satisfied, is not in jeopardy, but on the other hand faces a field full of splendid possibilities.

**New Brass Industry.**—Hamilton Brass Ltd., Burlington Street, E., Hamilton, Ont., has purchased a four acre tract at the west end of Main Street, near the C.P.R. round house, and ground is being broken for the erection of the first building, which will be about 30 by 120, one storey. It will be equipped with crushers, rolls, jig tables, pit furnaces, Swartz furnaces, assay laboratory, and all equipment necessary for the concentration and smelting of brass and copper, slag, ashes, sweepings, skimmings and scrap.

**Preston Shop Busy.**—There are at present some excellent prospects for business ahead of the Preston Car and Coach Company. The Toronto Street Railway Company are asking for figures on the hundred electric cars while the Dominion Government is about to place an order for nineteen baggage cars. Either order in its entirety will run to about a half million dollars. Both orders will be placed somewhere and the Car and Coach have every reason to believe they will secure a full share of the business. Other smaller orders are also in prospect one of which is nine cars for the York Radial. Then there is considerable repair work ahead for the same reason that new work is required.

**New Repair Shop.**—Peacock Brothers of Montreal have recently added a new branch to their other activities, that of a fully equipped repair department for handling the repairs of different kinds of recording instruments, such as various types of pressure gauges, thermometers, pyrometers, and other appliances requiring very accurate adjustment. The laboratory is being rapidly equipped for the efficient handling of this work. Mr. E. Dawson, who is in charge of this department, has had a wide experience in this class of work. Little effort has been made in the past to establish a repair bureau of this character here in Canada hitherto the bulk of this repair work has had to be sent to the States, entailing a heavy expense on custom charges.

**New Bridge Company.**—The T., H. & B., C.N.R., and N.Y.C. have formed a company under the name of the Canadian Niagara Bridge Company to build a new bridge over the Niagara River near Bridgeburg. The company has a private bill, which will come before the Dominion Parliament at the present session. The directors of the company are: Baron Shaughnessy of Montreal, president of the Canadian Pacific Railway; Alfred H. Smith of Chappaqua, N.Y., president of the New York Central and Michigan

# RICE LEWIS AND SON
LIMITED

ESTABLISHED 1834 TORONTO, ONTARIO 19 VICTORIA STREET

We have a good stock of heavy material such as:

BAR IRON
HOOP AND BAND IRON
SHEET IRON, Black and Galvanized
ANGLES
MILD STEEL
SHAFTING
CAST STEEL
SPRING STEEL
HIGH SPEED STEEL, Etc.
Also MACHINIST SUPPLIES, Etc.

Your enquiries and orders are solicited

# Let them know it's there

In complimenting us upon the results secured from their advertisement in the classified section, one advertiser said:

"Of course we would not have sold it without letting people know it was here, that is obvious, and thanks are due you for letting the people know it was for sale."

If you have any old or used equipment for sale, let people know it's there. Your message in Canadian Machinery will be placed before the probable buyers of such equipment.

**Canadian Machinery**

*Classified Advertising Section*

143 University Ave., TORONTO

# Nosing Dies

## For all Sizes of Shells

We have still in use in our own shell factory a Chilled Iron Nosing Die that we started using last June. **It has nosed approximately 50,000 shells, and is still giving good service.**

Our customers are getting nearly as good results in using our make of dies.

One customer writes:

"We have found these very satisfactory and to have an exceptionally long life, often running to 25,000 to 30,000 shells [illegible] having to be [illegible]."

The [illegible] confidentially to anyone interested.

Let us prove the merits of these Chilled Iron Nosing Dies for you in your own factory.

**Marsh Engineering Works, Ltd.**

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Central Railways; John N. Beckley of Rochester, N.Y., president of the Toronto, Hamilton & Buffalo Railway; Edward Donaldson Cahill, K.C., of Hamilton, and William Percy Torrance of Toronto, barrister-at-law.

**A New Process.**—A highly important discovery has recently been made by H. V. Jansen, a chemical engineer, resident of Toronto, by which the whey from milk can be made into alcohol. Dr. J. F. Strangard of Toronto is associated with Mr. Jansen in the invention, patents for which have been taken out in all available countries. The discovery not only means the saving of immense quantities of grain now being used, but it cheapens the cost of alcohol to a very material extent. The patent has been disposed of for a cash consideration of $50,000 and a quarter interest in the formation of a parent company of $1,000,000. Mr. Jansen, the inventor, is to be retained by the company at a salary of $6,000 a year, and Dr. Strangard will be engaged to dispose of the patent rights in European countries. Both are Danes with several years' residence in Canada.

## MARINE

PORT COLBORNE.—The steamer Wyoming cleared here on the 17th for Buffalo dry-dock. There is no ice in sight.

**Toronto.**—It is expected that the steamer Cayuga, of the Canada Steamship Line, will go into commission on May 18th between Toronto, Niagara-on-the-Lake, Queenston, and Lewiston.

**Victoria.**—The C. P. R. steamers Empress of Asia and Empress of Russia have been commandeered by the Dominion Government. The order has already gone forth that the sailings of the ships have been cancelled.

**Newcastle, N.B.**—At the shipyard at Rosebank, the work on the vessel under construction is proceeding satisfactorily. This vessel is a four-masted schooner of 540 tons. It is expected that she will be launched about August 1st. The keel for another vessel is also partly laid.

**Halifax.**—The steamer City of Wilmington was burned south of Sable Island on Saturday. The fire broke out suddenly early in the morning, and, despite the efforts of the crew, it spread rapidly throughout the ship. "S.O.S." signals were flashed out and preparations were made to abandon the steamer. The weather was fairly favorable and the boats were launched, provisioned and the crew entered them.

**Cleveland.**—The steamer Harvester, ter, which left South Chicago for Port McNicoll with a cargo of oats, was the first boat of the grain fleet to sail, and she may have trouble making port, as it was reported early in the week that the ice in Georgian Bay is pretty heavy. The Harvester has 640,000 bushels of oats, which is the largest grain cargo ever loaded at a Lake Michigan port.

**Detroit.**—Built in 1879 and for many years considered one of the finest vessels on the Great Lakes, the side-wheeler passenger boat Idlewild was sold to-day to Texas parties, who will operate her in freight trade out of Texas ports. The boat has been out of commission ten years. She formerly ran between Detroit, Toledo and Port Huron, and later was placed on a St. Lawrence River route. The Idlewild is an iron hull vessel, 150 feet in length, 26 feet wide and 47.4 feet deep. She was constructed at the Wyandotte yards.

**Owen Sound.**—One of the oldest residents of Owen Sound section passed away recently in the person of Captain Alexander McKenzie, East Linton. For many years he has been known on the Great Lakes, where he has commanded many boats during his 54 years as a sailor in Canada. He was born in Rossshire, Scotland, 74 years ago, and came to Canada when 20 years of age, living first at Toronto. The late Capt. McKenzie was for many years in command of various schooners and was a sailor of the old school, one who felt for years that sailing on anything except a schooner was not sailing at all. He was a strict disciplinarian with his crews, but always commanded their respect.

## INCORPORATIONS

**Universal Coal Co., Ltd.,** has been incorporated, with capital of $100,000, to deal in and produce coal, wood and fuel of all kinds. Head office, Toronto. Directors: R. H. Parmenter, W. S. Morlock, and S. D. Fowler.

**The National Shoe Mfg. Co.** has been incorporated, with capital of $40,000, to manufacture and deal in boots, shoes, etc. Head office, Toronto, and provisional directors are : B. E. Bull, J. G. Shaw, and J. Montgomery.

**The Dyrob Steel Tools, Ltd.,** has been granted incorporation to forge, manufacture, etc., tool steel, iron, metals, etc. Capital is placed at $100,000. Head office, Toronto. Provisional directors: C. J. Baguley, T. Dunlop, S. McD. Robertson, and F. C. Dyer.

**Toronto Cabinet Co., Ltd.,** has been incorporated, with capital of $40,000, and head office in Toronto. The company can carry on business of makers and dealers in furniture, musical instruments, etc. Provisional directors: A. Whitehead, R. J. Smyth, and M. A. Gallagher.

### MARKET FOR PUMPS AND PUMPING MACHINERY IN SOUTH AFRICA

S. W. HONAKE, United States' vice-consul at Johannesburg, South Africa, reports as follows, in part, regarding the market for pumps in that country:

Pumps and pumping machinery are used principally to supply water to municipalities, to meet agricultural and rural needs, and to satisfy the requirements of the mining industry. As mining is the principal industry of both the Transvaal and Southern Rhodesia, the principal demand is in connection with it, and the equipment already in use is valued at millions of dollars and em-

braces the most modern and approved types.

**Types of Pumps Used**

Swiss, British and American pumps are used throughout this consular district. The most popular of the pumps manufactured in Switzerland is said to be the "Sulzer," while those imported from England are as follows: Climax, Tangye, Allen, Pulsometer, Pearn, Robeson-Davidson, Rees-Roturbo, etc. German pumping machinery has never been extensively used, but the "Hoppe" pump had a fairly large sale previous to the outbreak of war. However, it is said that the big pumping on the Rand is done chiefly with American machinery, working against heads of from 2,000 to 2,300 feet. Although the American plunger pump is stated to accomplish very good results, gradual inroads upon this system has been made by the high-lift centrifugal pump, which is manufactured both in the United States and on the Continent.

**Pumps Used in Mines and for Municipal Purposes**

Pumping conditions on the Rand are said to be about as severe as in any part of the world. The quantity of water pumped from the mines of the Witwatersrand is approximately 400,000 gallons per mile of reef. Pumps having the latest improvements have, therefore, been installed, and with some of these it is stated that it is possible to obtain an efficiency of 70 per cent. when raising fairly large quantities of water against a head of 4,000 feet in one lift.

It is stated by a large dealer that the average pump requires 500 gallons of water per hour up to 100,000 gallons for irrigation purposes.

For municipal purposes water is generally obtained from underground sources, as the surface-water supply systems are comparatively rare in view of the scarcity of lakes and rivers of importance near commercial or agricultural centres. In the case of the Witwatersrand, water is obtained partly from drilled wells and partly from shafts sunk in the dolomite formation. The Johannesburg municipality does not pump its own water, but obtains it from the Rand Water Board. The sale of water by this corporation amounted to 9,860,000 gallons a day for the period ended March 31, 1917. This is the largest quantity disposed of, the previous record being that of 9,637,000 gallons attained in 1913-14.

## QUADRUPLE "TUBE" SPEED

### Kearney Railway Claims Speed of 150 Miles Per Hour for Trains

The Kearney high-speed railway, so the inventor, Mr. E. W. Chalmers Kearney, told the Society of Engineers the other night, had now been satisfactorily worked out for speeds up to 150 miles an hour, and would come into use as soon after the war as was practicable. Future tube railways would provide effective speeds of from three to four times those of the present London tubes if the system was adopted. A recent improvement in the Kearney system was the design of a "stepless" street level station.


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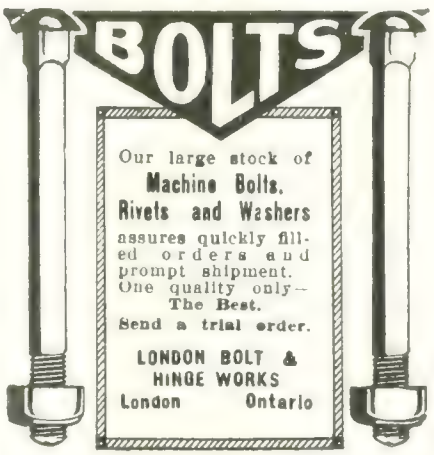
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The train would then proceed on a level until the approach to the next station, when it would run up a similiar [illegible] standstill without the destructive use of

## INCREASING CANADA'S MINERAL PRODUCTION

THE discovery by chemists in the Forest [illegible] of the Interior that pine oil can be produced from Canadian trees is of great interest to metal mining companies in Canada because this oil is necessary for the carrying out of the celebrated oil flotation process for the extraction of ore. The supply of pine oil from the southern United States is so limited that it is practically all required for United States mines. The Forestry Branch chemists not only discovered how to make pine oil in Canada but they found that a by-product, creosote oil, of the hardwood distillation industry could take the place of the more expensive pine oil. This means much to the mining interests of Canada, and is another evidence of the Government's work to aid industry in increasing production to the highest possible point in war time.

## MAKING MORE NOW THAN BEFORE WAR

### What An Investigation of the Old Country Business Has Brought to Life

THE immense profits made by munition manufacturers of Britain, and even greater profits which they would have made had it not been for the supervision of their contracts, are disclosed in the report of the committee on national expenditure, issued recently.

The committee found that in the aggregate twenty-six firms selected at random have made profits five times greater than in normal times; others have made profits of 27 per cent. on the turnover, or 341 on their capital.

On the other hand, technical investigations have resulted in the saving of £3,000,000 on cordite contracts, more than £35,000,000 on gun ammunition, £2,000,000 on gun equipment, and £1,700,000 on aircraft.

## ACCEPT HUDSON MAXIM'S "NON-SINKABLE" DEVICE

### U.S. Shipping Board Officials Take it for Experimental Work

HUDSON MAXIM'S device for a non-sinkable ship has been accepted for experimental purposes by the shipping board which anounced that officials had decided some start should be made toward producing vessels that could not be sunk by submarines.

Out of thousands of methods suggested the Ship Protection Committee, headed by John A. Donald, has selected several for special for special tests, of which Mr. Maxim's will be the first.

As described by Mr. Maxim to a Senate committee, after the shipping board first made an unfavorable report on it, his device consists of a row of cylinders containing water placed around the interior of a vessel's hull. Back of the cylinders would be a steel screen. Explosion of a torpedo would atomize the water against the screen, the vapor dispersing the heat and absorbing the gases which cause the damage in an explosion.

## START BUILDING FROM THE BOTTOM

### So B. C. Men Will Urge That Making of Pig Iron Get First Consideration

THE initial objective of the British Columbia steel delegation when it meets with the Federal authorities at Ottawa during the next few weeks will be the establishment, first and foremost, of a pig iron plant, if the proposal put forward at last night's meeting of the Central Iron Committee is given effect. The building and operation of a pig plant, it is held, may be the thin end of the wedge that will eventually shape itself into the most prolific iron and steel industry on the continent.

Mr. Thomas Walker, of the Hafer Machine Works, Vancouver, made the suggestion that as a starter in getting the wheels of the steel business turning the delegation should urge, prior to any hint at the proposition of building rolling mills or steel plate works, the establishment of a pig iron plant. Such a plan, he declared, would be building from the bottom and not from the top. If the production of pig iron was given the principal consideration in the representations to Ottawa, there was a good chance that something definite might be done at an early date. If the other more advanced and costly projects were put forward the result of the agitation might prove negative.

## COSTLY MACHINE TO TURN OUT BRIQUETTES

### Hamilton City Council Finds Out Where It Can Spend $40,000

SOME time ago City Engineer Gray, of Hamilton, wrote to the Malcolmson Briqueting Co., of Chicago, seeking information regarding machines which might be used in event of the city undertaking to manufacture coal briquettes from A. Peart's recipe. This morning word was received that a suitable machine could be purchased for about $40,000, and that information regarding it was being forwarded. The Peart briquettes are made out of coal dust and mud, but it is doubtful if the city will be willing to spend $40,000 on a machine to experiment with them.

## ANTHRACITE BUYERS ARE LESS INSISTENT

### But the Demand is Still Well Ahead of the Available Supply

*The Coal Trade Journal* of Buffalo says: "The weather having moderated, the demand for anthracite is not quite so insistent, but it is still running ahead of the supply. The local trestles have

been getting more chestnut coal than any other size, with little stove coming occasionally. Some officials who have urged customers to get their coal in early would gratify those in receipt of this excellent advice if they would add a word as to where the coal could be procured. Dealers are way behind on orders and expect to be for some time. After the severe winter consumers are in a mood to put in coal as early as possible.

## MINERAL PRODUCTION IN QUEBEC

THE preliminary statement of the mineral production in the province of Quebec for the year 1917 issued by the Department of Colonization, Mines and Fisheries says:

The total value of the mineral production of the province of Quebec during 1917, as shown by the provisional compilation of returns received at the department, amounted to $16,051,188. This is an increase of $2,764,164, as compared with the previous year, or 20.8 per cent.

In the tables "building materials" have been kept separate from the "products of the mines." As in the three previous years, the building materials show a decrease, whereas the products of the mine show an increase of [illegible] per cent.

The following gives the total figures of the province for each year since 1900. It may be seen that in eighteen years the value of the mineral production of the province has grown from 2½ million dollars to 16 million dollars, a proportional increase of 540 per cent.

| | | | |
|---|---|---|---|
| 1900.... | $2,546,076 | 1909.... | $5,552,063 |
| 1901.... | 2,997,731 | 1910.... | 7,323,281 |
| 1902.... | 2,985,463 | 1911.... | 8,679,786 |
| 1903.... | 2,772,762 | 1912.... | 11,187,110 |
| 1904.... | 3,023,568 | 1913.... | 13,119,811 |
| 1905.... | 3,750,300 | 1914.... | 11,732,783 |
| 1906.... | 5,019,932 | 1915.... | 11,465,873 |
| 1907.... | 5,391,368 | 1916.... | 13,287,024 |
| 1908.... | 5,458,998 | 1917.... | 16,051,188 |

The mineral production of the province for 1917 is as follows:

| | Quantity. | Value. |
|---|---|---|
| Asbestos, tons .... | 137,242 | $7,198,558 |
| Asbestic, tons .... | 17,210 | 42,139 |
| Chromite, tons ... | 35,726 | 495,981 |
| Copper and sulphur ore, tons ..... | 122,822 | 1,205,242 |
| Feldspar and kaolin, tons ..... | 2,028 | 19,969 |
| Gold, oz. ..... | 1,116 | 22,570 |
| Graphite, lbs. .... | 1,078,000 | 99,024 |
| Iron ore, tons .... | 11,593 | 31,365 |
| Magnestite, tons ... | 58,090 | 728,275 |
| Mica, lbs. ..... | 961,237 | 282,153 |
| Mineral waters, gals. ..... | 39,318 | 6,541 |
| Mineral paint (ochre), tons ... | 9,252 | 69,536 |
| Molybdenite, lbs. . | 207,286 | 158,096 |
| Phosphate, titaniferous iron ore, quartz, tons ... | 7,547 | 30,995 |
| Silver, oz. ..... | 96,620 | 78,880 |
| Zinc and lead ore, tons ..... | 4,618 | 242,778 |
| Structural Materials. | | |
| Brick, M. ..... | 55,699 | 503,638 |


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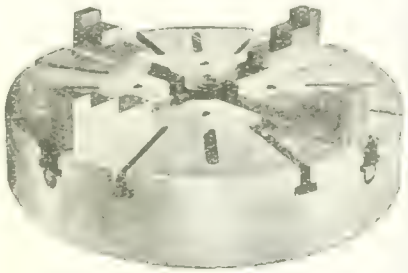

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| | | |
|---|---|---|
| Cement, Brls. | 2,979,401 | 3,264,661 |
| Graphite | | 197,150 |
| Lime, bush. | 1,274,868 | 280,527 |
| Limestone and marble | | 739,228 |
| Sand | | 131,465 |
| Sandstone, tons | | 7,475 |
| Slate and flagstone, square | 1,422 | 7,885 |
| Pipe, drain and sewer pipe, pottery, etc. | | 266,995 |
| | | $16,051,188 |

## ALBERTA MINES INCREASE OUTPUT

ACCORDING to the figures for 1917, as compiled by J. T. Sterling, of the Mines Branch of the Department of Public Works, the total output of Alberta mines for the year was 4,863,414 tons, with 283 mines in operation. One copper mine was opened up on the main line of the C. P. R. west of Banff, and two shale mines are in operation at Red Cliff, near Medicine Hat. The total output of lignite coal for the year was 2,637,829 tons; of bituminous, 2,206,868 tons; anthracite, 118,718 tons; and briquettes, 93,818 tons. There were also 31,630 tons of coke burned. The total output for 1916 was: Lignite, 2,172,801 tons; bituminous, 2,335,259 tons; anthracite, 140,544 tons; briquettes, 107,959 tons; coke, 41,950 tons. This is the first time that the output of lignite has not been greater than the bituminous. It shows a considerable increase in lignite and bituminous and a falling off in anthracite, briquettes and coke. The total number of men employed in Alberta in the lignite field during the year 1917 was 5,779, as compared with 5,060 in 1916; in bituminous, 3,746, as compared with 3,234 in 1916; and in the anthracite, 287 for 1917 and 305 in 1916. The total number of men employed for the year was 9,812 in 1917 and 8,599 in 1916.

## MACHINERY BELTING FOR SOUTH AND CENTRAL AMERICA

THE London *Times* trade supplement says that the export trade of Great Britain in machinery belting—whether of leather, woven hair, or cotton—is of some importance is proved by the fact that our share of this industry is valued at something over £1,600,000 per annum. The German export trade of a similar nature has hitherto had a value of £700,000 or £800,000, while that of Austria-Hungary has amounted to a little over £23,000. The Latin-American countries, especially the larger States of Argentina, Brazil and Chile, and perhaps Mexico, are consumers of all classes of machinery belting, since they are always adding to their existing manufacturing plant. There are no belting manufactories of any consequence in any of these states. British-made belting is well known and very well thought of in Argentina and Brazil, and fairly largely used in Chile. To Argentina before the war we normally sold such goods to the value of a little over £25,000, to Brazil £33,000, and to Chile £9,500. The corresponding exports from Germany to these countries amounted to £8,700, £6,200, and £3,350. In regard to the export of woven hair belting, as well as of cotton belting, British manufactures enjoyed a wide popularitw. In 1913 we sold goods of this description to Argentina of a value of £24,700 (against Germany's £5,450); to Brazil £20,200 (against Germany's £650); and to Chile, £13,100 (against Germany's £8,450). It is, however, in the smaller Republics—Cuba, Bolivia, Uruguay, and the Central Americas—that the more serious German competition had hitherto been met with. It is here, therefore, that at the present time we have the better chance of extending our connection. Ordinarily Cuba took from Germany manufactures of this class four times in excess of British supplies. In 1913 Germany supplied machinery belting of woven hair or cotton worth £1,200, against our £300. Naturally the United States furnished more than the two together, but that was due to the advantageous geographical position occupied by our Transatlantic competitor. The reputation enjoyed in all foreign markets by British-made belting (raw hide is usually accepted in preference to the ordinary tanned leather; being stronger and much thinner) is very sound. Continuous woven leather belts of British make are to be found in many of the principal machine shops and railway shops of South America, while the patent laminated belting, made of a number of leather strands placed side by side on edge and then sown together, has also a market. The most serious competitor of the leather belting has been the Gandy belting, which is waterproofed and unaffected by a change of temperature. This class of belting is found peculiarly suitable for the South and Central American markets. Another class of manufacture for which there should be a demand is the belting made of several plies of canvas treated with gutta-percha and balata since it possesses considerable strength and is thoroughly waterproof. United States manufacturers have introduced an improved kind of belting made of American cotton canvas, cemented in layers by vulcanized india-rubber, and covered by a specially prepared compound of india-rubber, which is forced into the canvas while passing through the rolls of a special form of calendar. Belts of this description have a smooth, even surface, and are found very durable and unaffected by damp or exposure—valuable factors where much of the belting in South America is in open sheds or employed in underground damp atmospheres.

## AUSTRALIA'S MERCANTILE MARINE

D. H. ROSS, Canadian Trade Commissioner at Melbourne, reports that the Australian Prime Minister created considerable surprise in an announcement to the effect that the Commonwealth Government has placed orders for fourteen ships in the United States. The majority of these vessels are now under construction and some are nearing completion.

Since the war 121,192 tons of coastal

shipping has been withdrawn by periodical requisitioning by the Government for transport and other urgent Imperial work. The decision of the Government to replace at least a portion of this tonnage by American cargo carriers was quite unexpected.

It is stated that ten of the new fleet will be ordinary steamers, with a speed of nine to ten knots. They are being specially constructed for wheat transport and will have a deadweight tonnage of about 3,300 tons. Four of the vessels are to be fitted with Diesel oil engines and, theregore, can be classed as auxiliary ships.

Particulars have already appeared of the fifteen cargo steamers purchased in June, 1916, by the Commonwealth Government. This fleet, comprising 65,245 tons gross and 41,868 tons net register, has been actively employed at such remunerative rates that it is now estimated the net earnings have paid off the original outlay of approximately £2,000,000.

In addition, the Commonwealth Government's shipping department has controlled, since the beginning of the war, twenty-one steamers aggregating 108,419 tons gross register and five sailing vessels of 12,312 tons gross. One of the steamers has since been made available to the Government of India. This fleet of sailers has been augmented by the purchase of a large ship in Melbourne, which is now being refitted for oversea trade.

On delivery of the steamers and auxiliary vessels now under construction in the United States, the Government will be operating forty-five steamers, four oil-engined ships and six sailing vessels. This fleet will serve a most necessary purpose for the transfer of Australian produce oversea, earning profitable freights on return voyages. The ships are of the standardized type, similar to that being built in England.

DURING last year the sale of electric domestic appliances in the U.S.A. showed a tremendous advance, chiefly owing to the growing scarcity of domestic labor; another factor in the increased purchase of appliances has been the better earnings received by the wage-earners generally. A total of 13,545 electrical appliances were placed on the Minneapolis Electric Company's lines during the period from January 1st to November 1st, 1917. Electric flat-irons were the most popular of all devices sold, the total numbering 4,601. Electric vacuum cleaners were next, the total being 3,091. The other appliances in the order of number of sales ranged as follows:—Toasters, 987; washing machines, 612; heating pads, 401; grills, 384; and curling irons, 343.


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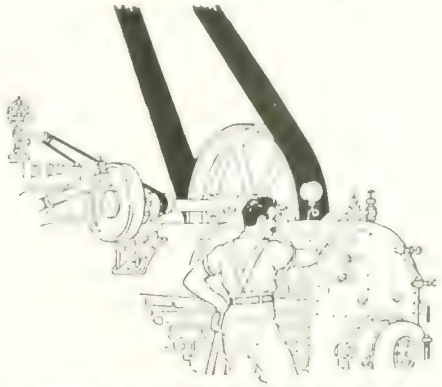


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# CANADIAN MACHINERY

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*A weekly newspaper devoted to the machinery and manufacturing interests.*

Vol. XIX. TORONTO, MAY 2, 1918 No. 18


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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Volume XIX No. 18 May 2, 1918

# The Organization of an Efficient Foundry Costs System

By M. H. Potter

*An efficient costs system is a necessity for the successful operation of the modern industrial plant. Without one the organization throughout is at a loss for information regarding the cost of making and merchandizing the articles manufactured, and no systematic allocation of overhead expenses is possible. In the following article a description is given of one system developed for use in the foundry, the various costs being reduced to a poundage basis.*

DURING the past few years rapid advances have been made in the foundry industry along mechanical lines. Some progress has been made towards better business methods and more efficient systems of organization, but it has been rather slow. The following practical system will effect economies in almost any casting plant.

Gradually, foundrymen are realizing that a well-equipped shop is only half the battle and that correct business principles are equally important. Consequently there is a growing interest in cost keeping, since business, if it be done at all, must be executed at a profit, and work turned out at a loss is worse than none at all.

### Cost Keeping Difficult

One reason why the foundry trade, referring especially to the jobbing shops, has been slow to take up the cost keeping question has been due to the difficulty in working out systems that are efficient, accurate and also inexpensive. The few shops fortunate enough to have good cost systems have jealously guarded the details, with the result that many plants are working in the dark, often bidding low and preventing the whole industry from being conducted on a profitable plane.

It should be stated at the outset that the figures given in the accompanying forms are introduced simply for the purpose of illustration. They are purely arbitrary and, while an attempt has been made to use reasonable values and preserve correct proportions, the figures given do not represent actual costs, either in the shop under discussion or in any other plant.

The cost of castings is estimated on a basis of material and moulding labor ac-

MONTHLY DISTRIBUTION OF FIXED CHARGES FOR YEAR 1917.

| DEPARTMENT NUMBER. | INVESTMENT ACCOUNT | | | DEPRECIATION ACCOUNT | | | MAINTENANCE | | INSURANCE | | TAXES | | POWER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VALUATION BASED ON APPRAISAL AND REAL ESTATE OWNED | RATIO PER CENT | MONTHLY CHARGE BASED ON 8% YEARLY ON INVEST. | TOTAL DEPRECIATION TABLE JAN 1 1916 | TOTAL DEPRECIATION VALUE DEC 31 1916 | MONTHLY CHARGE FOR DEPRECIATION | YEARS TOTAL MAINTENANCE | MONTHLY CHARGE | PER CENT INSURANCE TABLE | MONTHLY CHARGE | % TAXABLE PROPERTY | MONTHLY CHARGE | |
| ONE | $22,500 | 45 | $94 | $11250 | $10460 | $ 61 | $270 | $ 23 | 51 | $ 16 | $45 | $ 7 | |
| TWO | 13,500 | 27 | 56 | 6750 | 6270 | 41 | 66 | 13 | 24 | 11 | 27 | 4 | $15 |
| THREE | 1,400 | 38 | 8 | 950 | 878 | 1 | 23 | 2 | 7 | 3 | 3 | 1 | |
| FOUR | 11000 | 22 | 46 | 5500 | 5116 | 32 | 134 | 11 | 30 | 13 | 22 | 2 | 85 |
| FIVE | 1,100 | 2.2 | 4 | 550 | 526 | 3 | 13 | 1 | 1 | 2 | 1 | 1 | |
| TOTALS | $50,000 | 100.00 | $ 208 | $25,000 | $23,250 | $ 146 | $600 | $ 50 | 100% | $ 45 | $100 | $ 15 | $100 |

FIG. 1 MONTHLY SUMMARY OF COST ITEMS BY DEPARTMENTS

number of elements. The records necessary to supply this information are kept on three simple forms, which are illustrated herewith.

**Monthly Distribution**

Once a year the monthly distribution of fixed, overhead charges is made out

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | $800 | $ 800 | 33 | $2800 | | | Insurance 25<br>Taxes 1<br>Interest 60<br>Cleaning 220<br>Expense 30<br>Miscellaneous 30<br>Discounts 60<br>Selling Exp. 125<br>Contr=Labor 100<br>Sub. Total 675<br>Credit Dis. Earned 25 |
| | | | | 630 | 1725 | 146 | 1755 | Salaries | $600 | |
| | | | | $1510 | 3500 | 296 | Cost Dept. $4100 | | | |
| | | | | $1510 | $4760 | | $8860 | | | |
| | | | | | | | | TOTALS. | $600 | $ 650 $1250 |

FIG. 2 DISTRIBUTION OF FIXED CHARGES BY DEPARTMENTS

P is the price of metal per pound.

L is the cost of moulding labor for the casting.

F is a factor which expresses all other expenses in terms of moulding labor.

W is the weight of finished casting.

The factor F is obtained from the monthly cost sheet and includes the following items, each expressed as a per cent of the moulding labor:

F=N+M+I+C+O where N is the non-productive department labor:

M is miscellaneous expense in the moulding department.

I is fixed expense in the molding department.

C is the cleaning department expense.

O is core department expense.

In applying this formula the cost record must be depended upon the furnish the price of the metal per pound, P the cost of moulding labor for the casting L, and the factor, F, the latter being especially important since it involves a burden carried by each separate department, is computed.

Take for example the investment account. The total valuation of the plant based on appraisal and cost of real estate is assumed at $50,000. For the purpose of cost keeping the plant is divided into five departments, namely, melting, moulding, core, cleaning and office. The proportion of the total investment of $50,000, chargeable to each department is indicated in Fig. 2, and a monthly charge based on 5 per cent. interest on the investment in each department is calculated. The investment in department 1, melting, being $22,500, the interest on this sum at 5 per cent. is $1,125 per year, or $94 per month approximately. In a similar manner the monthly investment charge for department 2, moulding, is found to be $56; for department 3, core, $8; for department 4, cleaning, $46, and for department 5, office, $4, or a total of $208 per month, equivalent to 5 per cent. interest in the aggregate investment of $50,000.

**Computing Monthly Depreciation**

The amount chargeable to each department monthly for depreciation is computed in a slightly different manner. As indicated in Fig. 2, there are two columns under depreciation account, which show the total depreciative value of the investment in each department at the beginning of the year and again at the end of the year.

DAILY SUMMARY FOR ONE MONTH.

| WORKING DAY | DATE | TONNAGE | BANK BALANCE | ACCOUNTS RECEIVABLE | ACCOUNTS PAYABLE | CASTINGS SCRAPPED. | FURNACE SCRAP | FLOOR SCRAP | GATES AND RISERS | SALES | LABOR. MOLDING | CORE | CLEANING | FURNACE | OFFICE | TOTAL | No. OF FURNACES RUNNING | No. OF HEATS | No. OF POTS | PUNCHINGS USED | SCRAP USED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | $ | $ | $ | LBS. | LBS. | LBS. | LBS | $ | NUMBER OF MEN | | | | | | | | | LBS. | LBS. |
| 1 | 1 | | | | | | | | | | | | | | | | | | | | |
| 2 | 3 | | | | | | | | | | | | | | | | | | | | |
| 3 | 4 | | | | | | | | | | | | | | | | | | | | |

FIG. 3 DAILY SUMMARY OF COST ITEMS

The difference between these two quantities in each case is the total depreciation. This amount divided by 12, of course, gives the monthly depreciation charge directly. For instance, in department 1 the total depreciation value at the beginning of the year was $11,250, and at the end $10,460, the difference being 790, or $66 a month. The depreciative value of the entire plant at the beginning of the year is assumed as $25,000, or one half the total investment. While these figures are arbitrary in an actual case the depreciative value never equals the amount invested, since there is considerable property, such as real estate, which does not frequently depreciate and which, in certain cases, may even grow in value. When the various sums of depreciation have been computed in the manner described they may then be reduced to a percentage basis if desired.

Maintenance includes such extraordinary repairs and replacements as cannot be properly charged to depreciation, and which are always too large to be charged to operating expenses. The total of such charges for each department for the year is given in Fig. 2 under maintenance, and these items divided by 12 give the proper monthly charges. In a similar manner the insurance and tax items divided by 12 give the proper monthly charges, using the proper per cent. in insurable value and taxable property in each case as a basis.

The various calculations give a series of monthly charges, which may be transferred directly to the distribution sheet, showing the detailed costs in each department.

A monthly summary, showing the costs of each of the five departments is made out according to the form given in Fig. 1. From this summary the correct value for the factor F in the cost formula is obtained. The greatest simplicity coupled with accuracy has been aimed at in making up these sheets. The expenses in each department are divided into a number of general groups, such as labor, material and miscellaneous expense. The proper items for interest on investment, depreciation, maintenance, insurance and taxes are entered under a general head of miscellaneous expense in each case.

### Division in Melting Department

Taking for instance the melting department, the monthly charge for investment, as shown in Fig. 2, is $94, and under depreciation and maintenance $66 and $23 respectively. These items are set down against investment, depreciation and maintenance under the general heading miscellaneous expense in that portion of Fig. 1 devoted to melting department costs. In a similar manner the monthly fixed charges for the other departments, as given in Fig. 2, are transferred to the distribution sheet, Fig. 1. It will be noticed that the items charged to insurance and taxes in Fig. 1 do not correspond with the monthly charges for insurance and taxes for the various departments as given in Fig. 2. This is because an amount covering liability insurance and special taxes from month to month is added to the fixed portions of these items when they are entered in Fig. 1.

### Office Expense

There is no factor in the cost formula for office expense. This item, which amounted to $1,250 in the expense under

DISTRIBUTION OF COSTS FOR ONE MONTH.

| DEPT. 1. MELTING | EXPENSE LABOR | MISCELLANEOUS EXPENSE | TOTAL EXP | MATERIAL USED. | TOTAL COST DEPT. 1 |
|---|---|---|---|---|---|
| | | Investment $ 94<br>Depreciation 66<br>Maintenance 23<br>Insurance 30<br>Taxes 15<br>Crucibles 1300<br>Oil 730<br>Brick 10<br>Manganese 14<br>Aglucon 12<br>Aluminium 17<br>Vanadium 7<br>Misc Expense 21<br>Office " 54<br>Sub Total 2395<br>Credit Scrap 100<br>" Crucibles 145 | | Runchings $1600<br>Risers $ 100 | Castings shipped 100,000 lbs<br>Cost per ton $ 82<br>Cost per lb $ 041<br>Melt metal 4% loss 240,000 lbs<br>Cost per lb at exp of furnace $ 37<br>Cost per lb at edge of furnace $ 017 |
| TOTALS | $ 250 | $ 2150 | $2400 | | $4100 |

| DEPT 2 MOLDING | PRODUCTIVE LABOR | EXPENSE LABOR | % P.L | MISCELLANEOUS EXPENSE | AMOUNT. | TOTAL COST DEPT. 2. |
|---|---|---|---|---|---|---|
| Pay roll<br>Office | $ 1200 | $ 500<br>300 | | Investment $56<br>Depreciation 40<br>Maintenance 13<br>Insurance 24<br>Taxes 12<br>Office 325<br>Power 26<br>Sand 180<br>Gas 96<br>Crucibles 16<br>Tools 4<br>Miscellaneous 9 | | Castings shipped 100 000 lbs<br>Cost per T $56<br>" " lb 028<br>Cost of prod. labor per lb (average) $ 012<br>PER CENT P.L 133 |
| TOTALS | $ 1200 | $ 800 | 667 | $ 800 | | $2800 |
| RECAPITULATION | | | | | PER CENT P.L | TOTAL COST WHOLE PLANT |

| DEPT 3 CORE | EXPENSE LABOR | MISCELLANEOUS EXPENSE | TOTAL COST DEPT 3. |
|---|---|---|---|
| Office<br>Pay roll | $ 25<br>100 | Investment $ 8<br>Depreciation 6<br>Maintenance 2<br>Insurance 5<br>Taxes 3<br>Office 26<br>Coke 12<br>Sand 8<br>Miscellaneous 10 | Castings shipped 100 000 lbs<br>Cost per ton $ 4<br>Cost per lb $ 002 |
| TOTALS | $ 125 | $ 80 | $205 |

| DEPT. 4 CLEANING | EXPENSE LABOR | MISCELLANEOUS EXPENSE | TOTAL COST DEPT. 4. |
|---|---|---|---|
| Office<br>Pay roll | $ 400<br>225 | Investment $ 46<br>Depreciation 32<br>Maintenance 11<br>Insurance 25<br>Taxes 5<br>Office 245<br>Power 100<br>Sand 66<br>Hack Saw Blades 27<br>Barrels & Bags 20<br>Misc. 53 | Castings shipped 100 000 lbs<br>Cost per ton $ 35<br>Cost per lb $ 0175 |
| TOTALS | $ 1125 | $ 630 | $ 1755 |

| DEPT. 5. OFFICE | EXPENSE LABOR | MISCELLANEOUS EXPENSE | TOTAL COST DEPT 5 |
|---|---|---|---|
| | | Investment $ 4<br>Depreciation 2<br>Maintenance 1 | |

FIG. 1. FORM USED FOR SHOWING THE DISTRIBUTION OF COSTS FOR ONE MONTH

payrolls in the various producing departments. The total office expense, $1,250, consists of salaries $600, and miscellaneous expense $650, as indicated in Fig. 1.

The payrolls in each of the other four departments, melting, moulding, core and cleaning, are $200, $1,200, $100 and $900 respectively, the total being $2,400. The payroll in the melting department, $200, is therefore 8 1-3 per cent. of the total payroll of $2,400. Hence 8 1-3 per cent. of $1,250 office expense is charged to office in the cost of operating department.

The detailed expenses of department 1, melting, are grouped under three headings, namely, labor, expense, miscellaneous expense and material used. Space is also provided on the cost sheet for the total cost as indicated in Fig. 1. The heading expense labor includes $50, office labor charged to department 1, as explained above, and the $200 payroll. The latter covers the wages of the melters and their assistants, the total charged to expense labor being $250.

Under miscellaneous expense are grouped the five items covering fixed charges, namely investment, depreciation, maintenance, insurance and taxes. The method of entering the proper amounts against these items has been explained, miscellaneous expense also includes the amount paid out for crucibles, oil, brick, manganese, silicon, etc.

Since the melting department payroll is 8 1-3 per cent. of the total payroll, $54, of the $650, miscellaneous office expense is also charged with the foregoing items. The melting department is credited under miscellaneous expense with the scrap and crucibles sold, the net sum chargeable to the department being $2,150. In this case it is also assumed that the material used during the month cost $1,700, making the total charged to department 1, $4,100. It is also assumed that 100,000 pounds of castings are shipped. The cost per ton is therefore $82, and the cost per pound is $0.041. The cost per ton at the edge of the furnace, that is the cost based on material melted instead of on castings shipped, is $34 per ton. This figure is obtained by dividing the total cost, $4,100, by the amount of material melted, 120 tons.

### Department Two

The costs in department 2 are grouped under three headings, productive labor, expense labor and miscellaneous expense, also the ratio of the two latter items to the expense for productive labor is computed. The expense labor being $800, and the productive labor $1,200 the former is clearly seen to be 66.7 per cent. of the latter; the sum of the expense labor and the miscellaneous expense is $1,600, or 13.3 per cent. of the productive labor.

Since we have assumed that 50 tons of castings are shipped, the melting loss per ton works out at $56. The total cost for productive labor for the month under consideration being $1,200, the average cost per pound is calculated to be 1.2 cents. The various ratios to productive labor are very important, since they are used in computing the factor F appearing in the estimating formula.

From the foregoing explanation it is clearly evident how the expenses in the three remaining departments, cores, cleaning and office, are calculated. In each of these cases the expenses are grouped under two principal heads, expense labor and miscellaneous.

### Recapitulation

After the detailed expenses of each department have been worked out and the office expense properly proportioned among the other departments, the various totals are recapitulated, as indicated in the lower left hand corner of Fig. 1, and the ratio of all other expenses to the cost of productive labor in the moulding department is calculated. Using the figures which we have assumed this ratio is 296 per cent. The recapitulation, of course, does not include the melting department expenses, since the latter are dealt with separately in the estimating formula. As previously stated this formula is as follows:

$$\text{Cost per pound} \quad \frac{W\,P + L + F\,L}{W}$$

The price of the metal per pound, represented by P in the formula, is obtained from Fig. 1 under melting department expense, where it is given as $0.017 per pound. Fig. 1 also gives the average cost of productive labor in the moulding department as 1.2 cents per pound, and this may be used in computing the term L in the formula for any ordinary casting. In order, however, to have more specific information on this important matter separate records are kept giving the moulding time, and therefore the moulding cost of each job, with which new work may be compared. This is a more satisfactory method, since the average figure has only a limited application and is liable to lead to erroneous results if not properly applied. The individual records of moulding time indicate that the moulding time indicate that the moulding cost varies from $5 to $50 a ton. The factor F in the formula is obtained direct from the recapiulation in Fig. 1, and in this case is 296.

The application of the formula in connection with the cost quantities given in Fig. 1 may best be explained by an example. Assume for instance a connecting rod weighing 50 pounds. Assume also that the weight of the heads and rises is equal to 20 pounds, so that the total weight of the rough casting is 70 pounds. The cost of the casting is as follows:

$$\frac{W\,P + L + L\,F}{W}$$

$$\frac{(70 \times 1.7) + (50 \times 1.2) + (60 \times 2.96)}{50} = 7.15$$

cents per pound.

No cost system is absolutely accurate and the efficient system is the one which gives the most accurate results at the least expense. It is thought that the system described herein is specially noteworthy for its accuracy combined with economy. This is an important characteristic, since a cost system which is not accurate is worse than none. In fact, it is probable that more managers are led astray by false statements found in their cost records than get into trouble through the lack of any system at all.

Of course the human element enters into this phase of the question, it requiring no little amount of moral courage to face the actual figures when business is going badly. It is very easy in such cases to juggle the cost items a little so that they will give a favorable appearance, but this is encouraging a practice of self-deception that is very dangerous.

## A BIG INCREASE IN CANADA'S TRADE

AN increase of $315,292,044 in the trade of Canada during the fiscal year ending on March 31 last is shown by the monthly statement issued through the Customs Department. The statement shows that at the end of the last fiscal year the grand total of Canadian exports and imports was $2,564,482,215, as against $2,249,170,171 at the end of 1917. Domestic merchandise exported from Canada last year totalled $1,540,027,786, while the imports during the same period were $962,521,847. Foreign merchandise was exported to the total of $46,142,004.

Dutiable goods to the amount of $542,319,623 were imported into Canada during the year just ended, and free goods to the amount of $420,202,224. Duty collected during the year totalled $161,588,465, as compared with $147,623,230 in 1917. The imports of coin and bullion during 1918 were $12,279,173 against $28,081,120 in the previous year.

Although the total trade of the Dominion shows a marked increase in the year, the statement shows that there was a falling off in exports and imports in the month of March as compared with a year ago. In March, 1917, the total trade was $230,722,774, while during the past month it amounted to only $191,737,332. Of this total $87,255,698 represented merchandise entered for consumption in Canada, and the exports totaled $99,854,987.

Products of Canadian factories to the total of $636,602,516 were exported during the past fiscal year, as compared with $477,399,676 in 1917. Exports of domestic agricultural products reached a total of $567,713,584, and animal products exported amounted to $172,743,081. Products of Canadian forests were sent out of the country to the amount of $51,899,704, and Canadian minerals exported totaled $73,760,502.

## BRITISH INSTITUTIONS FAVOR DECIMAL COINAGE

THE question of a reform in the British coinage system has been urged for some time, and the movement has now gathered weight to such an extent that the advantages of the decimal system are

more generally recognized. In a report issued by the British Decimal Association details are given of a system which has been agreed upon as convenient and desirable by the Institute of Bankers, the Association of Chambers of Commerce of the United Kingdom, and the Decimal Association after lengthy deliberation in joint conference by these bodies.

### Eliminates the Penny

In considering the question of a change from the present to a decimal system the first difficulty to be dealt with is the fact that the penny is not a decimal submultiple of the pound sterling. It is considered wholly undesirable that any change should be made in the pound sterling, because of its universal recognition in the settlement of international transactions, and it has been decided, therefore, to retain it as the British standard monetary unit and to eliminate the present "penny" coinages, replacing the latter units by an entirely new series. The silver coins of the values of crown (5s.=$1.22), half-crown (2s. 6d. =$0.61), and threepence ($0.06) are also to be withdrawn.

The suggested coins are to be termed "mil," and the recommendations jointly agreed upon by the bodies above mentioned advise the adoption of the following table of currency:

| Coins | Value in £ | Value in Mils | Equivalent Value in Pres. Currency |
|---|---|---|---|
| Gold or Notes | | | |
| Sovereign ..... | 1.000 | 1,000 | Sovereign |
| Half sovereign .. | .500 | 500 | Half sovereign |
| Silver— | | | |
| Double florin .... | .200 | 200 | 4 shillings |
| Florin ..... | .100 | 100 | 2 shillings |
| ½ florin or shill. | .050 | 50 | Shilling |
| ¼ florin or sixpence .. .. .. | .025 | 25 | Sixpence |
| Nickel— | | | |
| 10-mil piece .... | .010 | 10 | 2.4 pence |
| 5-mil piece ..... | .005 | 5 | 1.2 pence |
| Bronze— | | | |
| 4-mil piece ..... | .004 | 4 | 0.96 pence |
| 3-mil piece ..... | .003 | 3 | 0.72 pence |
| 2-mil piece | .002 | 2 | 0.48 pence |
| 1-mil piece ..... | .001 | 1 | 0.24 pence |

It is urged that by this system it will be possible to adjust the price of goods or services more equitably and in more finely graduated proportions to the fluctuations in cost than is now possible. Under present conditions, it is pointed out, while the cost of many necessaries may increase by 20 per cent., the retailer must raise the prices of halfpenny goods and services by 100 per cent. to 1d., or of penny goods by 50 per cent. to 3 halfpence, for, although farthings (one-quarter penny) are coined, they are rarely used. British banks do not accept for deposit or pay out any fraction of a penny, but if the suggested system were adopted the smallest coin in value would be recognized.

## BRITISH INDUSTRIES FAIR

THE British Industries Fair, which has just closed, was held at the London Docks. Only British manufacturing firms were permitted to exhibit, and no exhibitor was allowed to show articles other than those of his own manufacture.

The main trades represented were those concerned with earthenware, porcelain and china, glass and glassware, fancy goods, stationery and printing, paper, toys and games—all affording evidence of the ability of British firms to capture business formerly in the hands of German and Austro-Hungarian competitors.

Special mention may be made of the exhibits by the group of exhibitors known as the British Chemical Ware Manufacturers' Association, wherein were centred key industries of paramount importance—glass, porcelain and filter paper for scientific purposes. The association comprises firms which have entered whole-heartedly into the problem of supplying our chemists, physicists, bacteriologists and medical men with many of their most urgent requirements; and an extensive variety of apparatus of excellent quality and design was displayed. Remarkable progress has been made with these commodities since the Fair of 1917. In engineering glassware, several firms showed ships' lantern dioptric lenses, railway lamp glasses, electric light and arc lamp globes and shades, gauge glasses, reflex glasses, protector glasses, cylinders, needle lubricators, miners' lamp glasses, etc.

## MARKET FOR OIL ENGINES IN ENGLAND

E. HALDEMAN DENNISON, U. S. consul at Birmingham, England, reports that there is a good demand in the Birmingham district for agricultural implements, particularly oil engines and tractors. Though a substantial amount of iron and steel has been released for the purpose of meeting these requirements, home manufacturers are experiencing some difficulty in meeting the demand. Even with regular importations from the United States and Canada there are arrears which, it is feared, may retard farm operations.

Oil-driven engines of moderate power are being called for in increasing numbers by agriculturists. Some of these are made in the district and others are imported. Engines of about 2¼ horsepower are being installed for the operation of mechanical milkers and other purposes, while for what is known here as "barn work" (pulping, chaff cutting, etc.) many engines of somewhat larger capacity are being sold.

While some British firms are building heavy tractors for breaking up the grass lands that are to be brought under wheat cultivation, they are unable to give the attention to the development of this branch that the occasion demands. A considerable proportion of the tractors now being acquired by individual farmers are of the type introduced from the United States by the Board of Agriculture. The ploughs attached to them, however, are more frequently of British make. They are adapted to the simultaneous ploughing of three or four furrows, according to the character of the land and the power of the tractor. Coming from plants of manufacturers who have gained their experience largely in the automobile industry, the domestic tractors are built with vertical engines, whereas in the United States the horizontal engine receives the preference. Some of the tractors are applicable only to agricultural operations; others can be used also for general road transport. Some of the smaller rural authorities are purchasing the latter type.

## WHAT IS A SKILLED MAN?

THE following definition regarding skilled workers and others is advanced by a correspondent in an English contemporary.

1. A skilled man is essentially a man who has served an apprenticeship (indentured or other) to the trade in which he is and has been continuously employed since completing such apprenticeship. He is capable of exercising his skill independent of his surroundings.

2. A semi-skilled man is a man who, not having served an apprenticeship to the trade in which he is employed, has acquired some skill in some portion or portions of the work which would otherwise be performed by a skilled man. He is only capable of exercising such skill as he may possess under certain conditions.

3. An unskilled man is one who performs any operation not requiring manual dexterity of any kind.

4. Both semi-skilled and unskilled men may have a special knowledge which is of importance in the particular work they are employed on but such knowledge cannot in any way amount to skill.

## AUTO IMPORTS TO CANADA

ACCORDING to the Department of Customs report for the fiscal year 1917, which has been tabled in the House of Commons, Ottawa, the total importations of automobiles for the fiscal year 1917 included 12,037 cars, valued at nearly $8,000,000, or one dollar per head for the population of Canada. There was almost as large a sum spent in the importation of parts, but these were largely for the manufacture of new automobiles in Canada—a Canadian industry. If the importation of entire passenger automobiles were prohibited outright, Canada would lose nearly $3,000,000 in duty. The figures for 1917 follow:

| | Value | Duty |
|---|---|---|
| Passenger autos .. | $7,981,177 | $2,790,256 |
| Freight autos .... | 423,824 | 148,338 |
| Motorcycles, etc. .. | 177,621 | 62,071 |
| Motor vehicles,parts | 7,200,017 | 2,171,723 |

ACCORDING to statements made by merchant captains arriving at ports in the United States the periscopes of German submarines are now being nickel-plated or bronzed with aluminum in order to make them invisible. This process, it is claimed, reflects the colors of the surrounding water and leaves the periscope indistinguishable from the water. The officers said the fact that so many steamships of late have been sunk without anyone aboard having seen any sign of a submarine is proof of the truth that the U-boat periscopes have been rendered invisible.

# U. S. Shipping Board: Its Handicaps and Accomplishments

By Edward N. Hurley •

*[illegible] transportation is the supreme question of the hour. Rumors and rumors have created some degree of uncertainty regarding the progress of [illegible]. On March 26 the following address was delivered before the National Union League at New York. The facts and figures are silently eloquent.*

If by [illegible] a bridge could be thrown across the Atlantic over which our armies, their artillery and supplies could move rapidly and unhampered to the battle lines in France, would any military man in Berlin, Vienna, Rome, Paris, London, or Washington have any doubt but that the world would be made safe for democracy before the year goes out? We have the men, we have the guns, we have the supplies, but without means of getting them to the front we might as well be without them. And unless we get our men to the battle line we will not win this war.

### Start Under a Handicap

So it all comes back to ocean transportation—to the vital need of ships. Fail there and we fail utterly. Upon the Shipping Board has devolved the responsibility of supplying this need, and supplying it under the most extraordinary conditions that ever existed-supplying it at the most crucial period of the war's history—at a time when every other industry is being taxed to its utmost capacity in the matter of materials and labor to provide [illegible].

The handicaps have been many. We were not a maritime nation. Our flag had almost vanished from the seas, and with the exception of a few widely scattered shipyards, merchant marine construction had almost become a lost art with us. Then came this sudden call to outdo the rest of the world in the upbuilding of a merchant marine; a call coming at a moment when the navy was undergoing the greatest expansion in its history, when most, if not all, of the established yards were feverishly engaged [illegible], destroyers, submarines, fuel ships, tenders, and other auxiliary craft, and when [illegible] called to government navy yards or private shipbuilding plants.

VIEW OF SLIP IN SHIPYARD SHOWING TYPE OF TRAVELLING CRANE AND SCAFFOLDING INSTALLED.

[illegible] by Committee on Public Information.

From the ground up, but of first securing the ground upon which to make a start, some of it marsh land which had to be filled in before launching ways could be laid. Therefore we who are engaged in the work appreciate the magnitude of the task. I doubt if its magnitude is generally realized. I am not here to emphasize that magnitude—I am not here as an optimist glorifying an outcome—I am not here as a pessimist saying the task can not be accomplished. I am here to tell you of the situation as it is—to deal with facts as they exist—to lay all of our cards upon the table, and face up.

When we took hold of this job of shipbuilding, we found there was not shipyard in existence with which we could place an order. The old yards, with their trained force of shipbuilders, were filled to capacity. We had to establish the yards first, get the shipbuilders to take charge of them and train the men to build the ships.

There were 17 steel shipyards in America at the time of our entrance into the war. We have located 81 additional steel and wood yards, while 18 other yards have been expanded. Does America realize what this job means? Does it realize what a tribute is paid to its own initiative in this achievement?

### Big Job in a Big Way

We are building in the new and expanded steel yards 235 new steel shipways, or 26 more than at present exist in all the shipyards of England. If we had been content with doing the job in a small way, we might have built a few new yards, and added a little to our capacity. A few ships might have been finished more quickly; but it was the spirit and will of America to do the job in a big way, and the judgment of the country will be vindicated by the results when all these new ways are completed and are turning out ships. Many of these ways have actually been finished. The new industry we have created will make America the greatest maritime nation in the history of the world.

### Battle With the Elements

Struggling against something that can not be avoided is more baffling than struggling against something that can be. You can appeal to striking men to go back to work, but you can make no appeal against zero weather. We did what we could. We told the new shipyards to go ahead and use dynamite in locating their pilings. The men in those new yards fought the bitter winter. They had the same spirit and demonstrated the same pluck and unselfishness as the men in the trenches. They have virtually completed the job of building America's new shipyards—the new yards that will make us the greatest shipbuilding nation.

It has been an uphill struggle. I am willing to confess there have been times when we have been discouraged, not at the magnitude of the task, but through a doubt of human ability to accomplish the stupendous work in the short time

But we have had our moments of elation when we have felt that we are making progress. The record made by the Skinner & Eddy Co., of Seattle, is a case in point. That company laid the keel for an 8,800-ton vessel, which was launched in 64 days. She was delivered to the Fleet Corporation on January 5, and started on the first voyage on January 14. This record accomplishment shows what can be done in live, wide-awake efficient American shipyards.

### Steadily Taking the Water

Then a few days ago we received a telegram from the Moore Shipbuilding Co., of Oakland, Cal., announcing the

successful launching of one of their large vessels. Twenty minutes later we received another telegram from the same company announcing the launching of a second ship of the same type, and 40 minutes afterwards a third telegram saying that a third vessel of similar character had gone overboard.

There are two methods for computing the construction of tonnage to show what is accomplished. One is by showing the tonnage in the water; the other is by showing the tonnage under construction. But when a great many ships are put under construction at the same time the question that should be asked is, How are they all progressing; how near to completion is the vast program? Here is the answer:

### Steel Construction Tonnage

The total amount of our steel construction program on March 1 was 8,205,708 dead-weight tons. This is made up of 5,160,300 dead-weight tons under contract with the Emergency Fleet Corporation, and 3,045,408 dead-weight tons of requisition vessels.

Of this total steel construction, 2,121,568 dead-weight tons, or approximately 28 per cent., has been completed. That means that in addition to the building of our big new yards we have also been building ships. That is, the program for steel ships has advanced 28 per cent. toward completion. Of the amount of steel ships under contract and under requisition, 655,456 dead-weight tons, or approximately 8 per cent., were actually completed and in service on March 1 of this year, nearly a month ago. This amount of floating tonnage exceeds our total output in 1916, including steel, wooden, and sailing vessels, by approximately 50 per cent.

In the yards which we have already completed and those which are nearing completion the progress will be cumulative from this time on.

### Building Yards and Ships

Thus, while we have been building the yards and training the new forces necessary to construction, we have also been building the ships.

Notwithstanding the difficulties of organization, of the handicaps of bad weather conditions, of transportation embargoes and railroad congestion, nearly as much tonnage has been constructed in American waters in the past three months as by all the other maritime nations of the world combined.

I have referred to the necessity of providing additional facilities for the building of ships. That is, for the creation of new shipyards, for enlarging old ones, for the education of new shipbuilders, and, I may now add, the necessity of providing increased means for obtaining engines, boilers, turbines, and other equipment. At the outset the 37 old steel yards began increasing their capacity until they now have 195 ways as against 162 eight months ago. Other parts of their plants have increased in proportion. We then made provision for additional new steel yards, some of which have been given financial assistance by the Emergency Fleet Corporation. Thirty additional new steel shipyards are thus being created, with a total of 203 shipbuilding ways. Thus we now have in the aggregate 67 steel shipyards either wholly or partly engaged in Fleet Corporation work. These yards will have a total of 398 steel building ways. Of these 35 yards, with 258 ways, are on the Atlantic and Gulf coast; 19 yards, with 66 ways, are on the Pacific; while 13 yards, with 74 ways, are on the Great Lakes.

VIEW OF STEEL HULL IN COURSE OF CONSTRUCTION. THE MEN ARE PLACING FRAMES IN POSITION FOR RIVETTING TO THE KEEL

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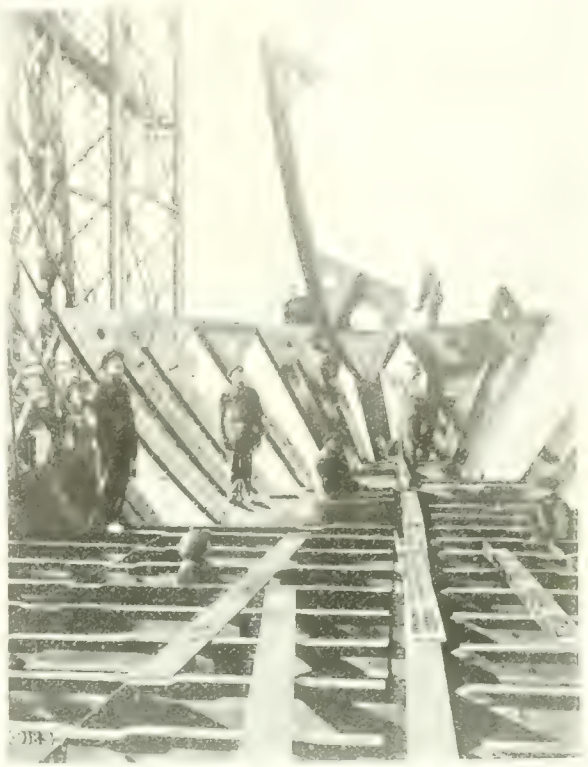
### Wooden Ship Construction

Our program for building wooden ships has been beset with many difficulties and handicaps which could not



ASSEMBLING THE LOWER PORTIONS OF THE BOW FRAMES OF A STEEL SHIP

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well be foreseen. A year ago wooden shipbuilding in the United States was almost a lost art. We found 24 old wooden shipyards with 74 ways. The capacity for wooden shipbuilding has been increased until we now have 81 wooden shipbuilding yards, with 332 ways completed or nearing completion.

Assuming that these ways will each produce two standard ships per year, we should turn out about 2,300,000 dead-weight tons of wooden ships annually. These 332 wooden shipbuilding ways, now nearing completion, added to our 398 steel building ways, will give us a total of 730 berths upon which to build steel and wooden vessels. When you consider that we had only 162 steel building ways a few months ago and 73 wooden shipbuilding ways—a total of 235—an increase is shown of 495 wooden and steel berths on which we can build ships.

### Delayed by Railroads

Our program on wooden ships was delayed by the fact that we were unable to provide the necessary big timber in sufficient quantities from the forests east of the Mississippi River. We found ourselves obliged to go to the west coast and arrange for the transportation of hundreds of carloads of Douglas fir, which it was necessary to substitute for long-leaf yellow pine for keels and other heavy timber. Here again we encountered a serious phase of the transportation problem. Our shipments were held up for weeks by the railroad embargo.

RIDING THE LOAD IN A SHIPYARD. THE MEN ARE CARRIED ON A SHIP'S RUDDER.

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the shipbuilding program caught the turbine and engine manufacturers totally unprepared. In the past the engines for ships built in this country had been manufactured at the shipbuilding plants. As contracts for new shipyards were given it became necessary to increase the turbine and engine building capacity at the same time. Special tools of all kinds were required for the engine builders' shops, and these tools had to be secured from manufacturing shops already overcrowded with war orders. In addition to this, the severe weather and the transportation tie-up seriously delayed the construction of some of our largest turbine-building plants. We anticipated delay during the earlier months for lack of the turbines and engines, but expect to make up for the early shortage.

### First Concrete Vessel

The proposal to build ships of concrete was first regarded as a fascinating absurdity. On March 14 there was launched from the yards of the San Francisco Co. the first concrete steamship, a vessel which the builders christened Faith. We hope she will exemplify her name. The builders believe she will, for in the telegram announcing the successful launching of the vessel were added these words: "Appearance after launching warrants us in saying to you that we believe this form of construction may be safely depended upon."

Now as to labor—[illegible] right arm. There has been much talk of conscripting labor—of forcing it into shipyards as our soldiers have been brought into the camps. I am fully aware that I am flying in the face of a growing popular sentiment that men should be drafted into the industry which supports the battle lines, but I wish to put myself on record as being opposed to the conscription of labor. I do not believe conscription necessary, for I believe labor itself will produce conditions which will render idle all thought of conscripting workmen. The vast majority of our workmen are men of intelligence, and when they come to a full realization of the fact that any defection on their part now will injure their fellow-workers in almost every field of industrial activity, I feel sure they will respond to all demands made upon them. Unless they fully do their part, their brothers will suffer.

### Labor Loyally Expected

It would be useless to manufacture material and supplies and pile up the products in the wharves if there are no ships to transport them. So unless our ship workers do their best, other industries must slow down or halt completely, with the result that thousands of workers throughout the country will suffer for lack of employment.

I believe that labor has begun to realize that fact, but I want to drive it home to them, for there are some, I regret to say, who do not yet sense their responsibility. There are many who are not working to their full capacity. There are many who, because of the high wages they are earning, are prone to take too many holidays. Labor generally throughout our shipyards is to-day receiving the highest rate of wages ever paid for similar work in the history of the world. The additional cost of our ships, due to increased wages in shipyards covering the program we have mapped out, will be in excess of $300,000,000. We expect, and we have a right to expect—the country has a right to expect—that labor will render for this increase of wages a corresponding increase in production—that is, the output of ships.

### Confidence in Leaders

All has not gone smoothly in the labor situation, and there have been times when this phase of the problem was enough to cause discouragement. The vast majority of laboring men are patriotic; the leaders whom I have known through close contact in Washington, especially Mr. Gompers and his immediate associates, have my confidence, and the country recognizes their patriotism. With only one exception the leaders of the shipyard crafts generally have shown a spirit of co-operation, ready to sink their personal differences in the common pool of patriotism.

We have established a labor adjustment board whose complete fairness can not be questioned.

We have felt that it was our duty to see to it that the problem of housing the workmen in these vast new plants we have been creating was solved with care. We have not rushed into this work with closed eyes. Our duty is to guard the public expenditures; to see to it that there is no abuse of the liberality of Congress in the matter of appropriations. Every dollar expended must bring a dollar's worth of return to the Government. The cost-plus system has been banned by Congress in the housing op-

ASSEMBLED COMPONENT OF SHIP'S FRAMING AWAITING INCORPORATION WITH THE HULL.

—Copyright by Committee on Public Information.

erations, because Congress itself, as well as the rest of us, have felt that there should be a greater check, not merely upon profits but upon the actual cost of all work done for the Government.

### Army of Reserve Workers

The new yards have been established, wherever possible, away from the congested districts, and while this was necessary, it brought with it the problem of transportation, as well as of housing. We are arranging now for proper transportation, as well as for proper housing.

We have recruited a volunteer force of 250,000 highly skilled mechanics who have, with a patriotism that has made us all proud, agreed to hold themselves in readiness for our call. These men are being held in reserve, remaining in their present employment until such time as in the development of our yards the demand arises for their services.

### The Fabricating System

This brings me to the point where I desire to make a brief reference to what have been popularly termed our three fabricating shipyards. The term is more or less a misnomer, for these yards, located at Hog Island, Newark Bay, and Bristol, Pa., are in reality assembling yards. The shipbuilding materials which will go into the making of vessels launched at these yards are being fabricated in scores of steel plants, scattered throughout the country as far west as Omaha, Neb. In some instances 95 per cent. of the work on these materials is being done at points far remote from the shipyards. The so-called fabricated ship is almost a new method of ship construction—almost as new to England as it is to us. But from the progress of the work as it has thus far developed we are confident that it will be the means of adding millions of tons to our merchant marine.

When the high point in the curve of production finally is reached and the magnitude of America's shipbuilding program is realized it will be a continuous performance of production and launching.

There is no doubt that we are destined to be one of the leading shipbuilding nations of the world.

STEEL MASTS IN COURSE OF CONSTRUCTION. PNEUMATIC DRILLING, RIVETTING, AND CAULKING MACHINES IN OPERATION.
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## BRITISH WEST INDIES TRADE

CLOSER commercial relations when the war is over between Canada, the British West Indies and contiguous British territory is a subject that is receiving some attention at the present time among upper Canadian manufacturers and shippers.

It is one that has a deep interest for the Maritime Provinces, as any development in the direction referred to must inevitably lead to increased shipments through the maritime ports of St. John and Halifax, and must also tend to stimulate the manufacturing industries of these lower provinces.

### Tariff Increases Trade

As a result of the operation of the preferential tariff, says the St. John "Board of Trade Journal," there has been a slight increase in the trade between Canada and the British West Indies. In the last fiscal year the imports from the West Indies reached a total of $14,239,595, as against $6,354,991 in 1916. Exports from Canada did not show the same ratio of increase, the figures for 1917 being $5,179,083 and for 1916, $4,134,901. It is quite apparent from the above that the manufacturers and shippers of Canada are not getting all out of the trade that they should get, or that they might obtain under improved transportation conditions.

The "Barbados Advocate," in a recent article on the subject, remarked:

"It cannot be too strongly pointed out that this one market, that of the British West Indies, is comparatively close at hand, is waiting for further development, and possesses these direct advantages that the merchants there are strongly desirous of having more extensive and closer trade relations with us, and that, already, throughout these colonies there are active branches of two leading Canadian banks, ready to assist with information and banking facilities in developing our trade."

### Fast Steamship Service

The same paper declares that these advantages would be futile if they were not linked with such transportation conditions as more frequent and quick steamship services between near Canadian ports and the British West Indies, fast through freight services with Canadian business centres timed to meet the arrival and departure of the steamships, and through freight rates and charges between the West Indies and Montreal and Toronto via a Canadian port and not exceeding those via New York and Boston. There must also be cold storage facilities; cool, ventilated accommodation, especially for fruits, in both steamships and cars, rapid sailings and prompt handling of cargoes.

These results can be obtained by the utilization of the advantages possessed by the Canadian ports of Halifax and St. John. Both possess peculiar advantages. St. John has western connection by two transcontinental lines, the Canadian Pacific Railway and the Canadian Government Railway; Halifax has the latter line of railway. There is practically little difference in the ocean distance between the two maritime ports and the West India Islands. The advantage in this respect is with Halifax, but there is only a difference of twenty-one miles. Against this short ocean advantage, St. John has the advantage of a very much shorter land haul by both transcontinental lines. By the Canadian Pacific Railway the combined rail and ocean mileage from Montreal to Bermuda via St. John is 1,254 miles, while via Halifax and the Canadian Government Railway it is 1,588 miles. In the shipments north of the molasses crop of 1917 a much larger proportion came via St. John, illustrating the advantage that the shorter rail haul to the interior gives to St. John.

Clearly, the two ports must work together in this as well as in other national enterprises involving the use of lower province ports.

Concentration of the business thought of Canada upon the whole question is very much needed at the present time, so that when the war is over no time may be lost in putting plans into effect.

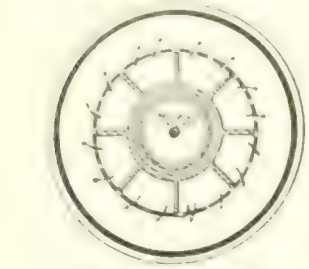
## SHIP'S AIR PURIFYING APPARATUS

DIFFICULTIES with the attuning apparatus of radio receiving and sending instruments have been the subject of experimentation by William J. Baldwin of New York, who recently designed an apparatus for a radio room that would admit air not only separated from rain, salt spray and spume, but that would also condition or regulate the humidity within the room by keeping it at a common standard of humidity, regardless of the outside changes.

Cold water in the spray form will do this, provided the spray can be gotten rid of after it has combined with the excess of humidity (steam in the air) and then separated from the air by some practicable form of apparatus that is simple and clean, and that occupies small space.

While a shower of rain will clear the atmosphere, the elements of nature have all outdoors in which to set up the appa-

as small as a cabin or radio cabinet.



Section X-Y

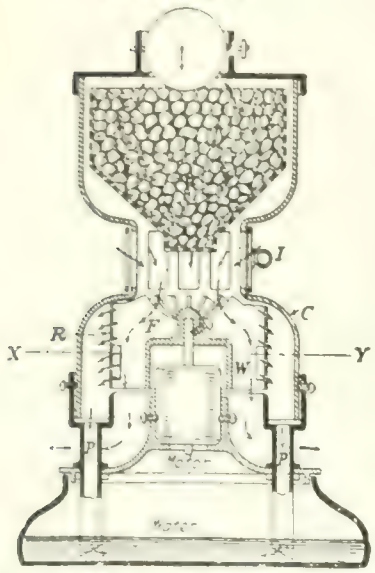



FIG. 1—SECTIONAL ELEVATION OF BALDWIN AIR DRYER AND COOLER.

apparatus was used similar to one designed two years earlier for the purpose of precipitating the $CO_2$ when found in great excess in a confined space, as in the hold of a submarine, when forced to stay a long time under water.

In this machine a spray of potash water was used in connection with a mechanical dust precipitator for the purpose of seizing on the carbonic acid in the air and thrown it down, so to eliminate the $CO_2$ at the dust and water discharge of the apparatus.

It was proposed to put the apparatus in a bulkhead; the discharge side of the apparatus coming into the air of the living quarters, the air freed of its $CO_2$ being forced back again into the chamber of greatest vitiation, thus forming a cycle.

In the general experiments it was found that a prepared spray of chemical liquid or even cold water not only seized the dust but on the other gases in the air, with which the chemical in the spray would combine, and that a pure-water spray turned into the apparatus would keep the humidity of the air constant by suitable regulation of the temperature of the water spray. In a room of 90° F. and a humidity of almost 90%, it was possible to drop the humidity to 45% by reducing the temperature of the spray to 70° F.

A simple form of the apparatus arranged for cooling a room is shown in Figs. 1 and 2. The apparatus from the inlet to the line X-Y (Fig. 1) is an ordinary fan or blower F, and the downward extensions of the fan blades or wings W are necessary to accelerate the rotary motion of the air.

The rotor R is a rotating hoop of permeable metal, against the inner side of which the air is thrown with all its impurities. If the heavy particles in the air, such as dust, mud or particles of water, strike into the perforations of the hoop, they pass through into a quiet space formed by the outer case C. Or, if they strike on the solid part of the hoop, they are rubbed through the nearest holes by the forward movement of the air. They then pass into the quiet space C, drop down within it, and escape by the pipe or pipes P into the tank.

The air does not escape with the heavy particles, as might appear at first, for the lower ends of the pipe legs are sealed by the water in the tank. The tank may be of any shape, or there may be no tank, the separated particles going to a waste pipe.

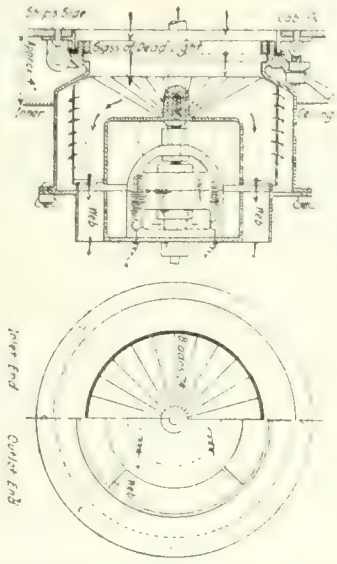


FIG. 2—ARRANGEMENT OF APPARATUS ADAPTED TO SHIP'S PORT-HOLE.

The greater the velocity of the rotor R the more efficient is the apparatus. A speed of 5,000 ft. per min. is very practicable, but 10,000 is not excessive, either from the point of bursting or for any other reason.

The fan gives the same static pressure as any other centrifugal blower of equal diameter and speed and requires only equal power for equal work, and the power required for separation and friction is considerably under 25% of the blower power required to move the air.

The device as described above illustrates the principle of the various types of apparatus, whether used for taking the dust from the air, the $CO_2$ from a chimney or an enclosed space, the excess of humidity from the air, throwing down fog, cooling and moving air, etc. It will be noted that the ice in the upper tank serves both as a cooling medium and for the supply of cold water, broken into spray by the rapid motion of the fan, for the purification of the air.

FIG. 3. ARRANGEMENT OF APPARATUS FOR REMOVING FLUE DUST FROM CHIMNEY GASES.

## BAY OF FUNDY SAFE

THERE was a time in the history of the Bay of Funday when some fears respecting its safe navigation were justifiable, but these days have long since gone by. With the protection that is thrown around the mariner in the way of lighthouses, lightships, for alarms, automatic buoys, bell-buoys and other forms of precautionary signals, the perils of the Bay of Funday navigation have now been almost wholly eliminated. This is borne out by the fact that for the past four years, though 22,614 ships, of a tonnage of 13,660,866 tons have passed in and out of St. John, coming from or going overseas, there has not been a single casualty of any consequence to any of them in the Bay of Fundy.

Some years ago, when the question came before the St. John Board of Trade, a careful study was made of the wreck record for a period of eighteen years subsequent to 1896 with the result that it was shown that with a total tonnage of 42,029,262 tons entering the port, the casualty average was only .033 of 1 per cent. This statement was based on the whole Bay of Fundy from Cape Sable up.

The statements above made as to the safety of the Bay of Fundy were fully established in the evidence submitted to the Special Pilotage Commission (which sat in St. John recently) by several masters of ocean steamers using this port. The pilotage service in the Bay of Fundy was also favorably commented upon. To make the pilotage service more effective it was recommended to the commission that the present three districts be consolidated into one and a pilotage station established about eight miles below Partridge Island.

The suffocating poison gas first used by the Germans is not chlorine as generally supposed but phosgene, which is a combination of chlorine and carbon monoxide. This powerful gas is an important factor in the manufacture of synthetic colors. Here is a case where a German peace product was immediately available for military offensive.

# Some Considerations Regarding Modern Plant Organization-V

By M. H. Potter

*The factors which enter into the successful manufacturing business of to-day are interdependent to an ever-increasing degree. Location, type of building, transportation facilities, staff organization and plant equipment are features which require to be considered both singly and as a whole in relation to the particular product to be undertaken. A clear and concise idea of such considerations is necessary before entering any one line of manufacture.*

### Cost Records

A CONVENIENT system of indicating what work shall be got out by the shop has been found to be a system of orders, known as production orders or shop-work orders. These orders must be capable of being separately identified, and it will be readily understood that to give each the actual name of the work in progress would not be practicable; therefore, a system of numbers is used, and by the number given to a work order the work is known in all its stages.

It is desirable to allot a series of numbers for standing orders. The distinction between a factory "standing order" and a "factory work order" is that the former is an order, which stands until changed, to perform certain work in the nature of expense, and to which such material as may be used is charged, also the labor pertaining thereto, while the work order is issued to authorize work to be got out in the nature of product and to identify it while in progress of manufacture.

### The Cost Clerk

One clerk to be known as the cost clerk—with such assistance as may be necessary—should be responsible for the operation of the cost system. In the equipment of his department there is ample opportunity for the use of cards, indexes, loose-leaf records, and other convenient and quick helps in the assembling of cost data.

### Importance of Exactness

If system is desirable in the workshop in obtaining records, orderly methods should also obtain in the cost department to permit of the information furnished by the factory records being assembled for entry in the cost accounts with reasonable promptness. This is necessary if the cost system is to be effective.

The entry in the cost accounts of charges from factory records should never be allowed to be in arrears. It is not unreasonable to expect that the entry of charges in the cost records shall be overtaken on the day succeeding that in which they occur. Cost accounts lose much of their value when the information they purport to give is delayed for weeks after the completion of the product.

If the system of obtaining costs is found to affect the promptness with which records should reasonably be expected, then the cause of the delay must be located and an immediate remedy provided, whether it be in the factory or in the cost department. It may be that the clerical assistance is inefficient, or, if it is efficient, the work is in excess of the means to overtake it. These conditions are also capable of adjustment.

If the cost of machine operating is kept, the cost ledger should contain accounts with the various machines. The form of ruling to be used in the cost ledger accounts will be as varied as the industries for which it is required. There should, however, be sufficient provision for analytical detail to show quickly what the cost is, and what it contains.

MAXIMUM STOCK _____
MINIMUM STOCK _____

UNIT____ NAME OF ARTICLE _____

| RECEIVED | | | | ISSUED | | | | BALANCE | |
|---|---|---|---|---|---|---|---|---|---|
| DATE | ORDER | QUANTITY | COST | DATE | REQ | QUANTITY | COST | QUANTITY | COST |
| | | | | | | | | | |

FORM 1 STOCK CARD

### Installation of a Cost System

In the installation of a cost system one of the first points requiring consideration

REQUISITION No _____

To Account No _____ Date _____

MATERIAL REQUISITION

For Production Order No _____ Shop Order No _____

Required For Department _____ The Following Material For Making: _____

_____

USE A SEPARATE REQUISITION FOR EACH ITEM

| QUANTITY | KIND OF MATERIAL | PRICE |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

By _____ O.K. _____ Sup't.

FOREMAN _____

_____ Record Clerk

FORM 2 REQUISITION [illegible] REMOVAL [illegible]

is a simple and efficient purchase system. The purchasing agent maintains a card index giving details as to sellers and their specialties. A purchase order blank

| DATE | ORDER No 1 | ORDER No 2 | ORDER No 3 | ORDER No 4 |
|---|---|---|---|---|
| | | | | |
| TOTALS | | | | |
| | | | | |
| L. F | | | | |

FORM 3 SUMMARY RECORD OF MATERIALS USED.

departments, and the fourth copy is retained by the purchasing department.

### Method of Working

The goods having been received, the invoice accompanying same is compared with the order and checked as to quantity and quality; the invoice is then passed to the purchasing department for approval of prices, after which it is sent to the accounting department. The prices mentioned in the invoice are now entered on the copy of the original order which the accounting department has received, and the order is sent to the factory superintendent, who exchanges his copy for the one he now receives, first checking with his requisition to verify the fact that all goods required have been ordered and shipped. The factory bookkeeping department next enters upon the stock record the quantity and prices of the goods.

For the verification of receipt of goods, prices, extensions, all necessary approvals and the ledger folio of the creditor and the designation of the account which is to receive the debit, a form should be rubber-stamped on some convenient space on the invoice. A cover on which is summarized the charges and credits contained within is then fastened to the invoice, and through this medium posting can be made directly to the accounts affected. In practice, however, it has been found advantageous to post only the creditors' ledger from the invoice, carrying the debits to a purchase summary, from which monthly totals are posted to the general ledger accounts.

### First Necessary Requirements

The raw material having been received, a stores ledger is necessary in order to keep a summary of the following:

1. Material received.
2. Material used in the factory.
3. The exact amount of material used on any particular piece of work.
4. Data to maintain a running or perpetual inventory. One card or page is allotted to each article purchased. (See Form 1.) From this it will be seen that when goods are received the stock clerk places at once on the debit side of the card the date of receipt, quantity purchased and unit price.

### Withdrawals

When goods are to be withdrawn from stock for use it should be done only by requisition, prepared usually in triplicate, and properly signed by some one competent. This requisition contains at the top the number of the order against which the material is to be charged, the date, and the quantity desired (see Form 2).

NAME _____ DATE _____ WORKMAN'S No. _____

| ORDER No'S | No HOURS | UNIT RATE | EXTENSION |
|---|---|---|---|
| | | | |

FORM 4- TIME CARD ALLOCATING TIME TO VARIOUS WORK ORDERS.

One requisition should be used each time material is drawn, each order having a separate requisition. The worker requiring the goods should go to the clerk who issues the goods, secure on one requisition a proper receipt, file this, and on the other requisition make an extension from the stock card of the cost of the material issued. This requisition is then sent to the accounting department, where it is entered on a summary sheet of materials consumed (see Form 3) the amount being extended to the column designated to correspond with the order number against which the goods are drawn. This sheet is totaled every period and the total charged in the cost ledger to the respective order. In the general ledger manufacturing is debited, and materials and supplies credited.

A trial balance of the stores ledger should be taken monthly, its balance of stock may be verified by checking with the physical inventory at regular periods or at such times as the various items of stock are at a minimum. It should also agree with the balance of "raw material" account on the general books.

### Time Reports

Each employee engaged in productive labor is required to report his time each day on a daily time report, showing the number of hours consumed on each order number (see Form 4). This report is checked by the foreman and passed to the accounting department.

When these time reports get to the accounting department they contain merely the employee's number, the number of hours employed on respective order numbers, and the date. The time clerk will then extend the cost of labor expended upon each, and all reports relating to the same number are collected and the number of hours and cost thereof on a labor distribution sheet (see Form 5).

At the end of each paying period this sheet is totalled, and should, of course, equal the amount of the pay-roll, which is posted directly from the time reports. This makes one of the best possible checks on the pay-roll. In the general ledger, manufacturing is debited and accrued labor is credited. This will always keep a credit balance to accrued labor, except on the day on which the

| DATE | ORDER No 1 | | ORDER No 2 | | ORDER No 3 | |
|---|---|---|---|---|---|---|
| | HOURS | AMOUNT | HOURS | AMOUNT | HOURS | AMOUNT |
| TOTALS | | | | | | |
| L.F. | | | | | | |

FORM 5 ALLOCATION OF TIME COSTS TO PROPER WORK ORDERS.

pay-roll is paid, and even then in cases where payment is not made up to date. The cost of the productive labor expended on each order number is then posted to the debit of the respective order accounts in the cost ledger from the summary sheet.

### Incidental Expense Reports

In order to ascertain correctly the general expense, it must always be remembered that the labor expended upon the reports is always non-productive. The orders or units against which all general expenses are charged are, in every instance, standing orders. The material is ascertained usually in the same way as outlined above for material in general, but there is apt to be a deviation from the rule that the storekeeper receive and issue all materials. It is sometimes necessary that the supplies be first consumed and then a report made as to the order numbers against which they should be charged. This often occurs in the consumption of very small lots of inexpensive supplies, such as coal, etc. A summary sheet of materials consumed is shown in Form 6.

The time expended under manufacturing expenses is reported in the same manner as that expended by productive labor, except that no record is kept of the number of hours expended.

| DATE | ORDER-A | | ORDER-B | | ORDER-C | |
|---|---|---|---|---|---|---|
| | AMOUNT | | AMOUNT | | AMOUNT | |
| | | | | | | |
| TOTALS | | | | | | |
| L.F. | | | | | | |

FORM 6—MISCELLANEOUS MATERIAL ORDER FORM.

| ACCOUNT | AMOUNT | ORDER No | HOURS | RATE | EXTENSION | L.F. |
|---|---|---|---|---|---|---|
| | | | | | | |
| TOTALS | | | | | | |

FORM 7. DISTRIBUTION SHEET OF MANUFACTURING EXPENSES

Having charged to each account in the manufacturing ledger the expenses pertaining to it, the next step is to distribute them over the various orders for the production of goods as shown in the cost ledger. This distribution is made by means of a distribution sheet of manufacturing expenses (see Form 7).

In the account column is placed the name of each account appearing in the manufacturing ledger, and in the amount column the total expended under the account. In the order number column are placed the numbers of all the orders worked on for the period, taken from the cost ledger, and in the next column is placed the number of hours of productive labor expended on each such order number. The total of this number of hours divided by the total amount expended as given in the amount column gives the unit rate or constant by which the total amount of the manufacturing expenses is thus properly distributed, and is ready for transfer to the proper accounts on the cost sheet. This distribution is made at the end of each period.

### Closing of Completed Order Numbers

When the articles to be manufactured by an order are completed, that order number is ended and the account in the cost ledger must be closed. To do this a summary sheet of order numbers completed is prepared for each given period (see Form 8. This is the medium through which is completed the transfer from goods in process of manufacture to finished product.

### The Main and Auxiliary Ledgers

In addition to the main or general ledger, there are four auxiliary ledgers maintained, each of which has a controlling account in the main ledger. These are: Stores Ledger, Cost Ledger, Creditors' Ledger, Manufacturing Ledger.

The account in the main ledger is manufacturing, which is the controlling account for the cost ledger. This account is debited with the total account of material drawn from stores, accrued labor, and accrued manufacturing expenses.

| DATE | ORDER Nos | FINISHED PRODUCTS | |
|---|---|---|---|
| | | SALES | STOCK |
| | | | |
| TOTALS | | | |
| L.F. | | | |

FORM 8. SUMMARY SHEET OF ORDER NUMBERS COMPLETED

The auxiliary ledgers are self-explanatory. The stores ledger is a record of stock received and issued. The total purchased is carried to the main ledger through the summary sheet of goods received.

The summary sheet of orders completed is posted in detail to the credit of respective completed orders in the cost ledger, there being no debit, this being but a transfer of completed orders from the cost ledger to the summary sheet. The summary entry on this sheet is posted in the main ledger to the debit of finished product and to the credit of manufacturing.

When this transfer of cost totals for the month to the general books account has been made, there remains but little to be done to complete a monthly statement of the results of operating and trading. The figures presented are not the results of estimates but of actual operations, and, if the accounts have been well and carefully kept, are not of less value because of being presented at the end of the month, instead of at the end of twelve months. Monthly statements of operating and trading are of the greatest value.

In these days of immense transactions, quick trading, close margins and frequent incident of risk, yearly statements showing the results of operating and trading are largely matters of past history. Something more than this is required for the wide-awake business man. In a fiscal year a concern may suffer serious loss, or let pass the opportunity to engage in profitable manufacturing because of the absence of immediate information which modern methods of accounting would afford. Once a complete system is installed the issue of frequent statements is a matter of comparative ease, with the result that the company is at all times thoroughly in touch with every phase of its affairs.

## UNITED STATES MACHINERY AND TOOL BUILDERS' WAR CONVENTION AT CLEVELAND

Cleveland committees which are working ply industry the largest in the histories of the various organizations which will

To consider ways and means of keeping the supply and machinery industry and decisive conclusion will be the work of the convention. During the week of May 13 the Hollenden Hotel, Cleveland, Monday and Tuesday, May 13 and 14, the National Pipe and Supplies Association will meet. Wednesday, Thursday and Friday, May 15, 16 and 17, there

HOTEL HOLLENDER, CLEVELAND, WHERE CONVENTION IS TO BE HELD

will be a joint convention of the National Supply & Machinery Dealers' Association, the Southern Supply & Machinery Dealers' Association and the American Supply and Machinery Manufacturers' Association.

R. F. Valentine, of Cleveland, president of the American Supply & Machinery Manufacturers' Association, has been named the chairman of the Cleveland committees. W. M. Pattison, general chairman, is past president both of the National Supply & Machinery Dealers' Association and the National Pipe & Supplies Association. Mr. Pattison is a member of the Stores Division of the Council of National Defence, and is one of the most active civilian aides of the Ordnance Department in the present emergency. H. W. Strong, chairman of publicity, is president of the National Supply & Machinery Dealers' Association, and was one of its organizers.

D. K. Swartout, chairman of the press committee, is past president of the American Supply & Machinery Manufacturers' Association. H. E. Dickerman, chairman of the decorations committee, is also past president of the American Supply & Machinery Manufacturers' Association. S. D. Latty, of the Kirk-Latty Mfg. Co., is chairman of the entertainment committee. George M. North, of the Ferry Cap & Set Screw Co., is chairman of the finance committee. H. C McKean, of the Standard Tool Co., is chairman of the ladies' entertainment committee. F. H. McIsaac, of the Kirk Latty Mfg. Co., is secretary of the convention, and Harold D. North, of the Ferry Cap & Set Screw Co., is treasurer.

At the Wednesday session addresses will be given by the presidents of the associations represented and reports and discussions on business methods will take place.

Papers will be read by representative manufacturers on the business situation as affecting their various lines on Thursday and addresses on the supply and machinery man's part in winning the war will be given. Friday will be given over to executive sessions and discussions on sales problems.

It is expected that a national speaker will be present to give an address dealing with the machinery and supply trade as relating to the war.

## NAVIGATION OPENING ADJUSTS EXCHANGE

CANADIAN financiers expect the exchange situation to become more normal now that lake navigation has opened. Vast stores of Canadian grain ore and merchandise have lain in the holds of vessels, warehouses and granaries throughout the winter months awaiting the going out of the ice. These stores of goods will now be delivered in American ports as rapidly as Canadian wooden and steel freighters can carry them there.

Steamship companies look for the most active freighting season ever experienced on the Great Lakes. Not only have several new vessels been put into commission, but many old vessels have been completely overhauled and put back into service. In addition to this the holds of most passenger steamers have been enlarged, and all but a few passenger vessels will also carry package freight. Authoritative figures show that actual lake tonnage will be considerably greater than a twelve-month ago, despite the taking over for war purposes of a number of fresh water boats.

Exchange statistics show that soon after the opening of navigation last year there was a sharp decline in Canadian funds of New York, and that after shipment of Canadian goods had been going forward by water for about a week, par was reached and from then on the exchange rate ruled more favorably for Canada. At the present time the rate for us is much more unfavorable than a year ago, as the balance of trade is preponderatingly in favor of the United States. So that even with increased shipments of Canadian goods it may take longer for a rate favorable to Canada to be reached. But the Canadian restriction of imports recently decided upon is also a considerable factor which will materially assist in reducing the balance of trade now against Canada.

## CANADA BUYING ROLLING STOCK

CANADIAN car builders will require about 80,000 tons of steel bars, plates and shapes for the construction of cars, and 30,000 tons of cast rolled and forged steel for building locomotives, orders for which have been placed with equipment manufacturers in the last few weeks. This steel tonnage is probably a part of the 700,000 tons reported on order with American mills for shipment to Canada. In addition to the 6,400 cars placed with the Canadian car builders a few weeks ago, the Dominion Government has ordered from American manufacturers 1,721 cars, including tanks, refrigerators, side and centre dump cars and cars for passenger service. The total expenditure of the Canadian Government for cars and locomotives will be $32,966,515, of which $23,759,435 is for car construction alone. Some additional orders for cars and motive power may be placed in the near future.

THE Shanghai electric power station continues to suffer from the defective working of the German machines, says "Eastern Engineering." A recent report by the acting engineer-in-chief and manager, Mr. A. H. Blagden, shows that further serious breakdowns have occurred, with the result that in November of last year the whole of the 14,000 kilowatts of A.E.G. plant was out of commission. It was impossible to effect all the repairs locally, and it is questionable even when the repairs have been made that the results will be satisfactory. It is significant that this failure of German electrical machinery has also occurred in such widely distant countries as South Africa and Australia, so that the breakdown in China is not an isolated or exceptional case. It is equally significant that the British machinery at Shanghai has stood the test of time, and has in every way proved itself superior to the A.E.G. plant.

## TEST PIECES FOR MATERIAL COMING UNDER SUPERVISION OF LLOYD'S REGISTER

By A. F. Menzies.

METHODS and procedures for the accurate testing of materials have assumed great importance in the last three years, consequent upon the expansion in all metal working industries necessitated by the insatiable demands of modern warfare. The impetus given to shipbuilding by the inroads of the submarine and the increased volume of traffic handled has resulted in a widespread demand for knowledge of matters relating to design and construction and the testing of materials entering into ship construction is of considerable interest at the present moment.

Material entering into the construction of ships coming under the supervision of Lloyd's Register of Shipping, is subject to test and the test-pieces illustrated in this article have been standardized by a Canadian plant for their own convenience. Since considerable time can be wasted in the looking up of specifications and requirements for the test-pieces used, tabulated drawings were prepared in such a manner that all the dimensions required by Lloyd's and those governed by the design of the machine were readily accessible together with the requirements which had to be met by the test-pieces under load. By this means the information was always available and the making of rough sketches was obviated.

Fig. 4 shows the test-pieces required for the tensile proving of plates and shapes. The elongation required in the table applies to material ⅜ inch thick and over. For ship-material less than 5/16 inch thick the requirements as regards elongation are slightly smaller, the minimum elongation necessary being 16 per cent. For boiler plate the elongation of material less than ⅜ inch thick may be not more than 3 per cent. below the tabulated values.

The cold and temper bend test piece for plates and shapes is shown in the upper view of Fig. 2 and for cold and temper bends the test piece must withstand bending double on itself, the maximum allowable internal radius being 1½ times the thickness of the test piece.

The tensile test pieces for bars are shown in Fig. 3. Test piece B is used for bars one inch or less in diameter and C for bars over one inch. Test piece B may be used for bars over one inch in diameter provided that the diameter of the gauge length is turned down to one inch or less diameter.

For steel castings and forgings the test pieces, shown in Fig. 4, are threaded. This enables a shorter over all piece to be used and economizes in material. The third piece would have required an 1½ inch thread which would have been too large for the jaws of the testing machine. This piece is therefore shown with a square end, which also enables a shorter grip to be taken than if the piece were cylindrical.

The bend test pieces for steel forgings and castings are shown in the lower part of Fig. 2. The test piece for steel castings must withstand without fracture being bent cold through an angle of 120°, the internal radius being not greater than one inch.

The bend test piece for steel forgings must withstand being bent cold through an angle of 180° without fracture, the internal radius being not greater than ¼ inch.

FIG. 2.—UPPER COLD AND TEMPER BEND TEST PIECE FOR PLATES AND SHAPES. LOWER BEND TEST PIECE FOR STEEL CASTINGS AND FORGINGS.

**Cold and Temper Bend Tests For Plates and Shapes**

In a cold bend test and in temper bend tests for plates and shapes [illegible] 1 in. in thickness the rough edge may be removed by filing or grinding. In samples 1 in. in thickness or over the edges may be machined. For both cold and temper bends the test piece shall withstand, without fracture, being doubled over until the internal piece and the sides are parallel.

**Bend Test Steel Castings and Forgings.**

For steel castings the test piece must withstand without fracture, being bent cold through an angle of 120° the internal radius being not greater than 1 in.

For steel forgings the test piece must withstand, without fraction, being bent cold through an agle of 180é the internal radius being not greater than ¼ in.

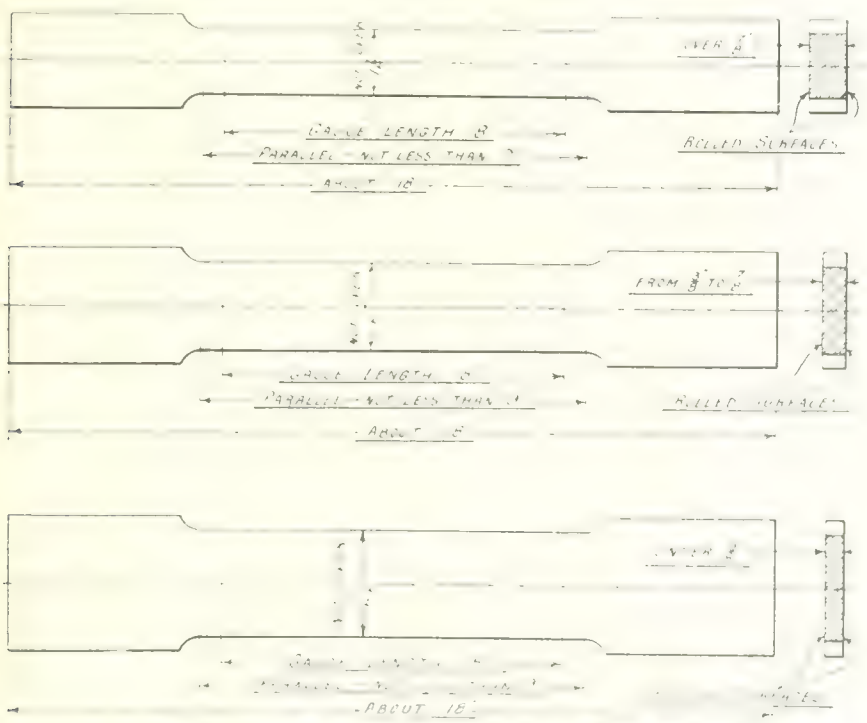



FIG. 1.—TEST PIECES A FOR PLATES AND SHAPES.

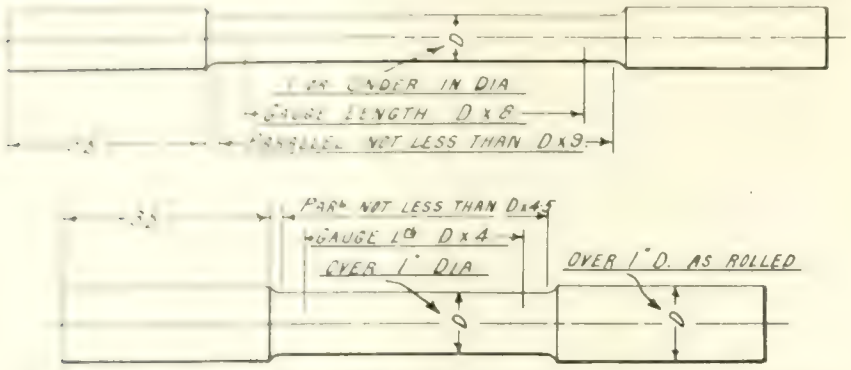
| TABLE I.— | Tensile Strength | Elongation |
|---|---|---|
| Plates, [illegible] | 28-32 tons | 20% |
| Plates, [illegible] | 26-30 tons | 23% |
| Shapes [illegible] | 28-33 tons | [illegible] |
| Shapes (boiler) | 28-32 tons | 20% |

The [illegible] for ships' material under [illegible] for boiler material of the same thickness not more than [illegible]

## BRITISH SHIPBUILDING ACTIVITY

NEVER has there been greater activity in the shipbuilding yards of GGreat Britain than exists at present. On the four principal shipbuilding rivers of the British Isles every available foot of adjoining land has a ship more or less in construction on it. Nearby engine works are turning out motive power for the vessels at a tremendous rate. Shipbuilders of various sorts—men, women, boys, girls—are all working at top speed. Great Britain has two great objects in all this activity. The first is to help to beat the German U-boat destructiveness and the second is to recoup her greatly theatened prestige as the first maritime nation of the world.

Nowhere is the growing importance of the United States and Japan as maritime




UPPER, TENSILE TEST PIECE B FOR BARS. LOWER TENSILE TEST PIECE C FOR BARS.

Note: Test piece B may be used for any dia. bar provided gauge length is turned to less

| | Tensile Strength | Elongation B | Elongation C |
|---|---|---|---|
| Combination Chamber Stays | 28-32 tons | 20% | 24% |
| | 26-30 tons | 23% | 28% |
| | 26-30 tons | 25% | 30% |
| | 25-30 tons | 25% | 30% |

assume their maritime precedence, and the British navy, which has been kept intact during the war, will enable authority to be given to these demands. It is well known in America that British builders are rushing out countless destroyers, cruisers and other naval ships, which must for the present remain as "mysteries." Standardization of construction has been adopted in the shipbuilding yards to the greatest possible extent. All parts of hulls, engines—in fact everything—are standard and may be used where first needed. Hitherto thirty-five sizes of steel sections were used in the construction of ordinary vessels, and standardization process has reduced the number to eight. Before the war Germany was the only real competitor on the sea and now there are two—friendly may be, but nevertheless competitors—Japan and the United States.

## REGULATION OF IMPORTS

In its commercial letter for the month of April, the Canadian Bank of Commerce takes it for granted that some regulation of imports will become necessary, and asserts that Canadians as a people are not economizing to the extent that is desirable. The letter says:

"The War Trade Board is contemplating the adoption of some decisive steps to regulate the importation of non-essential commodities, but the precise nature of these steps has not yet been announced. The object will doubtless be to reduce our imports from the United States, with a view to conserving our financial resources for war objects and to placing exchange conditions on a more satisfactory basis. Some lines of business may by this action be temporarily dislocated, but the capital and labor employed therein might be diverted to other forms of enterprise with ad-

funds indicates the continued existence of a considerable adverse balance of trade, which is partially created by the importation of non-essential articles.

"Public men, realizing how imperatively necessary it is that the resources of the country should be conserved in every possible way, continue to urge economy and co-operation with the departments of the government established for that purpose, but it is quite obvious that the general public is not depriving itself of its usual comforts and luxuries, despite the continually advancing prices of all necessaries. The abundance of employment at high and advancing wages, due to war conditions, is sustaining the present apparent prosperity, which, as might be expected, is not accompanied by evidences of personal sacrifice and frugality. Our railroad, financial and industrial organizations are working at very high pressure, and on the whole have, since the outbreak of the war, developed greater efficiency. The output of our industries continues to increase, and more orders are being placed here by the Government of the United States. It remains highly desirable, however, that industries necessary for the successful prosecution of the war should not be hampered by lack of labor and should have the sympathetic co-operation of Government agencies. The producers and importers of commodities not of this class may, however, reasonably expect to have their operations curtailed, and any effort to this end on the part of the War Trade Board will be welcomed by all who realize the seriousness of the outlook."

THE larger part of the antimony shipped from Hankow, China, comes from the province of Hunan; only a very small part of it is smelted in local furnaces. The trade is largely in the hands of Japanese firms.

The addition of small quantities of molybdenum and chromium to iron by an experimenter in Europe has produced a practically acid proof alloy.

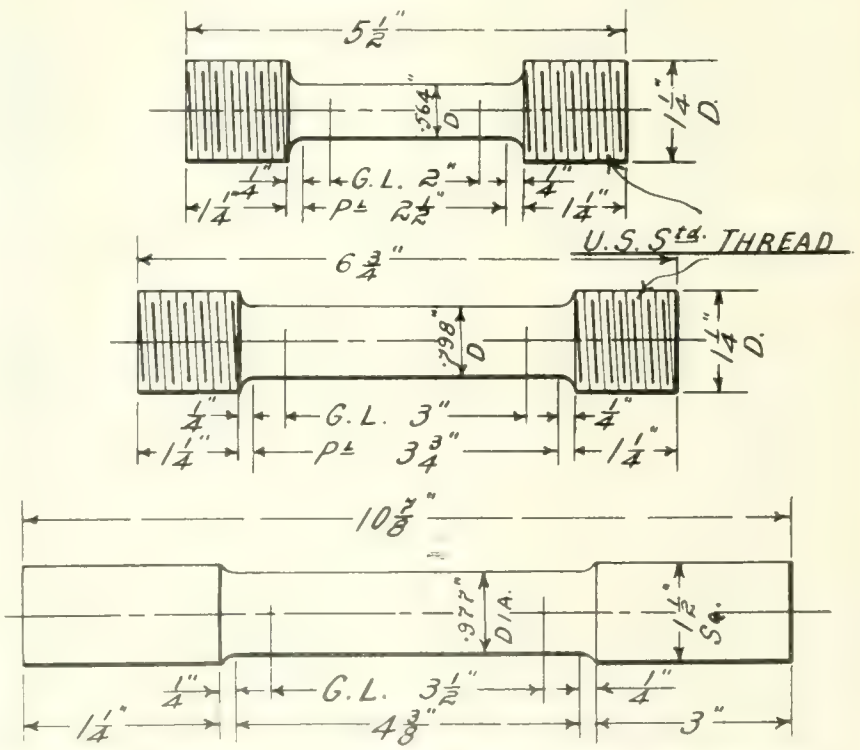



FIG. 4. TENSILE TEST PIECES FOR STEEL CASTINGS AND FORGINGS.

| TABLE 3. | Tensile Strength | Elongation |
|---|---|---|
| Steel Castings | 26-35 tons | 20% |
| Forgings | 28-32 tons | 29% for 28 tons T<br>25% for 32 tons T. |

In no case must the sum of the tensile strength and elongation be less than 57 for steel forgings

# Worm Gearing: Principles of Design and Manufacture III*

By Francis J. Bostock

*For many years the manufacture of worm gears was undertaken by means of empirical and more or less rule of thumb methods and as a consequence efficiencies were low and unsatisfactory. Improved methods of design and manufacture in recent years have effected such improvements that the worm gear is to-day one of the most efficient methods of power transmission. Considerable interest attaches to the description by the writer of the various machines and methods used in the production of worm gears.*

### Worm Thread Grinding

IT has been mentioned that it has been necessary to design special machines for each individual operation. The various movements to be executed in the grinding of a multi-threaded worm are intricate and require to be carried out with the greatest precision. The ideal machine should, of course, be automatic in action, but the designing of a machine to fulfil such stringent conditions is a most difficult proposition; nevertheless it has been accomplished, with entirely successful results.

The general lines of this machine are based on the best modern practice of up-to-date cylindrical grinders, as will be noted in Fig. 11. The abrasive wheel is mounted upon a universal head, and is of large diameter, its shape being generated by a patent diamond generating device. The wheel is so mounted that it can be easily placed in the best position relative to the thread of the worm, with regard to the spiral and pressure angles, thus enabling a large diameter to be used without interference. The worm is caused to travel spirally in front of the wheel; the change gears, in order to give the necessary lead and index, are situated respectively at the top and side of the fixed head, and the motion, after rotating the work, passes through the lead change gears and the differential, so driving the lead screw nut, thus giving the necessary spiral movement. During the cutting operation the motion passes through a gear-box to give various grinding speeds, but for the quick return the drive is taken direct; and the mechanism is so connected to the abrasive wheel slide that at the moment of reversal for the return stroke the latter is rapidly withdrawn from the work, and at the end of its travel it slowly approaches the worm thread, ready for the next cut. During the quick return stroke the differential comes into action and causes the worm to be automatically indexed to the next thread.

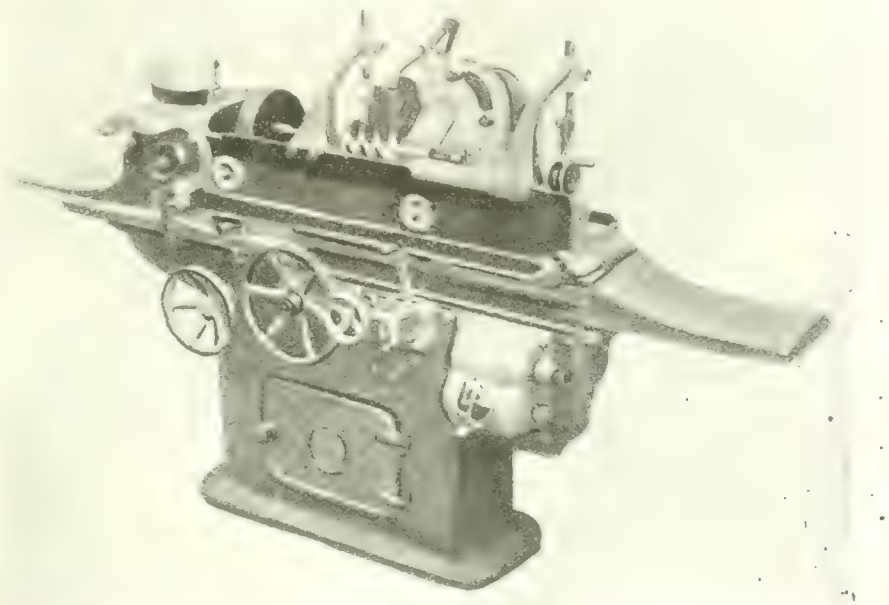


FIG. 11. WORM GRINDING MACHINE WITH ITS MEASURING INSTRUMENTS.

The machine is so designed that the worm is revolved on fixed centres, the top table being also pivoted to provide for the correction of parallelism. An easy movement of the handles gives instant setting to suit either a right or left-hand worm. The whole of the operating hand wheels and levers are situated in front of the machine in a most accessible position. The simple movement of a lever automatically arrests, at the end of the next quick return stroke, all the movements of the machine, thus enabling the operator to gauge the work that is being ground. After gauging, the machine is ready to commence the next cutting stroke, it being only necessary again to move the above lever, when the cycle of operations is once more resumed.

### Generated Grinding Wheel Curves

One has already observed how it is necessary for the worm-milling cutter to have its contour generated, and when this is with a cutter diameter of only 5 in. how much more so is it not imperative

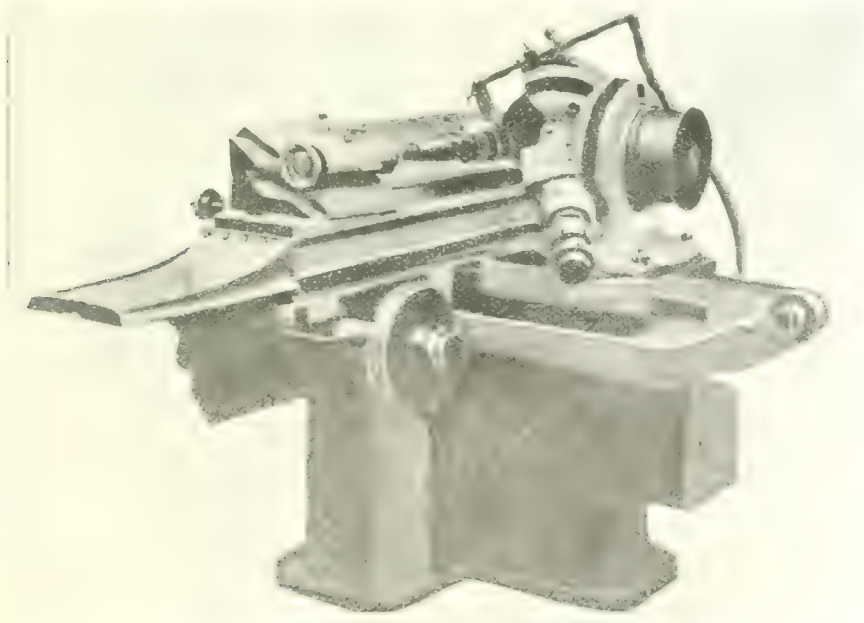


FIG. 11A. ANOTHER VIEW OF WORM GRINDING MACHINE.

*Read before the Manchester Association of Engineers.

FIG. [illegible] WORM GRINDING ABRASIVE WHEEL GENERATOR

[illegible] which carries a reciprocating diamond set to travel at the required pressure angle and situated exactly upon the centre line of the system; hence it follows that its movement corresponds to a line on the worm face, so that when it is caused to reciprocate at the same time as it traverses spirally across the face of the wheel, it will give to the latter just that particular shape which will in turn grind the worm with the correct shape of tooth.

The work is fed laterally to the face of the wheel, hence the contour remains constant during the grinding operation. After one side has been done the worm is turned end for end, and the other side ground in like manner. The machine is fitted with measuring devices for the [illegible] of the work during grinding operations.

### Manufacturing and Sharpening of Hobs

The teeth of worm wheels are of such construction that they do not lend themselves to operations of planing, shaping or milling [illegible] forms of gearing, and can only be produced by a process of generation by means of a cutting tool called a hob.

At first the hob would appear to be a reproduction of the worm, with which the wheel will have to mesh. Whilst it is true that the spiral angle, pitch, number of threads, and pitch diameter must correspond exactly with that of the worm, yet both the outside and bottom diameters are made larger in order to provide requisite clearance in the roots of the teeth. There is a still further difference in that the hob thread is gashed along its length normal to the spiral angle for the purpose of providing a cutting face, whilst the sides of the teeth are relieved in order to provide a cutting clearance.

As the shape and contour of the wheel teeth are entirely dependent upon the design and accuracy of the hob, it is necessary that this tool should receive the most careful supervision in all the stages of its progress, because when finished it is extremely difficult to examine it without cutting a wheel, and so verifying the shape by means of a worm. No matter how perfectly one may make a hob, unless it be sharpened with a corresponding degree of accuracy and precision the original object is quickly defeated, rendering it useless for first-class production. It has therefore been found necessaryy to design and build a special machine for the purpose of sharpening hobs and cutters.

The general lines of this machine will be apparent from Fig. 13. It consists essentially of a column carrying a ram slide, the latter carrying, at right angles, the abrasive wheel slide. The hob or cutter to be ground is mounted vertically on a suitable holder, which is centrally situated in a circular water basin, which in turn is fitted to the bed of the machine. The abrasive wheel is mounted upon a universal head, which can be rotated at an angle to suit the lead of the gashes of the hob, and is driven from an overhead countershaft by means of round leather belting.

The ram slide is reciprocated in a vertical direction, thus causing the abrasive wheel to traverse the length of the hob, the latter having given to it by means of change gears the requisite rotation to give the required spiral movement. The machine is so designed that the return stroke is at a higher velocity than the cutting one, and the depression of the operating pedal causes it to stop at the top of its next up or return stroke. The indexing is accomplished by means of a dividing plate, in conjunction with which is a fine adjustment for obtaining the feed or cut.

Hobs are generally made with their cutting faces radial; it is therefore necessary that they be sharpened radially, or an alteration in shape will result. The same, of course applies to ordinary rotary cutters. In order to accomplish this an abrasive wheel generator is placed in the machine instead of the hob. In this generator the diamond reciprocates radially, so that when it traverses the face of the abrasive wheel it removes that interference which would prevent the wheel from cutting a radial face. This interference is very great, and the resultant shape is a peculiar curve which varies with every hob, position and diameter of wheel.

It will be readily seen that as a hob is sharpened its diameter is reduced, but with a reamer hob the reduction in diameter is only a few thousandths of an inch in the whole length of the tooth; thus uniformity of shape is obtained. Most of the hobs are made from high-speed steel, many of which are ground on the threads after hardening.

### Worm Wheel Generating

Generally the worm wheels are rough-turned on automatics and turret machines, and pass from thence to the worm-wheel section for rough cutting of the teeth, after which they are finish-turned, and finally the teeth undergo a reamering or finishing operation. In no small measure is the interchangeability and high efficiency of the wheels due to this reamering operation.

The generating of the teeth of the worm wheel is carried out in a machine as illustrated in Fig. 14, the blank being mounted upon a revolving table, which is positively driven at a predetermined speed, according to the ratio of the gears being cut, whilst the hob is caused to travel longitudionally across the face of the wheel. Owing to the spiral of the hob it is necessary to compensate for its longitudinal travel by means of a differential, whilst the rate of travel or feed can be varied at the will of the operator.

A special feature is made of the mounting of the worm wheel on the table. A hardened and ground micrometer adapter carries the arbor, which supports various other adaptors to suit the locating register of the worm wheel blanks, the micrometer being adjusted until the specified distance from the locating face of the blank to the axis of the hob is obtained.

To facilitate setting up, and to test the true running of the registers and worm wheel blank, the drive to the table

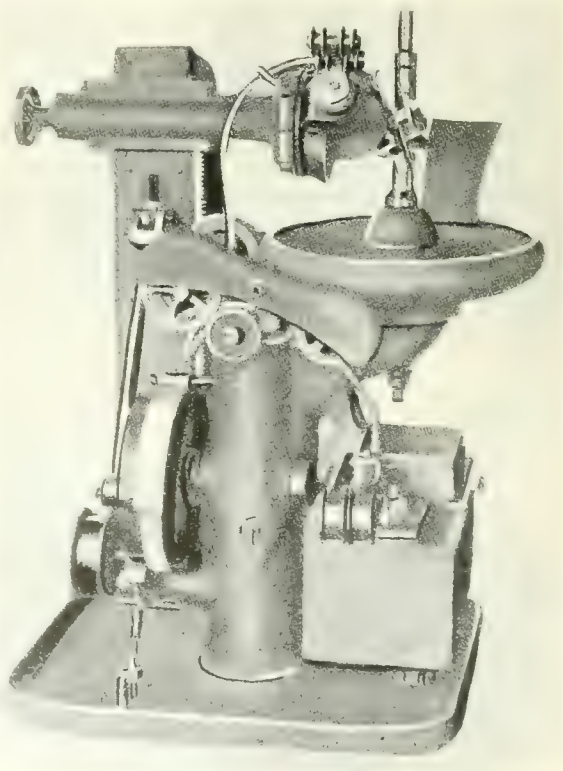


FIG 13 SEMI-AUTOMATIC HOB SHARPENING MACHINE WITH QUICK RETURN MOTION TO GRINDING HEAD.

is arranged so that it can be disconnected in order that the operator may be able to revolve the table by hand and so, by means of a clock indicator, test the accuracy of the mounting.

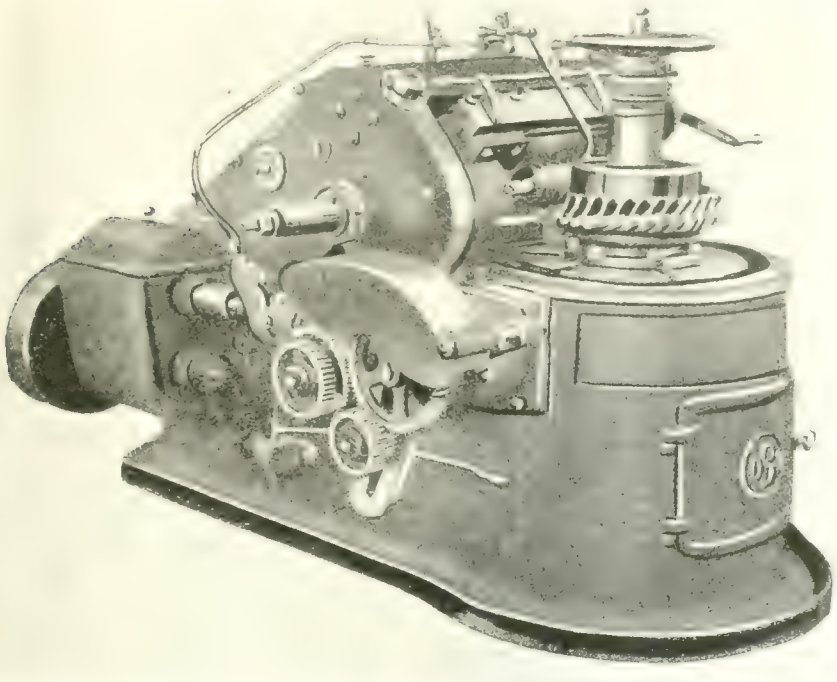


FIG. 14. WORM WHEEL GENERATING MACHINE WITH SPIRAL HOB MOVING LONGITUDINALLY TO INCREASE DEPTH OF CUT.

The head, which slides horizontally along the bed towards the worm wheel, contains the whole of the mechanism for driving the hob and traversing the hob slide. The latter is mounted on the head at an angle normal to the direction of the stress, so as to present the maximum bearing area to the very best advantage.

The main drive is taken from a single pulley fitted with an internal friction clutch in conjunction with a four-speed gear-box. The drive is then transmitted in one case directly to the index change wheels for driving the table, and in the other to the worm wheel mounted on the hob spindle.

It should be mentioned that the dividing wheel is of greater diameter than the largest blank which the machine will cut, and a neat design is effected by allowing the cuttings to fall through the arms of the table into the bed of the machine, from whence the cutting lubricant is drained.

### Inspection and Testing

Interchangeability of the worm wheel is ensured by the use of a double ball micrometer, which measures the comparative pitch diameters.

The final inspection is made on the testing machine shown in Fig. 15, where the work undergoes a more rigorous test. The wheels are tested for concentricity of cutting and the distance from the centre of the worm axis to the locating face, after which they are tested together to verify the centre distance. From the foregoing it will be realized that the system of manufacture and inspection described enables the worm and [illegible] wheels to be regarded as independent components, hence facilitating production and duplication.

Turning now to the application of worm gearing: in many cases the contracts for reducing gear units specify that prior to despatch they shall undergo to the satisfaction of their engineer running tests as near as possible to the actual service conditions, during which [illegible] various observations and readings are taken to determine the satisfactory running of the gears.

Some time ago, in order to ascertain the efficiency of a worm-driven back axle as a unit, a series of tests were made on a chassis which was in the course of erection. The carden shaft was replaced by an Amsler torsional dynamometer, the differential was locked, the chassis jacked up, and a special prony brake was applied to one of the rear wheels. The resulting efficiencies at different speeds and loads varied from 94 per cent. to 96 per cent. The result included the loss in friction by the universal joint, journals and thrust races, felt washers, the air resistance of the spokes and felloes of the wheels, in fact as near as possible to the actual road conditions. When it is remarked that this worm and wheel had been assembled exactly as they came from the machine shop, it shows conclusively that, with the method and degree of accuracy obtained by the processes described, the high efficiency is attained right at the commencement, the net efficiency of this gear being within the region of 96 per cent. to 98 per cent.

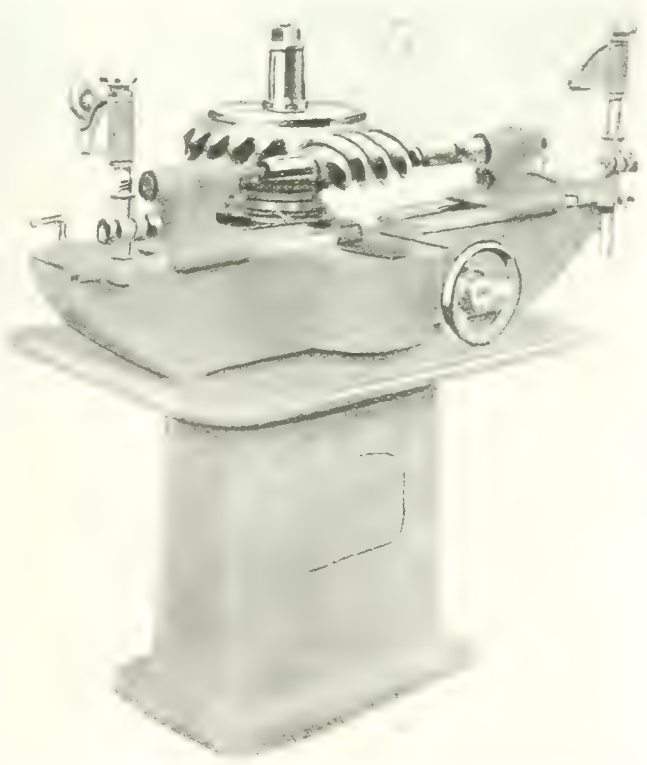


FIG. 15. MACHINE FOR TESTING CONCENTRICITY OF CUTTING, DISTANCE FROM CENTRE OF WORM AXIS TO LOCATING FACE AND ALSO CHECKING THE WORM AND GEAR TOGETHER.

### Worm Gear Application

Worm reducing gear units are with great advantage coupled direct to electric motors, enabling reductions in speed from 4: 1 to 100: 1 in a silent and efficient manner, and when both of them are mounted on the common baseplate they represent a simple, sound and economical proposition. For shop drives, machine tools, boiler feed pump, blower, and other work they have proved themselves to be invaluable.

On account of their ability to withstand considerable overload for short periods they lend themselves admirably to intermittent work, because for the work they are called upon to do they can be made relatively small; therefore they are of great use in crane work and for starting purposes of electric motors, steam, gas and oil engines.

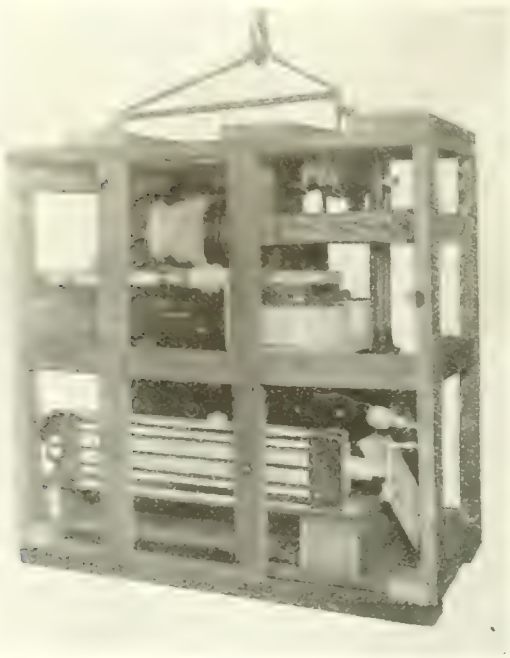
placing at his disposal the facilities for the reading of this paper.

### CRATING MACHINERY FOR EXPORT

As a result of the development of the machinery export [illegible] a packing case manufactured and used by the Ford-Smith Maching Co., of Hamilton, for shipping their machine tools to Europe, [illegible] parts of the world. Former experience in the export trade made the company realize the necessity and obvious advantage of providing a strong and not too cumbersome packing case for this particular purpose. The ordinary method of packing machinery was found to be unsuitable for the hard usage meted out to shipments going abroad particularly at this time when skilled stevedores and laborers are scarce. The possibility of having machinery broken in transit, occasioning delays and other inconveniences, was too serious because of the necessity of the shipment reaching its destination intact, as soon as possible, as machinery exported now is required for work [illegible].

The Ford-Smith Machine Co. are making a new line of plain and universal machines in addition to grinders of various types. The demand for this product developed to such an extent that for the European and foreign mar[illegible] a special packing case for export shipments alone. The description of the crate, which in this particular case was made for shipping milling machines, will doubtless be of service to other [illegible].

The illustrations show the packing case with the outside boarding removed in order to give a better idea of its general construction. The case is made of substantial lumber which was found to be absolutely necessary in order to stand rough handling in transit. The case which is compact and rigid measures 5 ft. 5 in. x 5 ft. 4½ in. x 2 ft. 7¾ in., and is entirely enclosed with 1 in. x 10¼ in. boards, all being dressed on the outside. The top of the case is composed of 2 in x 10 in. boards also dressed on the outside. The bottom skids for the No. 2 size millers are made from 5 in. x 4 in. hard maple, while for the No. 3 size machine 6 in. x 4 in. hard maple skids are used. The uprights are 2 in. x 4 in. and 2 in. x 5 in., well braced at important points. The main members are bolted. At the corners band iron straps, bolted through the main members, are used to further stiffen the crate.



GENERAL VIEW OF MILLING MACHINE PACKED FOR EXPORT.

END VIEW OF MILLING MACHINE PACKED FOR EXPORT.

Two lifting rings or slings made of round iron are used when lifting with a crane. The slings are put round the arm of the machine, which is protected with bagging, and pass through slots in the top of the crate when required for lifting, otherwise they are not exposed. This is not the least important factor in the make-up of the case, as the crane lifts the machine direct, avoiding undue strains on the packing case and also facilitating handling during transit.

The boards and skids are all cut to specification and assembled to drawings, ensuring all crates being of equal size and strength, and materially lowering production costs. The box fastened to skids at the bottom contains the arbors, handles and miscellaneous equipment, at the same time acting as a rest for the miller table. The countershaft pulleys rest on stiff bracing at the top of knee, while the countershaft proper is well supported by two special blocks shaped for the purpose.

### GEAR MANUFACTURERS MEET

THE second annual meeting of the American Gear Manufacturers' Association was held at White Sulphur Springs, West Va., April 18 to April 20. At the opening session on Thursday Mr. F. N. Sheppard, of the U.S. Chamber of Commerce, spoke on "How we can get behind the government and help win the war." Mr. B. F. Waterman presented a paper on gear standardization at the same session.

At the morning session on Friday, routine matters were disposed of, including the election of an executive committee and officers for the ensuing year as follows: For three years, F. W. Sinram, Cleveland; Frank D. Hamlin, Philadelphia; H. E. Eberhardt, Newark; for two years, Frank Burgess, Boston; Gee L. Markland Jr., Philadelphia; Milton Rupert, Pittsburg; for one year: Wm. Ganscou, Chicago; E. J. Frost, Jackson; H. W. Chopin, Syracuse.

The following officers were elected: President, F. W. Sinram; vice-president, H .E. Eberhardt; secretary and treasurer, Frank D. Hamlin. Friday afternoon was spent out of doors, the delegates amusing themselves as fancy dictated.

The annual dinner was held at the Greenbrier, Friday evening. Mr. John G. Willys and Mr. F. N. Sheppard spoke on this occasion. At the Saturday session two papers were presented as follows:

"Uniform Cost Accounting," by J. H. Dunn; "Hobbs and Hobbing Machines," by F. G. Hoffman and John Edgar.

About fifty members of the association were present.

The next meeting will be held in September, 1918, the exact time and place to be determined later.

### U. S. INLAND WATERWAY DEVELOPMENT

GREAT efforts are being made in the United States to improve the inland waterways throughout the whole country, and to increase the employment of motor barges, motor tugs, etc. There are many inland waterways in the country which are advocating the improvement, and the Inland Waterways Corporation of Louisiana and Texas at a recent meeting urged the construction of a canal, 9 ft. deep and 100 ft. wide, between New Orleans and Brownsville, which, it is stated, will shortly be put into execution.

A short time ago a convention was held of the Atlantic Deeper Waterways Association, when many improvements in inland waterways were suggested, and it was pointed out that these were needed, as the great railway system had almost broken down under the strain of increased traffic. Telegrams of approval were sent to the meeting by the Secretary of the Navy and also the Secretary of Commerce.

# Apparatus and Machines for Testing of Aeroplane Materials

*When it is realized that the aviator's life depends entirely upon the skill with which his machine is constructed and upon the soundness of the materials entering into its make-up, it is readily seen how important the testing of these materials becomes. The following article describes some of the machines used for this purpose.*

THE mastery of the air is possibly one of the factors which will influence the successful termination of the present war and the value which aeroplanes have for reconnaissance, bombing, artillery observation and fighting is so great that little need be said as to the necessity of outdistancing the enemy in their production.

It is not alone sufficient that aeroplanes be produced in greater numbers but they must also be of better design and higher efficiency than enemy machines employed for the same uses.

It is of interest in this connection to note some of the machines specially designed by Messrs. W. and T. Avery, Ltd., Soho Foundry, Birmingham, for use in aeroplane manufacture.

### The Balancing of Propellers

The device shown in Fig. 1 is a development arising out of the principles of static balance. A rocking bar with knife edges is mounted in bearings fixed to a substantial cast iron wall bracket. A spindle is mounted on this rocking arm in such a manner that the centre of the spindle is in line with the knife edges upon which the rocking bar is supported. A constant friction is thus obtained as well as an axial movement around the true centre of the propeller. On the spindle is mounted a gunmetal sleeve which fits the bored propeller boss. The sleeve is 8 inches long and has an attachment which allows it to turn on the spindle. This arrangement permits the turning of the propeller into different positions for balancing without disturbing the friction fit between the propeller and the gunmetal sleeve. The sleeve can be locked so that the propeller can be screwed on or off easily.

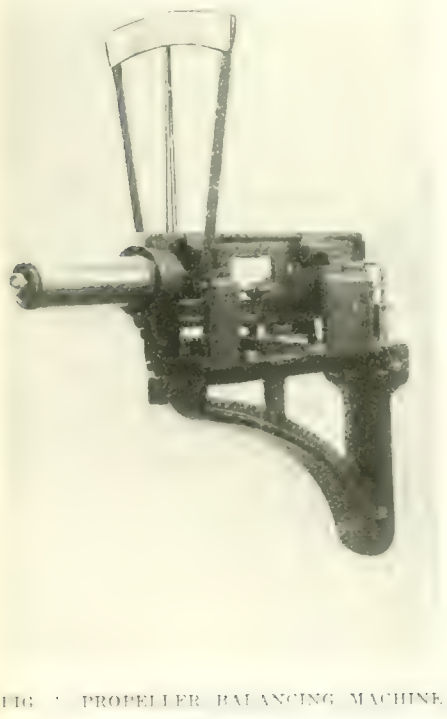


FIG. 1. PROPELLER BALANCING MACHINE.

A zero pointer and graduated chart are provided to indicate the quantitative errors in inch ounces, the minimum divisions being ½ inch ounce. These graduations show at once how near the propeller is balanced to the usual specification of ½ inch ounce error. The graduations are also useful in matching up the out of balance of laminations numerically before gluing. This process takes the place of matching heavy ends with light ones, and obtains a closer balance before this stage is reached. The graduations are of great assistance in the actual process of balancing, as with their use it is possible for the operator to gauge how much material must be removed.

The apparatus is controlled by a small dashpot placed at the rear of the rocking bar and so arranged that undue vibration of the propeller and the effects of draught are eliminated.

### Operation

When the machine has been installed it is adjusted by means of a small weight riding on a beam and moved by a key, until the pointer just returns to zero, when moved from the vertical. It does not affect the accuracy of the test if the pointer stops at a position slightly to either side of the zero mark.

When placing a propeller on the balancing machine the beam or rocking bar is locked by a slide and the propeller worked on to the sleeve by a to and fro motion.

### Balancing Two-Bladed Propellers

The propeller is first placed in a horizontal position. If the pointer swings beyond the graduations and against the stop the error is so large that plenty of material can be removed.

When the pointer shows the extent of the error in inch ounces then the excess weight can be estimated, if it is to be removed from the top of the blade, by knowing the distance from the tip to the centre. For instance, if the reading is 10 inch ounces and the distance from the tip to the centre is 48 inches then approximately ¼ ounce of material must be removed. If, however, the weight is to be removed uniformly over the blade, then the readings can not be converted into ounces but with practice the operator will know how much to remove for any design of propeller. As long as the excess weight can be removed by scraping, the propeller need not be removed from the machine and the gauging of the sections can be done quite easily.

FIG. 2. APPARATUS USED IN THE BALANCING OF CONNECTING RODS.

### Balancing Four-Bladed Propellers

In the balancing of four-bladed propellers two blades are placed in the horizontal position, the other two being in the vertical. The reading is taken and the horizontal blades now placed in the vertical position. The reading is again noted and it is readily seen which two blades are heavier than those opposing, the comparison of weight in each one being according to the difference in the readings. The balancing with the blades making angles of 45° to either the horizontal or the vertical can be done in a similar manner to the above, placing the propeller in two positions and making sure that the heavy part in the first position is located below the centre in the second to avoid unstable effects.

The polishing and varnishing of the propeller can be done as usual on the bench until the final coats are applied. The propeller is then placed upon the balancing machine and finished and balanced in position.

Hard and fast [illegible]

fers as to which part of a blade or blades the excess material is to be removed from. Some manufacturers take off excess weight from the tips or the flat face of the section according to the amount and to the gauging of the sections.

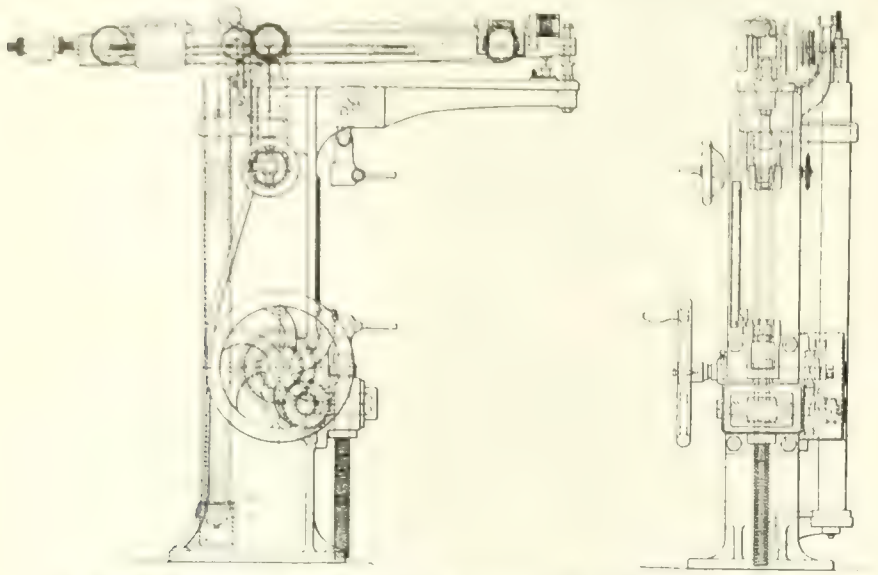


FIG. — AUTOPOISE WIRE-TESTING MACHINE OF 6,000 LB. CAPACITY.

With a four-bladed propeller it is not possible even by a process of elimination to determine that one blade is heavier than the other three, except at the initial stage of balancing, and it is more probable that the weight is distributed in two blades or portions of them.

Considering the rapidity with which balance varies, a tolerance of about one inch ounce might be allowed before polishing to be brought down to ½ inch ounce error in accordance with the specifications by means of the final polishing and varnishing.

A final check on the assembled propeller and steel holder or hub prevents any error creeping in, and for this a quantitive reading is most useful.

### The Balancing of Connecting Rods

On account of the high speed and delicacy of the aeroplane engine considerable care must be taken to eliminate vibration due to the faulty balance of the working parts. The connecting rods should be all of the same weight and also the distribution of the weight should be the same in all cases. Although the rods are machined all over variations in the density of materials and other causes frequently affect the centre of gravity of the rod.

With the machine illustrated in Fig. [illegible] to determine what correction, if any, is needed. A cast iron base plate, fitted with bevelling screws, carries the frames supporting the two steelyards shown. One of the frames can be adjusted to accommodate rods of different lengths.

In using the machine, a standard rod which should be somewhat lighter than those tested is suspended from the inner ends of the steelyards and the counterpoises adjusted until a perfect balance is obtained. This rod is then removed and replaced by the rod which is to be balanced, material being removed until both the weight and its distribution are the same as those of the standard rod.

It is necessary that all the rods should be suspended from the same centres and for this reason a short mandril having knife edges at each end along the axis is slipped into each end of the rod. These knife edges rest in stirrups suspended from the ends of the steelyards.

If desired, the steelyards can be graduated in ounces and provided with small poise weights which can be set to predetermined tolerances. Such tolerances are often used in specifications, and, in any case, the auxiliary poise weights form a convenient method of determining the exact amount of excess material to be removed.

### Tensile Strength Testing Machine

The many rods, wires, turnbuckles and shapes entering into the construction of aeroplanes are subjected to large stresses and the proper testing of these parts is very necessary.

The machine shown by the elevations and plan Fig. 3 forms a convenient piece of apparatus for this class of work, taking specimens up to ¼ inch, round or square, and flat specimens up to ⅞ inch wide by ⅛ inch thick.

The specimens may be of any length up to 12 inches between the grips and the maximum load that can be applied is in the neighborhood of 6,000 pounds. It will be seen that the machine is of the compound lever type, the levers being carried on a cast iron standard which also supports the straining gear.

The straining gear comprises a screw operated by means of a handwheel, and spur and worm gearing, all being enclosed in a cast iron housing.

A high speed gear is provided for the quick adjusting of the lower grips and this gear may be used for the testing of light wires where little power need be used.

### Indicating Arrangements

The extension of the specimen is indicated on a vertical scale graduated on nickel silver by means of an adjustable pointer fastened to the lower grips.

The main lever is an iron casting fitted with hardened steel knife edges and supported in hardened steel bearings. The upper grip is suspended from the middle knife edge of this lever as may be seen by reference to Fig. 3. The steelyard is an iron casting provided with hardened steel knife edges, the fulcrum knife edge resting in a bearing on top of the main standard while the rear knife edge carries a link to which the main lever is attached. The steel-

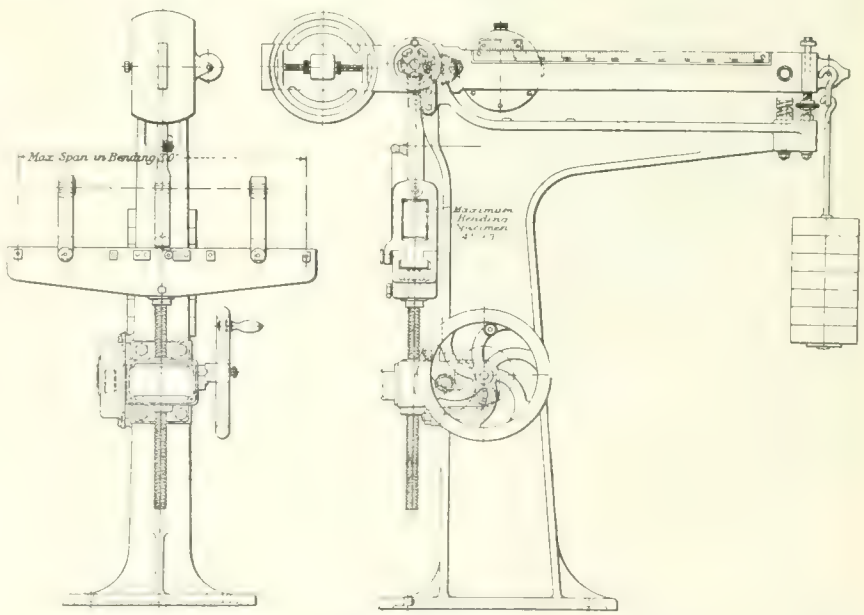



FIG. 4—10,000-LB. TESTING MACHINE ADAPTABLE TO A WIDE SCOPE OF WORK.

yard carries a scale graduated in steps of 20 pounds up to the full capacity of the machine, and the load at any moment during the course of a test is indicated by the position of the poise weight on this scale. A vernier attached to the poise enables the load to be read in single pounds. No loose weights are used.

The load is balanced by means of a very ingenious feature which automatically moves the poise along the arm as the load is applied. The poise mounted on rollers is propelled along a machined track on the steelyard by means of a falling weight enclosed in a tube filled with oil. The rate at which the load may be applied is varied by altering the viscosity of the oil. In making a test the operator has only to keep the straining wheel turning at such a rate that the steelyard is kept floating.

When the steelyard drops owing to the fracture of the test piece an electrical contact is made which automatically stops the movement of the poise.

Its position then gives an accurate record of the breaking load since there is no possibility of the movement of the poise continuing after fracture has taken place. There is therefore no need to watch the movement of the poise in tests which are only required to determine the breaking load. The small hand wheel near the top of the main standard, and visible in the illustrations, is for the purpose of returning the poise to the zero position at the completion of a test. It will be seen that the automatic movement of the poise at a constant rate enables any number of tests to be carried out under uniform conditions, which is important in that the strength of some materials is considerably affected by the rate of loading.

Three sets of wedges are provided with this machine to take specimens of the dimensions stated above, and, if desired, a pair of clamp holders can be supplied to take thin strips up to 1 inch wide. In all cases the wedges are opened and closed by the movement of a single lever, which leaves one hand free to insert the specimens.

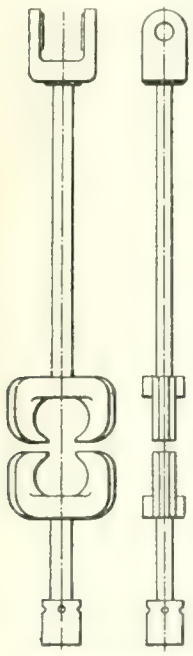


FIG. 5—CEMENT BRIQUETTE HOLDER.

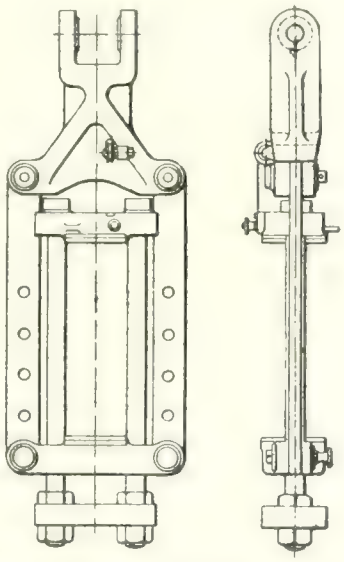


FIG. 6—COMPRESSION TOOLS.

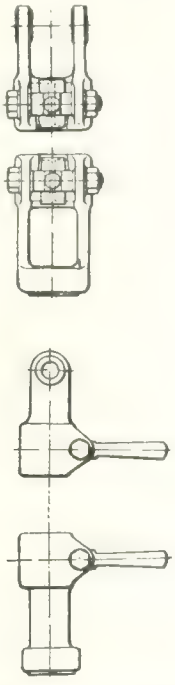


FIG. 7—TENSION TOOLS, TWO FORMS.

### 10,000-lb. Testing Machine

A machine adapted for similar work but lacking the automatic poise movement and of a wider scope is shown in Fig. 4. This machine has a capacity of 10,000 pounds and will take specimens up to 18 inches in length when stretched. It is of the single lever type and the steelyard is graduated up to 1,000 pounds, reading to 1 pound by means of a vernier attached to the poise. Additional loading, up to the full capacity of the machine, is obtained by means of loose weights, and, in favor of this system, it may be pointed out that tests requiring small loads, say up to 100 pounds, can be carried out with as great a degree of accuracy as those using the full capacity of the machine.

As mentioned before this machine is not provided with automatic means for moving the poise, so that the operator must use both the hand wheels shown when making a test, the lower one being used for straining the specimen and upper one for moving the poise. Accessories used for testing cement briquettes and for making bending and compression tests are shown in Figs. 4, 5 and 6, the apparatus used for bending tests being shown on the machine. Fig. 7, shows the usual forms of tension test clamps.

### Fabric Testing

Aeroplane manufacturers sometimes find it convenient or necessary to test the fabric used in wing construction, although such tests are generally made by the Government. This is the case when the effects of a new dope or wing varnish are to be known.

In testing fabrics the rate at which the load is applied seriously affects the results and to a secure uniform rate of loading the machine shown in Fig. 8 has been devised. The load is applied by allowing shot to fall from an upper fixed reservoir to a lower one suspended from the end of a lever to which the fabric is attached.

The flow of shot can be regulated so

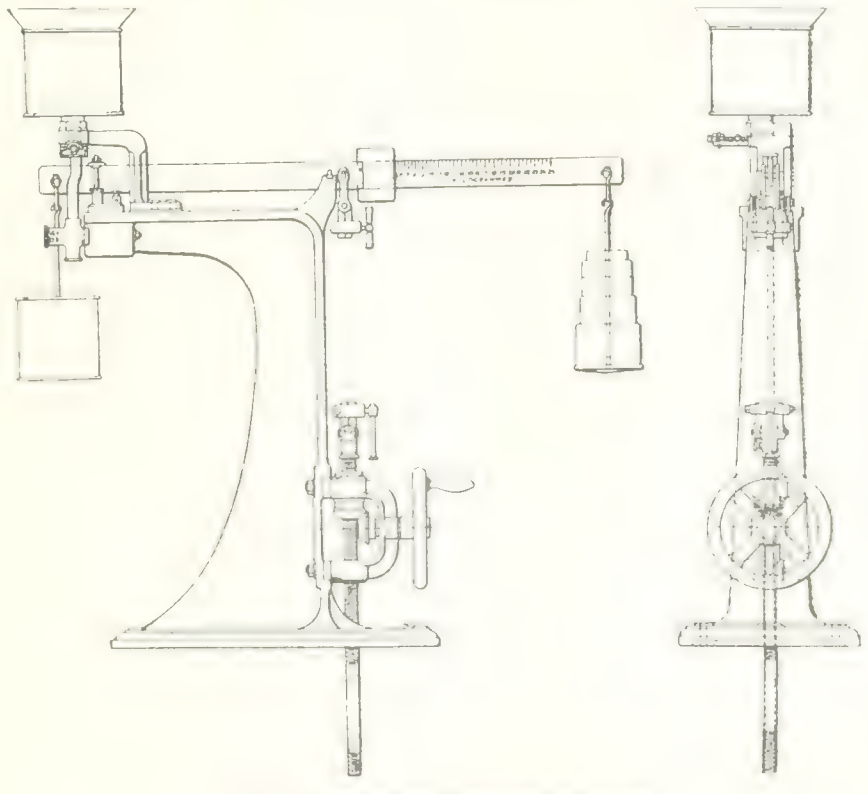


FIG. 8—MACHINE FOR TESTING FABRICS.

## POWER DEVELOPMENT NEAR MONTREAL

IN view of the present interest in the power development in Montreal and Quebec province and the apparent need of further development in the near future, the fact that Montreal Power can develop 300,000 horse power against the 240,000 which it will have by midsummer will be of interest.

The [illegible] Rapids is 100,000 horse power, though the water power development is 180,000 horse power. [illegible] horse power are now being installed, and will be completed by the end of July, when the power from the plant will be 120,000 horse power units, for the remaining 60,000 horse power will be installed as required.

Lachine and Soulanges plants develop from 12,000 to 15,000 horse power. The contract with Shawinigan would give the Power [illegible] 75,000 horse power.

The situation is that in a couple of months the company will have a nominal capacity of 240,000 horse power hydro-electric for distribution, and may increase this to 300,000 horse power hydro-electric simply by adding necessary units. In addition, its auxiliary steam plants have a capacity of 30,000 horse power available at any time.

This may be divided approximately, as follows:

| | H. P. |
|---|---|
| Power Co's. Chambly plant | 20,000 |
| Power Co.'s Lachine plant (12,000 to 15,000) | 12,000 |
| Power Co's. Soulanges plant (12,000 to 15,000) | 13,000 |
| Power Co's. Cedars Rapids by July 31 | 120,000 |
| Shaw W. & P. on contract | 75,000 |
| Hydro-electric power available by August | 240,000 |
| Cedars Rapids additional unit capacity | 60,000 |
| Hydro-Electric, totals | 300,000 |
| Capacity Co's. steam auxiliaries | 30,000 |

## EVERYONE MUST CONSERVE COAL

AT the close of the conference held here recently of coal operators, labor delegates and transportation representatives with Mr. Neale representing the United States Fuel Administration and C. A. Magrath, Dominion Fuel Controller, a memorandum was submitted by Mr. Magrath covering the chief developments of the conference, which lasted for a couple

The memorandum contained the important statement that the United States Fuel Controller felt it his duty to inform the Canadian Fuel Controller, so that he could pass the information to the Western Provinces of Canada, that the situation is as follows:

(1) That anthracite coal supplies to points in Western Canada will be very materially restricted during the present coal year.

(2) Under the circumstances it is safe to predict that no American anthracite coal will be available for shipment to points west of Winnipeg.

(3) It is also proposed to restrict shipments of anthracite to Canadian lake ports during the early part of the present season.

(4) That the public, both east and west, must be given to understand distinctly that conservation of coal must be practised to the utmost extent by all classes of consumers.

Mr. Magrath's memorandum said Sir George Foster had been able to announce that the attitude of the United States Fuel Administration was that Canada would receive precisely the same treatment as the various States of the Union. The Western States had been given to understand that they must use the softer coal of the West and that the available anthracite would have to be conserved for the purpose of supplying the eastern part of the Union and the Provinces of Ontario and Quebec.

## SHORTAGE OF MARINE ENGINEERS

There is a great shortage of marine oil engineers at the present time for commercial work. According to the *Motor Ship*, owing to the tremendous increase in the employment of internal combustion engines for war purposes of every conceivable class, the demand for men skilled in the usage and repair of this type of motor has been very considerable, and the result is that nearly every man in this position has been drawn from his normal work, even though he is over military age. Consequently the number of men remaining in civil employment who are qualified internal-combustion engine mechanics, or even reliable drivers of such motors, is comparatively small, and a good deal of difficulty has been experienced by owners of commercial motor craft to provide an efficient engine-room staff. This applies to all manner of vessels, whilst the motor ship is far from immune, many engineers having left motor ships to take up commissions in some branch of the Army, where a knowledge of internal-combustion engines is essential. Naturally, this fact is inimical to whatever prospects there might be of building commercial motor vessels at the present time, since owners realize the difficulty they will experience in obtaining suitable men to run such craft. The greatest difficulty is being experienced in connection with hot-bulb-engined boats, since there are extremely few men remaining out of the Army or Navy who have a satisfactory knowledge of such engines.

## RUST PREVENTATIVE

As a preventive from rust for machinery of all kinds, an application of iron phosphates has been found effective. The metal, after being thoroughly cleaned, is placed in a bath containing ferric and ferrous phosphates, a little manganese dioxide being added at boiling temperature. The articles should remain in the bath until hydrogen is no longer generated, then dried in the air, and painted, japanned or coated with mineral oil. The phosphate being attached chemically to the surface of the metal prevents rust forming at any spot. Marine motor parts, such as springs, or any portion exposed to the salt air, would be kept in good condition by this treatment.

## THE CAUSE OF WAVES

Waves in mid-ocean are caused entirely by the action of the wind. The adhesion between the rapidly-moving particles of air which compose the wind and the surface particles of the water causes the water's surface to be dragged along with the air. Small ripples are immediately formed, and these soon overtake others near them. They unite, and, due to the friction betwen the water particles, each succeeding ripple piles up on the top of the previous ones. Just as soon as oil is spread on the water, however, the size of the waves is reduced like magic. The reason for this is interesting. Oil, unlike water, has very little internal friction between its particles. The ripples of oil formed by the wind, therefore, cannot pile upon each other to any considerable height; hence water waves cannot grow in an area of oil placed about a steamer. They begin to fall down instead. By the time these waves reach the boat they will have lost their formative ripples.

## SALE OF AUSTRALIAN COPPER TO BRITISH GOVERNMENT

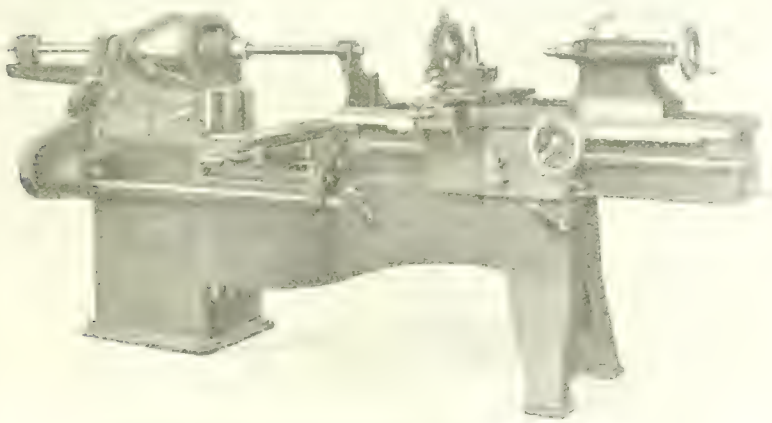
THE Australian Copper Producers' Association, recently formed by the principal copper mining companies, has accepted an offer from the British Ministry of Munitions, to June 30, 1918, for the Australian output of copper, excepting copper required for local consumption and copper sold under existing contracts. The amount of money involved under the contract will be approximately £2,150,000. The price to be paid for electrolytic and Wallaroo (South Australia) copper will be £108 per ton, and for other brands £106 per ton f.o.b. steamer at Australian ports. If the proportion of other brands exceeds one-fourth of the total tonnage the Munitions Department require an abatement in price of £4 per ton, thus reducing the price for the excess to £104 per ton. The maximum quantity which may be delivered under the contract is 20,000 tons, and the minimum 15,000 tons. If the maximum is exceeded the surplus will be taken by the British Ministry of Munitions at a price to begotiated. If, however, the minimum is not reached the Ministry of Munitions may claim delivery of the deficiency later at the contract price, but has no right to action for breach of contract.

# DEVELOPMENTS IN SHOP EQUIPMENT

*Notice of equipment and processes in metal working and machine shop practice, and illustrations of typical departments and machines.*

## COMBINATION LATHE BORING AND MILLING MACHINE

A MACHINE of a wide range of usefulness and of considerable adaptability is illustrated herewith. The construction permits of its use as a 16-in. engine lathe, a horizontal boring mill, a plain milling machine, or a sliding bed gap lathe.



MACHINE SET UP FOR USE AS A BORING MILL

Each unit is as complete and distinct as the same machines individually and gives the same range and capacity.

The base carrying the sliding member is strongly ribbed and the ways are scraped true to alignment for both carriage and tail stock.

The lathe carriage is made with the bridge on the end towards the headstock and extends out over the face of the apron to permit the use of the compound rest up to the full swing of 25 inches permissible in the gap.

The headstock is made with a four step cone pulley and is single back geared.

The milling machine table saddle and knees are of rigid construction scraped to accurate bearings on all moving surfaces. The table is elevated on the face of the column by means of helical gears and screw. The crank for operating the elevating gear is located on the face of the column in a convenient position for the operator. The standard machine is equipped with hand feed to milling machine table.

The horizontal boring mill is of the platen and table type. The boring bar is 1½ inches in diameter and is provided with power feed driven from the lathe change gears.

Power longitudinal feed to the milling machine table and additional equipment is furnished when desired.

The following dimensions of this machine are of interest: length over all with bed closed, 83½ ins., length with bed open, 105 ins., lathe takes between centers, closed, 36 ins., open 57½ ins. The lathe swings 17¼ ins. over ways and 32 ins. in gap, and will turn up to 25 ins. diameter. The milling machine has a longitudinal feed of 20 ins., a vertical feed of 20 in., and a cross feed of 7½ ins.

In the shop where a wide variety of work is handled the combination lathe-boring and milling machine is a valuable machine and enables the work to be accomplished with a minimum of investment.

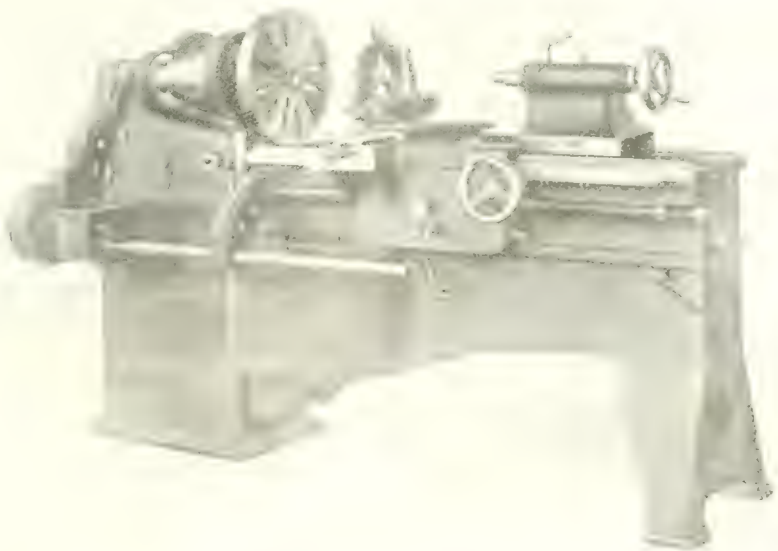
The G. W. Fleming Co., 16 Broadway, Springfield, Mass., are the manufacturers of this machine.

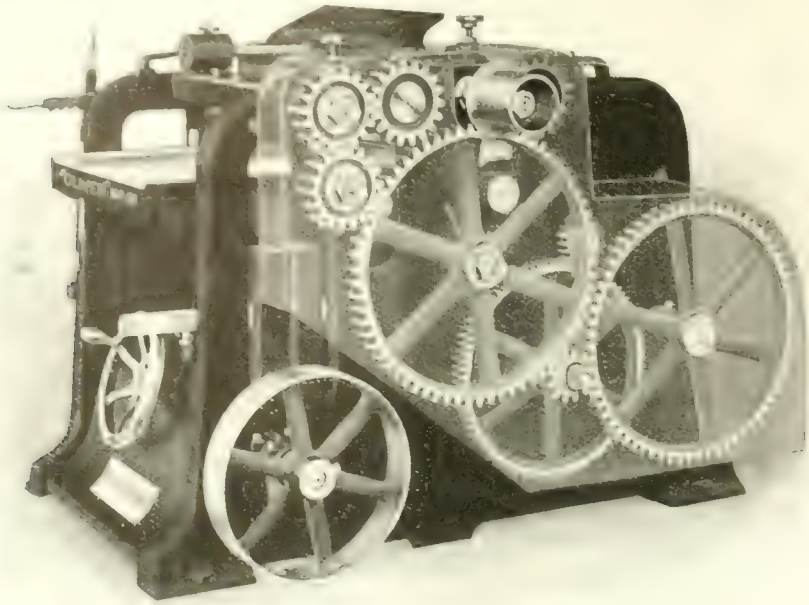
## CABINET SURFACER

A cabinet surfacer built by the Oliver Machinery Co. of Grand Rapids, Mich. is illustrated herewith. This machine has a number of improved features.

The demand for an accurate smooth planer capable of a wide range of work both in soft and hard woods is well met in the design of this planer, its correct design, compactness, feeding power and general efficiency making it readily adaptable to the requirements of pattern makers, aeroplane manufacturers, government shops, engineering works, shipbuilders and railroad car shops.

The machine is made in two widths





SINGLE CYLINDER FOUR ROLL DOUBLE BELTED CABINET SURAFACER.

tributed, eliminates strains and vibration.

To assure perfect balance, hence smooth planing, the cylinder is of the circular type, made of a crucible steel forging of uniform texture and belted at both ends. It carries two thin high speed air hardening steel knives securely clamped against hard steel chip breakers, whose lips are shaped to repel shavings and chips. The entire cylinder is nicely ground to perfect size. The journals are long, of unusually large diameter and machine ground.

The cylinder pulleys are two in number, and their faces are grooved spirally, preventing air pockets under the belts and augmenting the belt power through its close contact with the pulleys.

The cylinder bearings are of the self-oiling side-clamping type with large oil chambers. They are readily adjusted to hold the cylinder firmly in place for smooth planing. Readjustment of caps can be made instantly.

The back pressure bar follows the cylinder and is held by adjustable screws for regulating the hold-down pressure on the lumber as it leaves the cut. The throat between the front and rear pressure bars is only 2⅛ inches for service in planing smoothly and without end clipping on very short stock.

The chip breaking pressure bar before the cut holds the lumber firmly to the bed as it is planed, and prevents the chips from tearing its surface. It is attached to the main frame in such position that it raises concentrically with

raising into the knives. A steel spring shoe is secured to the lower part of the bar, which not only holds the stock firmly on the bed but yields to any ordinary inequalities in rough stock. An adjustable weight regulates the pressure.

The bed is of suitable dimensions, gibbed properly, and is raised in a wide central slide that is deep to give the bed the proper rigidity. A guide is located at each side to prevent material from leading away from the bed and striking the frame or gearing. The bed is supported on heavy square thread screws with ball bearings, reducing friction and permitting the raising of the bed without exertion. The bevel gears used in elevating the bed are machine cut and are protected from dirt by a wide shelf that covers the inner space below the table and keeps the shavings within the frame making it very easy to clean around the machine. Directly underneath the cylinder is a centre plate adjustable to wear, removable from the bed when worn. It may be redressed and refitted or discarded for a new one as the occasion demands.

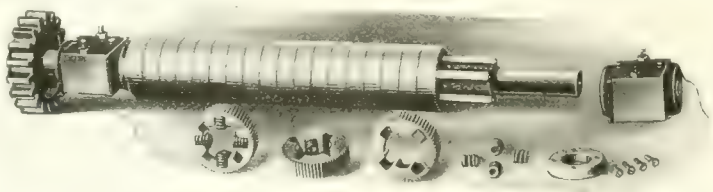
There are four feed rolls, one pair back of the cylinder to feed the material free of the knives and assist in carrying it through the machine. They are large in diameter, made of hammered steel and are supported in self-oiling boxes. The upper feed-in roll is corrugated for gripping the stock firmly. All the rolls are driven by a train of heavy gearing, three pitch, the teeth machine cut, insuring a smooth and positive feed. The feed-in rolls are weighted and the delivery rolls have spring tension. The upper delivery roll has a cover over it and is provided with a scraper which keeps the rolls free from shavings.

Sectional feed rolls may be provided when so desired. It consists of sections 1⅛ inches wide and 4 inches diameter. While giving a horizontal drive as positive as a solid roll, they yield vertically independently of each other to the extent of 3/16 inch. Each section is composed of an outer ring enclosing four sections or seats placed radially to the centre of the roll shaft and each carrying a helical spring.

The sectional chip breaker consists of 1⅛ inch sections pivoted in connection with section weights, on two horizontal bars attached to two plates. They yield concentric to the cylinder independently of each other.

The gearing that transmits the power to the rolls is all machine cut and perfectly finished throughout. Such gears as revolve on steel studs are provided with oiling devices that are right. Grease cups mounted on each stud furnish oil through channels in the studs to the inner surface of the hubs, producing effective lubrication. The studs are large and the bearings for shafts that pass through the machine are fitted with dust-proof spring oilers. The master driving pinion is hammered crucible steel and machine cut.

A grinding attachment is provided which will quickly and accurately grind the knives of planers and jointers without the trouble of taking the knives off the machine. The attachment can be quickly mounted on the machine or removed therefrom. The motor is mounted in grinder head; current is taken from an ordinary lamp socket.



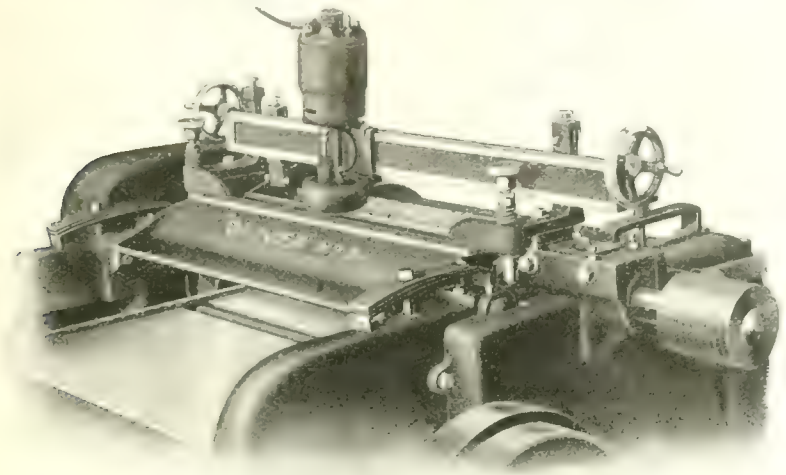
SECTIONAL FEED ROLL SHOWING POSITIVE DRIVE AND STRONG CONSTRUCTION.

## AUTOMATIC ELEVATOR FOR SHELLS

THE AUTOMATIC elevator illustrated in the accompanying engraving has been recently designed and erected by Ed. Bennis & Co., Ltd., of Little Hulton, near Bolton. It is arranged both to elevate shells or similar cylindrical bodies from a lower to a higher level, and to lower them, and can perform these operations simultaneously. A feature of the appliance lies in the fact that the articles do not pass round the top or bottom drums either when being raised or low-

ered, the feeding and discharging in each case taking place on the same side of the elevator.

The elevator can conveniently be bolted to a wooden framework. This framework is provided with bearings for the shafts of the top and bottom drums



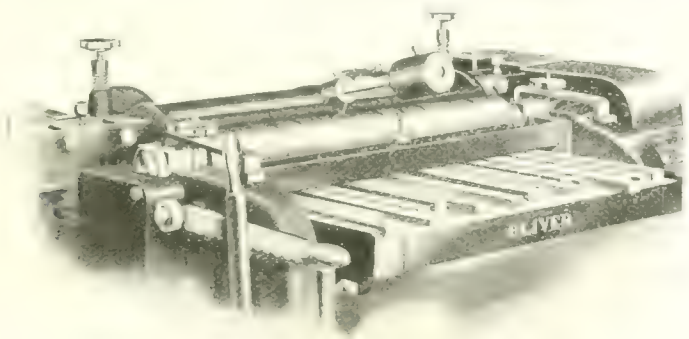
GRINDING JOINTING AND SETTING ATTACHMENT IN USE.

shown in the engraving. These drums are of cast iron, and are provided with sprocket teeth to engage the elevator chains. The shaft of the upper drum is extended to carry a driving belt pulley. The endless elevator chains are two in number, and are formed of cast steel links united by mild steel rivets. At intervals the two chains are connected crosswise by a horizontal rod. These rods serve as spindles whereon the shell carriers are pivoted. The carriers are built up of lever-like cast steel bossed plates A, the number of such plates in each carrier varying with the length of the article to be lifted.

The plates, pivoted on the cross spindle at B, are riveted together at C, and are joined by an axle at D. This axle does not rotate, but carries at each end

turned steel prongs J are fixed. The plates of the carrier passing between these prongs lift the lowest shell, which rolls into the position shown at K. On reaching the level at which the shells are to be discharged, the rollers of the carrier pass into a bend L in the guides F. This causes the carrier to tip the shell on to the gently-sloping discharging table M, the end of which is provided with straight prongs.

Passing over the top sprocket drum the carrier, now upside down, is available for lowering shells from the level N to the level P. The table at N slopes gently towards the elevator, and at its end is provided with a group of pivoted and balanced prongs Q. Two of these prongs are formed with projecting lips R against which projections S on two of the plates of the carrier strike during the descent. The shell resting on the prongs Q is thus allowed to fall into the hollow on the back of the carrier, as at T, is lowered thereon until it reaches the fixed straight prongs U on the end of the lower table P.



VIEW OF AXLE SHOWING FEED ROLLS

a roller E, the body of which is hollow and filled with lubricant. The rollers work against two pairs of mild steel angle iron guides, F, G, fixed to the wooden framework.

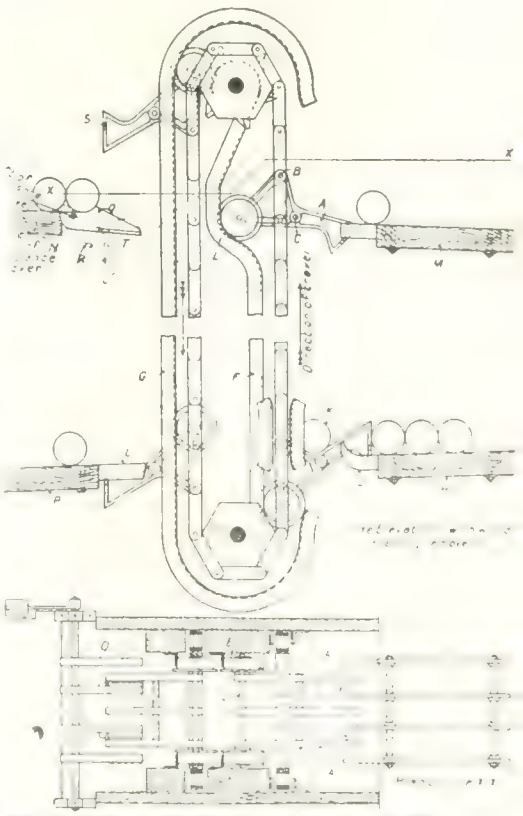
The shells to be raised approach the elevator by rolling down a gently sloping table H, at the end of which up-

## NO PASSPORTS WITHOUT CREDENTIALS

ALL American seamen must now show a seamen's certificate of citizenship, or intention to become such, before they can obtain their passports to sail coastwise or overseas. This applies to licensed officers as well as seamen, engineers, firemen, coal passers and stewards. Aliens must have a certificate of nationality issued by their respective consuls or be able to show continuous discharge books from previous employers. No alien enemies will be allowed to ship on American vessels of any sort, or on the vessels of the British Allies. It is very important that this information should be impressed on sailors, as they have not yet realized that they absolutely must show their papers as described above to obtain passports.

## THE WORLD'S PRESENT MOST VALUABLE ASSET

IT is predicted that the demand for tonnage will be even greater in 1918 than it was in 1917, and the utility of ships will enormously increase. The economic world crisis, however, it is believed, will not reach its climax until after the war. If



PLAN AND ELEVATION OF SHELL ELEVATOR

the law of supply and demand was allowed to operate, ships might some day be worth their weight in gold to their owners, but in the present controlled state of trade their immense value as national assets really detracts from their value as money-making instruments. Ships are, and will continue for some time to be, the most important factor of all in helping to preserve the lives of nations, and the States of Europe will not be likely to slacken their ship production and acquisition after the war until there are sufficient craft to ensure safety in regard to supplies of food and other essentials. The nation, in fact, that owns the greatest amount of tonnage and has it under the best control will have the most valuable asset when the war closes.

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## CANADIAN PROJECT MEETS WITH WIDE APPROVAL

A [illegible] Washington [illegible], the commendatory opinions which have been expressed throughout the Dominion regarding the projected plate mill plant in Nova Scotia. Such a step will afford considerable relief to the mills in the States with ultimate beneficial effect on congestion generally.

Announcement has also been made that the first order for steel has been placed in the States for the Canadian shipping program, calling for 80,000 tons of plate and sections. With the gradual increase of government ship work, as the Munitions Board vessels are completed, the volume of material required will assume considerable proportions, and in this respect much interest attaches to a recent statement by the management of the immense Hog Island yard that an average of two months elapses from the time the steel leaves the mill until it reaches the shipyard in fabricated form.

The additional four months required from the time the keel is laid until fitting out is completed mean that six months is required from the time the steel leaves the mill till it is afloat ready for duty.

An idea of the prospective load on transportation facilities in the States may be gathered from the fact that thirty-five shops, widely distributed, are engaged on the work of fabrication: this for one yard's output alone.

The Canadian program we understand calls for the adoption of the fabricated steel system of ship construction and if the plans adopted correspond to those now in use in the States, a high degree of output may be rapidly attained in the Dominion yards.

While the completion of the plate mill is quite some time distant, possibly eighteen months, some advantage may be gained by the fact that two-thirds of this time will be normal weather conditions allowing maximum rate of preparation. It is also not unlikely that in view of its desirable effect on traffic conditions south, the work of building the new equipment will be afforded every facility by United States authorities for rapid completion by the builders.

The project marks an epoch in Canadian industry, and its advent at the present juncture justifies the importance with which it is regarded in the eyes of the industrial leaders of the United States.

## THE NEEDS OF CANADA IN REGARD TO INDUSTRIAL RESEARCH

THAT scientific industrial research has proven its worth in cold cash as a business investment was stated by Professor F. C. Fields of Toronto, in a recent public address, although the initial cost of such expenditure is one of the chief obstacles to a more liberal attitude towards research on the part of many manufacturers.

Figures given by Professor Fields regarding such work in America are illuminative:

"In the case of one firm, an investment of $25,000 in two years had yielded assets of $200,000 and an annual profit of $1,000,000. In another case the same investment in 18 months was bringing a profit of $50,000.

"In one instance an investment of $25,000 in four months paid $1,500 per day."

Such instances of course are confined by the nature of circumstances to a limited number of firms, and in the broad national aspect are not of benefit to the population as a whole except via the sales department of the firm making the investment. All that is right and proper, but such a feature differs essentially from British practice which has been considerably accelerated of late.

The "State Department of Scientific and Industrial Research" in Great Britain has a fund of a million pounds sterling at its disposal and among its activities it has been founding co-operative laboratories for manufacturers in similar industries, the department defraying the costs.

The Council of Industrial and Scientific Research in Canada has ample precedent for its existence and while numerically its results may be less than those of similar bodies of other countries, it is a national necessity and as such should be kept closely in touch with by manufacturers throughout the Dominion.

Only by knowing what to look for can the efforts of such an institution be efficiently directed, and while natural resources offer many fields of application, the industrial life of the Dominion will become more consolidated if manufacturers once see the possible benefits to be derived by judicious consultation with the council.

## INTERNATIONAL INFLUENCE OF U.S. MACHINERY DEALERS' CONVENTION

CANADIAN machinery manufacturers and dealers are taking more than passing interest in the thirteenth annual convention of American associations connected with this branch of industry.

Just as the United States did not at first fully realize the magnitude of Canada's war effort, so are we liable to be misled by incorrect, exaggerated, and otherwise erroneous reports regarding our ally's activities.

Much information of a military nature will not be available, but much information, of a kind designed to assist individuals and firms in the efficient discharge of their duties as loyal citizens of a country at war, will be made available by the three supply and machinery associations concerned.

The event is particularly interesting in many ways. Secretary of War Baker; Charles A. Hinch, president of the American Bankers' Association; Fairfax Harrison, president of the Southern Railway, are expected to deliver addresses.

The impressive aspect of the convention is that machinery dealers and manufacturers are receiving the approval and personal co-operation of government, banking and allied interests in their efforts to serve their country.

It is now thirteen months since the United States declared war on Germany. Much of that time has been too strenuously occupied with active preparation. Although the first rush is still on and will be on till the end, the organizing instinct, the team-work microbe, has now got to the surface and the racial characteristic for co-operative discussion will be given full play.

Canada missed much of this propaganda work when it was most necessary, but just as peace time knowledge has been utilized in war, so can war time activities and ideas be studied with a view to peace however distant. Personal addresses by prominent officials of the leading industries concerned will be of a nature calculated to exert a powerful and beneficial result on the efforts of those concerned.

The closely allied and parallel paths of Canada and her big neighbor make the event truly international in the machinery world.

# Has Not a Moulding Apprentice in the Shop Although Wages Are Running High at Present

## Workers Have Given Good Satisfaction in Some of the Shops Where They Have Been Employed.

[illegible] there does not seem to be a well-organized apprentice system in the trade would seem to threaten a serious situation [illegible] more seriously affected than the manufacturer of stoves.

"We have not an apprentice in our shop to-day," said Mr. Charles Stewart of the Stewart Mfg. Co., Woodstock. "It cannot be said that there is no money in it for young men. We have offered unusual wages to beginners but they seem to prefer other work at less money. The men we have with us to-day have been with us for years, and same of them are [illegible] good workmen, and under the circumstances are worth the money, but they will not work six days a week. It may be that they are better men for the extra day's recuperation, for they certainly go some while they are at it.

"But the question is, how are we going to fill the ranks as they are thinned out? I understand that there are 200 moulders in Toronto to-day who are working at other trades. Are these men going back to the bench when there is no longer work for them elsewhere? Not likely if they can get as good money and cleaner work. What, then, is the remedy? Another stove manufacturer told me the other day that he had a shop full of apprentices but that they were all foreigners, and therein seems to be the only solution of the problem. Foundries must have moulders and I suppose it is hardly fair to expect the government to require that all tradesmen should seek employment in their own particular trades. That would be encroaching on personal liberty. Let us hope that this is one of the many problems to be solved after the war."

Mr. Stewart observes that scarcity of material and labor and consequent high prices would seem to induce falling off in demand, but it is a present-day peculiarity that the opposite is the case.

### About Women Workers

[illegible] tool makers, Galt, have been employing several young women in their factory for some time, and Mr. Preston states that he is more than satisfied with their work.

"It has not always been possible to secure men," he said, "and our experience is that on certain classes of machine work, such as repetition processes, we could not have done better than employ girls. Fortunately there has been available a certain amount of help that has had fine machine experience. For example, [illegible] have worked on shoe or knitting machinery have a practical aptitude and are quick to learn the different lathe manipulations. I do not say that we have placed them on calculative work or fine adjustments, but when they understand [illegible] operations that are necessary the work as a rule is done quickly and with intelligence. Ours of course is a light class of work, such as a girl could engage in at any time. After the war many of the girls who are employed in such plants as ours may seek other employment, but not because they have not made good on certain classes of work in the machine shop.

# HUDSON BAY MINERAL WEALTH IS LARGELY IN HANDS OF AMERICANS

APPARENTLY the people of the [illegible] the mineral wealth of the Hudson Bay district, especially in copper and gold, large quantities of which are already taken annually from the rocky sections of that country. CANADIAN MACHINERY had an interesting talk with A. D. Porter, who has been on the engineering staff in charge of the construction of the Hudson Bay Railroad, which is now held up on account of the shortage of steel, and the fear that some of the work may have to be lifted to make up for the shortage caused by taking Canadian steel to Europe.

Le Pas has been Mr. Porter's headquarters for some time past. The road is now built for a stretch of 380 miles, to Kettle Rapids. "It has not been a bad country to build through, one of the chief troubles being muskegs. Big bridges have been constructed, principally at the Saskatchewan river, Manitou Rapids and Kettle Rapids. The latter was a particularly hard piece of work. The water is deep and rapid and much of the work was carried on in the very cold weather, and by cold I mean 40 below for days and weeks at a time. Ninety-pound steel has been used so far on the road, but there is a chance that this may be brought to a lighter type if the work is carried on at all.

In answer to a query about the minerals of the country, Mr. Porter said, "The country is rich beyond words, in copper and gold, and what else I don't know. The Mandy Mining Co. took 9,000 tons of copper ore from their property. They team it on an ice road to Sturgeon Landing on the Saskatchewan, then it comes down to Le Pas. From there it is loaded and shipped away off to Trail, B.C., for the purposes of refining, and even with all that handling they make a good profit out of it. To give you an idea of the mineral wealth of the quartz, a team of mules took nine tons in one load from the mine along the ice road that they use. But it's all American capital that is interested in the property. Then there is gold at Herb Lake, some ten miles from the railroad. The provincial government built a wagon road in there, and the quartz that is taken out is rich stuff. McKeefer Bros., of Boston, have a stamping mill there, and when the ore is broken up the free gold can be seen very plainly, and in liberal quantities.

### Other Natural Resources

"Then there is the spruce timber being cut there," continued Mr. Porter, "I don't believe there could be finer wood. Fishing is carried on very extensively by the traders and Indians, and furs are sold largely to the trading companies and New York buyers."

Mr. Porter's brother, J. W. Porter, is chief engineer on the work of the Hudson Bay road. The mail comes to their headquarters every two days, and in that way they get a fairly good news service. "I have read CANADIAN MACHINERY for the last ten years," said Mr. Porter, "and through that paper I have been able to keep in touch with what is happening in engineering and machinery lines while I have been more or less out of touch with them in Northern Manitoba." Prior to working on the Hudson Bay road Mr. Porter was engaged in railway work in Montreal and other points, and filled a number of responsible positions, also having much to do with the outfitting of the C.N.R. For the past month he has been in Toronto working on the valuation of the C.N.R. rolling stock in connection [illegible] the worth of the stock.

# MARKET DEVELOPMENTS

# War Demand for Steel Dominates Situation

## More Steel Required for War Work—No Permits on Steel Plate for Stock—Machine Tool Market More Active—Tin Continues Very Scarce and Again Advances—Shortage of Steel Scrap.

SIGNS are not wanting that the orders for shells from the United States will be an important factor in the munitions industry in Canada this year. Already considerable contracts have been placed and indications point to interesting developments in this connection. Not only will the adverse balance be reduced materially but the additional flow of money into Canada will benefit the manufacturers and the country generally. Already there has been quite a revival in the machine tool trade on this account, and a stimulation among Canadian makers to build new and special tools for this purpose. This is an important development and one that will have a beneficial effect on the trade. The need for steel for war purposes is indicated in a new arrangement backed by the War Industries Board whereby steel is to be distributed in a classified order of priority. By this means firms engaged on war orders will have first claim on the mills, and when their requirements have been satisfied the balance will be allocated to the ordinary consumer. An order has been issued from Ottawa stating that no more export licenses will be issued by the United States Government until further notice on shipments of steel plate to Canada when required for stock. This again makes the position of the private consumer increasingly difficult. The demand for steel products in Canada continues good but merchants are handicapped by the difficulty that is being experienced in obtaining material. The scrap metal market is quiet and business continues dull. Buyers are keeping out of the market as they anticipate lower prices. There is a serious shortage of heavy melting steel and cast iron scrap with the result that prices of these materials are holding very firm. There is a good demand for machine shop supplies stimulated by the activity in the munitions industry. Prices are generally firm with an upward tendency in some lines. The continued scarcity of tin is the outstanding feature in the non-ferrous metal markets. This metal is in very short supply and there is no sign of relief in sight. The price of tin has advanced. It is asserted in some quarters that the fixed price of copper may be advanced to cover increased producing costs. Lead and spelter are easier and prices are lower. Solders have advanced on account of the acute tin situation.

## INCREASED ACTIVITY IN MUNITIONS INDUSTRY

### Opening of Navigation Will Relieve Freight Situation

MONTREAL, Que., April 29, 1918.—The feature of industrial activity in Montreal and the surrounding district is the revival of the munitions business. The decline that was apparent in this direction some six months ago or more has again given place to increasing business, more particularly in the demands for shells from the American Government. Large orders have recently been placed with a Montreal firm for the production of the 9.2-inch shell. This contract, while coming from the United States, will be identical in character as former shells of this particular size, as the ordnance of the American army is being adapted to conform as close as possible with that of the other Allies to avoid complications. One firm here has recently obtained an order for 155 m.m. shells for the American Government, and equipment is being obtained as rapidly as possible. In connection with one of the largest contracts ever placed by the American Government for valves for navy requirements an engineering firm of Montreal succeeded in obtaining business to the amount of over $65,000. This firm's total business for the year that has passed did not reach the total of this one order, and the manager recently intimated that his prospects for the present year would be close to 2½ millions. A feature of present developments is the suppressed interest that is being displayed in the demand for fuel conservation. Several local firms are planning to instal electric units in place of the steam equipment now in use, buying outside power from companies that are now generating current from water sources.

#### Steel

Steel activity throughout the district continues quite brisk, and consumers who are dependent upon shipments from outlying points report that they are getting better delivery than they have had for many months. This is partly due to the relief that has come with the opening of navigation and the consequent greater supply of cars that have resulted; in addition the various roads are gradually obtaining more cars for freight transportation. Local steel plants, both those that are working on rolled steel for light and heavy bars and those engaged in making billets for different-sized shells, are very active. Some little difficulty is still experienced by those plants working on the 75 m.m. shells in getting an ample supply of forgings for capacity operations. In this connection, however, Canadian manufacturers are endeavoring to overcome the handicap, and one firm in this district is now producing sufficient forgings for maximum operations on the machining of the shells. The delivery of plates to the steel shipbuilders is more encouraging, although there are times when operations are slightly suspended owing to the lack of sufficient material. One of the engineers of a plant in this district said "that it did not take very long to consume a thousand tons of steel plates, and there are times when we are necessarily waiting for a further supply." With the summer approaching, this firm anticipates better delivery of plates and expect much better progress in the construction of the vessels. Canadian mills making small-sized plates are reported to be exceptionally active, as this class of material is becoming more difficult to obtain from steel mills in the States. The local dealers report conditions that are practically normal in comparison to the activity of the past several weeks, but intimate that delivery has shown much improvement. The difficulty of placing orders with any assurance of definite delivery is still pro-

nounced and will likely continue so under the present pressure of business. Practically all quotations are held at last week's figures.

### Metals

With the exception of tin the metal market is normal in character and the general demand steady, with little to feature the developments of the week. Copper continues to be firm, but interest is centring in the possibilities of an advance in price. Tin continues to hold the place of honor in the metal movement and the situation here is nervous and acute. Spelter is very quiet, as lack of even moderate buying has given the metal an additional weakening tendency. Lead continues firm, although the demand has not been very heavy. Antimony and aluminum are unchanged, but relatively firm in prices asked.

**Copper.**—Little development has taken place to alter the firm tone of the market, and buying here has been very steady. Some interest is being shown locally over the prospect of the American Government, acceding to the demand of the producers for a higher price for this metal. Just what attitude the Government will adopt in this particular is not clear, but some sections of the trade apparently believe that a slight advance may be made. Dealers here continue to ask 29c and 30c on a steady market.

**Tin.**—The extreme scarcity at the present time has resulted in an exceptionally strong market, both here and in New York. This additional strength has developed from the announcement that a recent shipment of tin from England has been sunk in transit. This has created a temporary shortage on this side and quotations have jumped upward. Local dealers are asking as high as $1.10 per lb., this being an advance over last week of 10c per lb. The demand, however, is not very heavy at present, as many of the consumers are conserving as much as they can the supplies they have on hand, these supplies having been obtained before the situation became so acute. Dealers here are looking forward to an easier market within a week or so.

**Antimony.**—This market has developed a weaker tone owing to the decline in the demand and the plentiful supply of metal. The local situation is reflected in the easier quotation, dealers here asking 15c per lb., a decline over last week of 2c per lb.

Spelter, lead and aluminum are unchanged, both as regards the demand and the dealers' quotations.

### Machine Tools and Supplies

Activity throughout the machine tool trade is apparently steady, although not over active; inquiries are still coming in for medium-sized machines suitable for 4.7-in. and 6-inch shells. One large firm here is getting plans out for certain machines and intend to construct them in their own plant. The designer of these machines has installed many of the smaller sizes in different shell plants, but has had great difficulty in getting firms to undertake the manufacture of them, one of the reasons being that the firms complain of being unable to get sufficient skilled labor to produce the work.

## POINTS IN WEEK'S MARKETING NOTES

**Canadian firms are making special machine tools for munitions plants.**

**Machine tool trade more active as a result of American shell orders.**

**Export licenses for steel plate for stock will not be issued by United States Government until further notice.**

**Stocks of plate in Canada to be conserved and only used for more urgent requirements.**

**Munitions contracts placed in Canada by United States Government may total $100,000,000. Orders already placed include 12-inch, 9-inch, 155 m.m. and 75 m.m. shells.**

**Reported that Allied war orders will be transferred from the United States to Canada to speed up deliveries.**

**War Industries Board will distribute steel in order of priority according to urgency of requirements.**

**United States Government steel requirements growing heavier, absorbing a large percentage of output.**

**Sharp advance in tin, due to serious shortage, with no relief in sight.**

**Lead and spelter both easier, and prices have declined.**

**Copper prices come up for consideration shortly. Report states that prices may be advanced.**

Some dealers here report that goods are being received more promptly, but shipments from the States are still uncertain owing to the delay resulting from the necessity to obtain import license. Demand for small supplies of every description is very active, and prices in most cases are well maintained.

### Scrap

Little change is noted in the activity in old materials, as dealers here report a situation that is not encouraging owing to the uncertainty that apparently pervades the market. Consumers are only interested in immediate requirements, and heavy buying is not pronounced. Steel turnings for electric steel making are in fair demand, and prices are very firm. Brass and copper scraps are steady, but with a slight undertone of weakness. The general tone of the situation is one of firmness, but dealers would like to see a release of the tension that seems to dominate the market.

## BETTER DEMAND FOR MACHINE TOOLS

### Manufacturers Building Special Tools for Munition Plants

TORONTO, Ont., April 30.—In order to take care of the adverse balance of the trade against Canada with the United States, it is likely that large contracts for munitions and other lines of war orders will be placed in Canada by the U.S. Government. It is understood that munitions orders alone to the extent of $100,000,000 will be placed in Canada, while possibly several millions of allied war orders placed in the States will probably be transferred to Canada. This will also have the effect of relieving the congestion in some lines of war orders in the States where deliveries are said to be months behindhand. The expenditure of such large sums of money will be a great benefit to this country and also correct the adverse balance of trade against Canada. Already large orders for shells have been placed, and others will likely follow in due course.

### Steel

All indications point to more complex conditions in the iron and steel trade in the future than at any period previous to the present time. The insistent demand for steel for war purposes has created a most difficult situation for the ordinary consumer, and it is unlikely that conditions will improve until the war is over. An instance of the difficulties that consumers and dealers have to contend with may be shown in an order or regulation recently issued from Ottawa. The War Trade Board has informed dealers that no more export licenses will be issued by the U. S. Government until further notice on shipments of steel plate when required for stock. Dealers have also been instructed to conserve supplies on hand, and it is also intimated that no material will be released from stock without a permit from the War Trade Board at Ottawa for each individual shipment. Supplies of plates and sections for shipbuilders are arranged for direct between Ottawa and Washington so the order will not affect war activities. Merchants, however, will be hit and the private consumer also. They have no redress as the urgency of war demands is solely responsible.

A recent development in the United States indicates that the position of the ordinary consumer is becoming increasingly difficult. What happens over there will in a measure be reflected in Canada. Every day it is becoming more apparent that the commercial market for steel is growing narrower, because such a large percentage of the output is being absorbed by the U. S. Government, leaving a comparatively small tonnage available for private use. According to a new arrangement steel is to be distributed in a classified order of priority in which the national needs are so prominent and so heavy that anything else will receive

little attention. From this it follows that permits will in future be more difficult to obtain and the civilian consumer will be the first to suffer. Canadian car builders will require about 80,000 tons of steel bars, plates and shapes for the construction of cars and 30,000 tons of cast, rolled and forged steel for building locomotives, orders for which have been placed the last few weeks. This steel tonnage is probably a part of the 700,000 tons reported on order with American mills for shipment to Canada.

### Pig Iron

In regard to supply there is very little improvement to note in the domestic pig iron situation. Oil the maleable and foundry pig iron that is being produced quickly passes into consumption. The demand for basic iron continues insistent and is beyond the capacity of the furnaces. In the States very little pig iron is being sold except through government intervention for consumers that are working on war contracts, but there are few foundry interests that are not working either directly or indirectly on war orders. It seems probable that the iron industry must come more than ever under government control, in which case the furnaces would be relieved of the responsibility of satisfying the demands of their customers. Receipts of coke at the furnaces have increased, but deliveries have been irregular and furnace operations have not increased to the extent anticipated.

Steel manufacturers and importers of ferro-alloys are concerned over the embargo on ferromanganese, effective May 13. The trade is especially desirous of knowing if the embargo applies to manganese brought on British ships as well as on those operated under the American flag. The impression is that it would restrict importations of ferro-manganese carried by any vessel into United States ports. It is hoped that mining of manganese ore in the United States may be stimulated by the war necessities of the steel manufacturers. The price for 70 per cent. manganese remains $250 per ton, but the market would readily rise under present conditions were it not for the probability of government price-fixing. It is possible that ferro-manganese could be shipped from England into Canada, and thence overland into the United States, but British supplies are short and Canadian manufacturers are trying to obtain ferro-manganese here.

### Scrap

The market for old materials continues in much the same condition as has obtained for several weeks. There is a marked disinclination on the part of buyers to operate, while on the other hand dealers do not appear to be particularly anxious to sell. Business consequently is decidedly dull and shows little or no indication of activity in the near future. Heavy melting steel and cast iron scrap are still very scarce at firm prices, with so many electric furnaces now operating in Canada there is not much chance of stocks of steel scrap accumulating as supplies soon pass into consumption. In this connection a market has been found for shell borings and turnings. There are no price changes to report this week.

## U.S. NAVY VALVE REQUIREMENTS LARGE

**Canadian Firm Secures a Contract for Reducing Valves**

SOME idea of the magnitude of the shipbuilding activity may be gathered from the data herewith in connection with the recent bid for valves for use of the United States Navy Department. This bid is known as Schedule 1712, steam engineering section, and was opened on April 2. The aggregate number of valves required on this particular schedule is about 834,000, this quantity comprising all types of valves. The class of valve of which the greatest number is required is the ordinary globe valve, the requirements being upwards of 383,000, about 143,000 of these going to the yard at Norfolk, Va. The total number of ½ inch globe valves will be approximately 75,000. The total number of gate valves of various descriptions will be in the neighborhood of 70,000, these include steam and water valves and 100 or more 1½ inch quick opening for low pressure. The bid calls for nearly 2,000 pressure relief valves, including snifting, muffler and air types; 880 are of the flanged variety, ranging from 1 inch to 1½ inch in size. The total requirements for check valves including swing, horizontal and vertical, and will approximate 132,000. Pressure reducing valves will number about 4,000; these will be for reduction from 175 to 25 lbs. per sq. in., exclusive of about 600 of a heavier type requiring a pressure reduction of 300 lbs. per sq. in. to 30 lbs. per sq. in. Radiator valves of various sizes will be required to the number of about 9,000; these include lock shield, renewable disk, and plain globe and angle types. Many of these radiator valves will be nickel-plated; about 1,000 of the ⅛ inch size being automatic. Nearly 1,100 ⅛ inch needle valves will also be required. When it is understood that the above requirements are exclusively for American navy purposes, the activities in the marine field are very remarkable. In connection with the above it might be stated that a certain Canadian engineering firm have received a contract for the manufacture of about 2,500 of the small size reducing valves, the amount of the business being well over $50,000.

### Machine Tools

A marked revival in the machine tool trade has followed the placing of American contracts for shell in Canada. The sizes covered in the contracts include 12 inch, 9 inch, 153 m.m. and 75 m.m. In the millimetre sizes some new and special equipment will be required for certain operations, for the 12 inch heavy tools will be required. An interesting development of this new business is the impetus which will be given to the machine tool industry in Canada. Neither the Canadian or U.S. Governments are encouraging the importation of machinery, with the result that Canadian makers are becoming more interested in this market and a number of firms have taken up the manufacture of new lines.

### Supplies

The market for machine shop and mill supplies continues active and seems destined to remain in this condition for some time. The revival in the shell business and fitting up of new plants will stimulate the demand for supplies generally. Express shipments lately have not been coming forward as regularly as formerly. Dealers complain of packages going astray and shipments as a rule being delayed in transit. The heavy burden on the express companies has doubtless something to do with this state of affairs. There are no price changes of importance to note although there may be an advance in lubricating oils in the near future.

### Metals

In the non-ferrous metal markets, tin continues to be the principal object of interest. Prices have again advanced and the metal is still very scarce with no indication of increased supply. Copper continues unchanged although it is reported that the War Industries Board may advance the price to 24¼c at the conference which is to be held shortly. Lead and spelter are both easier and have declined. Solders have advanced. Business continues very good locally and the outlook favorable.

**Copper.**—The principal feature of importance is the conference which will be held shortly by the copper producers and the War Industries Board. It is reported that the fixed price of copper may be advanced to 24¼c as it has been estimated that there has been an advance in producing cost of ¾c since the date when the present price, 23½c was agreed on. The market is quiet and quotations are unchanged. Lake and electrolytic are quoted at 28½c and casting at 28c per pound.

**Tin.**—This metal continues in the same unfortunate position. There is no spot metal offering. Small lots have been reported sold in the last few days in New York at as high as 95c. It is not a question of price now but one of obtaining the metal. Inquiries for tin of any grade and in all positions indicate anxiety of consumers to obtain a supply but the holders of Chinese, which is the only tin which can be offered with any assurance of delivery, ask so much for their products that buyers hold off as far as possible. Straits and Banca tin are for the time being out of the market. Tin has advanced again and is now quoted at $1.05 per pound.

**Spelter.**—The market is easier and prices have declined ½c per lb. Little interest is being shown in spelter and business is consequently dull. It is understood that the British Government

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago | 37 50 |
| Standard low phos., Philadelphia | ..... |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 32 00 |

Government prices.

| | Toronto |
|---|---|
| Hamilton | ..... |
| Victoria | 50 00 |

## FINISHED IRON AND STEEL

| Per lb. to Large Buyers. | Cents |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 5 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 5 75 |
| Chequered floor plate, 3-16 in. | 12 20 |
| Chequered floor plate, ¼ in. | 12 00 |
| Staybolt iron | 8 50 |
| Bessemer rails, heavy, at mill | ..... |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | *3 50 |

F.O.B., Toronto Warehouse

| | |
|---|---|
| Steel bars | 5 50 |
| Small shapes | 5 75 |

F.O.B. Chicago Warehouse

| | |
|---|---|
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

## FREIGHT RATES

Pittsburgh to Following Points

| | C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 38.1 | 50.5 |
| Halifax | 39.1 | 51.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

## METALS

| | | |
|---|---|---|
| Lake copper | $30 00 | $28 50 |
| Electro copper | 30 00 | 28 50 |
| Castings, copper | 29 00 | 28 00 |
| Tin | 110 00 | 105 00 |
| Spelter | 10 00 | 9 50 |
| Lead | 9 50 | 8 50 |
| Antimony | 15 00 | 16 00 |
| Aluminum | 50 00 | 50 00 |

Prices per 100 lbs.

## PLATES

| | | |
|---|---|---|
| Plates, ¼ in. | $ 5 00 | $ 5 00 |
| Heads | 9 25 | 9 25 |
| Tank plates 3-16 in. | 9 50 | 9 50 |

## WROUGHT PIPE

Effective Feb. 5, 1918.

Standard Buttweld

| | | |
|---|---|---|
| ⅛ in. | $ 6 00 | $ 8 00 |
| ¼ in. | 5 16 | 7 29 |
| ⅜ in. | 5 16 | 7 29 |
| ½ in. | 6 55 | 8 12 |
| ¾ in. | 8 28 | 10 41 |
| 1 in. | 12 24 | 15 39 |
| 1¼ in. | 16 56 | 20 82 |
| 1½ in. | 19 80 | 24 89 |
| 2 in. | 26 64 | 33 49 |
| 2½ in. | 42 72 | 53 53 |
| 3 in. | 55 85 | 70 00 |
| 3½ in. | 70 84 | 87 86 |
| 4 in. | 83 93 | 104 10 |

Standard Lapweld

| | | |
|---|---|---|
| 2 in. | $ 29 60 | $ 36 08 |
| 2½ in. | 44 46 | 54 70 |
| 3 in. | 58 14 | 71 53 |
| 3½ in. | 72 68 | 90 62 |
| 4 in. | 86 11 | 107 37 |
| 4½ in. | 97 79 | 122 56 |
| 5 in. | 114 00 | 142 82 |
| 6 in. | 147 80 | 185 28 |
| 7 in. | 192 80 | 241 57 |
| 8 L in. | 202 50 | 253 75 |
| 8 in. | 233 30 | 292 32 |
| 9 in. | 279 50 | 350 18 |
| 10 L in. | 259 20 | 324 80 |
| 10 in. | 333 70 | 418 18 |

Prices—Ontario, Quebec and Maritime Provinces.

## WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

## OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 22 50 |
| Copper, heavy | 22 50 | 22 50 |
| Copper wire | 22 50 | 22 50 |
| No. 1 machine composition | 22 00 | 21 00 |
| New brass cuttings | 16 00 | 14 00 |
| Red brass turnings | 18 00 | 17 00 |
| Yellow brass turnings | 12 50 | 12 50 |
| Light brass | 10 00 | 9 50 |
| Medium brass | 13 00 | 12 00 |
| Heavy brass | 15 00 | 14 00 |
| Heavy melting steel | 24 00 | 21 00 |
| Steel turnings | 12 00 | 12 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 27 00 | 20 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 23 00 |
| No. 1 machine cast iron | 31 00 | 30 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 20 00 | 17 00 |
| Car wheels, iron | 26 00 | 30 00 |
| Steel axles | 38 00 | 35 00 |
| Mach. shop turn'gs | 9 00 | 8 50 |
| Cast borings | 12 00 | 12 00 |
| Stove plate | 19 00 | 19 00 |
| Scrap zinc | 6 50 | 6 50 |
| Heavy lead | 7 50 | 7 00 |
| Tea lead | 5 00 | 5 75 |
| Aluminum | 21 00 | 20 00 |

## BOLTS, NUTS AND SCREWS

| | |
|---|---|
| Carriage bolts, ⅜" and less | 10 |
| Carriage bolts, 7-16 and up | net |
| Coach and lag screws | 25 |
| Stove bolts | 55 |
| Plough bolts | 50 |
| Elevator bolts | 50 |
| Elevator bolts, 7-16 and up | net |
| Machine bolts, ⅜ and less | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd., steel | 10 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | add 25 |
| Nuts, square blank | add $1 50 |
| Nuts, square, tapped | add 1 75 |
| Nuts, hex., blank | add 1 75 |
| Nuts, hex., tapped | add 2 00 |
| Copper rivets and burrs, list plus | 30 |
| Burrs only, list plus | 50 |
| Iron rivets and burrs | 25 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 57½ |
| Wood screws, O. & R., brass | 32½ |
| Wood screws, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

## MILLED PRODUCTS

| | |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil. Head Cap Screws | net |
| Flat But. Hd. Cap Screws | plus net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. & Semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2 in. | plus 10 |
| Studs | net |
| Taper pins | 40 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | list plus 20 |
| Cotter screws | list plus 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | 65 |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add 7 00 |

## BILLETS

| | |
|---|---|
| Bessemer billets | $47 50 |
| Open-hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.

F.O.B. Pittsburgh.

## NAILS AND SPIKES

| | | |
|---|---|---|
| Wire nails | $5 25 | $5 20 |
| Cut nails | 5 70 | 5 65 |
| Miscellaneous wire nails | | 60% |
| Spikes, ¾ in. and larger | | $7 50 |
| Spikes, ¼ and 5-16 in. | | 8 00 |

## ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 41 |
| Plumbers' oakum, per lb. | 8½ |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila rope | 0 33 |
| Transmission rope, Manila | 0 45 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | net |

### MISCELLANEOUS

| | |
|---|---|
| [illegible] | 0 50 |
| [illegible] | 0 53 |
| [illegible] | 18 to 70 |
| [illegible] | 0 53 |
| Lead wool, per lb. | 0 16 |
| [illegible] | 4 75 |
| White lead, pure, cwt. | 16 05 |
| Red dry lead, 100-lb. kegs, per [illegible] | 15 50 |
| [illegible] | 0 35 |
| Tarred slater's paper, roll | 0 95 |
| [illegible] | 0 33 |
| [illegible] | 0 32 |
| Pure turpentine, single bbls., gal. | 0 71 |
| Linseed oil, raw, single bbls. | 1 95 |
| Linseed oil, boiled, single bbls. | 1 98 |
| Plaster of Paris, per bbl. | 2 50 |
| Sandpaper, B. & A. | list plus 20 |
| Emery cloth | list plus 20 |
| Sal Soda | 0 03½ |
| Sulphur, rolls | 0 05 |
| Sulphur, commercial | 0 04½ |
| Rosin "D," per lb. | 0 03 |
| Rosin "G," per lb. | 0 03½ |
| Borax crystal and granular | 0 12 |
| Wood alcohol, per gallon | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

### CARBON DRILLS AND REAMERS

| | Per Cent. |
|---|---|
| S.S. drills, wire sizes up to 52 | 40 |
| S.S. drills, wire sizes, No. 53 to 80 | 40 |
| Standard drills to 1½ in. | 40 |
| Standard drills, over 1½ in. | 40 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 |
| Bit stock | 40 |
| Ratchet drills | 15 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 40 |
| Sleeves | 40 |
| Taper pin reamers | net |
| Drills and countersinks | list plus 40 |
| Bridge reamers | 50 |
| Centre reamers | 10 |
| Chucking reamers | net |
| Hand reamers | 10 |
| High speed drills, list plus | 75 |
| High speed cutters, list plus | 40 |

### COLD ROLLED SHAFTING

| | |
|---|---|
| At mill | list plus 40% |
| At warehouse | list plus 50% |

**Discounts off new list. Warehouse price at Montreal and Toronto**

### IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 8 00 | $ 8 00 |
| Sheets, black, No. 10 | 10 00 | 9 50 |
| Canada plates, dull, 52 sheets | 9 00 | 8 65 |
| Can. plates, all bright. | 9 50 | 9 50 |
| Apollo brand, 10¾ oz. galvanized | ..... | ..... |
| Queen's Head, 28 B.W.G. | ..... | ..... |
| Fleur-de-Lis, 28 B.W.G. | ..... | ..... |
| Gorbal's Best, No. 28 | ..... | ..... |
| Colborne Crown, No. 28 | ..... | ..... |
| Premier, No. 28 U.S. | ..... | 8 95 |
| Premier, 10¾ oz. | ..... | 9 25 |
| Zinc sheets | 20 00 | 20 00 |

### PROOF COIL CHAIN

B

¼ in., $12.35; 5-16 in., $11.85; ⅜ in., $11.50; 7-16 in., $10.90; ½ in., $11.20; 9-16 in., $11.20; ⅝ in., $11.10; ¾ in., $11.00; ⅞ in., $10.90; 1 inch, $10.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

**ELECTRIC WELD COIL CHAIN B.B.**

⅛ in., $15.50; 3-16 in., $11.70; ¼ in., $8.40; 5-16 in., $7.40; ⅜ in., $6.35; 7-16 in., $6.35; ½ in., $6.35; ⅝ in., $6.35; ¾ in., $6.35.

**Prices per 100 lbs.**

### FILES AND RASPS.

| | Per cent |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 40 |
| Black Diamond | 40 |
| J. Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 37½ |
| Disston | 50 |
| Whitman & Barnes | 50 |

### BOILER TUBES.

| Size. | Seamless | Lapwelded |
|---|---|---|
| 1 in. | $36 00 | $..... |
| 1¼ in. | 40 00 | ..... |
| 1½ in. | 43 00 | 36 00 |
| 1¾ in. | 43 00 | 36 00 |
| 2 in. | 50 00 | 36 00 |
| 2¼ in. | 53 00 | 38 00 |
| 2½ in. | 55 00 | 42 00 |
| 3 in. | 64 00 | 50 00 |
| 3¼ in. | ..... | 58 00 |
| 3½ in. | 77 00 | 60 00 |
| 4 in. | 90 00 | 75 00 |

Prices per 100 ft., Montreal and Toronto.

### OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | |
| Royalite, per gal., bulk | 18 |
| Palacine | 21 |
| Machine oil, per gal. | 26½ |
| Black oil, per gal. | 15 |
| Cylinder oil, Capital | 49½ |
| Cylinder oil, Acme | 39½ |
| Standard cutting compound, per lb. | 0 06 |
| Lard oil, per gal. | $2 60 |
| Union thread cutting oil antiseptic | 88 |
| Acme cutting oil, antiseptic | 37½ |
| Imperial quenching oil | 39½ |
| Petroleum fuel oil | 13½ |

### BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30-5% |
| Standard | 40% |
| Cut leather lacing, No. 1 | 1 95 |
| Leather in sides | 1 75 |

### TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 06 |
| Emery glue | 15 to 20 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 35 |

**Prices Per Lb.**

### ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | .08½ |
| Grits, 80 and finer | .06 |

### BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 38 |
| Brass sheets, 24 gauge and heavier, base | 0 43 |
| Brass tubing, seamless | 0 46 |
| Copper tubing, seamless | 0 48 |

### WASTE.

| White. | | Ots. per lb. | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 18½ |
| Peerless | 21 | X Empire | 17¼ |
| Grand | 19¾ | Ideal | 17¼ |
| Superior | 19¾ | X press | 16 |
| X L C R | 18½ | | |

**Colored.**

| | | | |
|---|---|---|---|
| Lion | 15 | Popular | 12 |
| Standard | 13½ | Keen | 10½ |
| No. 1 | 13½ | | |

**Wool Packing.**

| | | | |
|---|---|---|---|
| Arrow | 25 | Anvil | 15 |
| Axle | 20 | Anchor | 11 |

**Washed Wipers.**

| | | | |
|---|---|---|---|
| Select White | 11 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING.

Standard 10% Best grades 15%

### ANODES.

| | |
|---|---|
| Nickel | .50 to .54 |
| Cobalt | 1.75 to 2.00 |
| Copper | .44 to .46 |
| Tin | .49 to .56 |
| Zinc | .23 to .25 |

**Prices Per Lb.**

### COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | 42 50 | 43 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 46 00 | 44 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 48 00 | 48 00 |
| Copper sheet, planished, 16 oz. base | 57 00 | 45 00 |
| Braziers,' in sheets, 6x4 base | 45 00 | 44 00 |

### LEAD SHEETS.

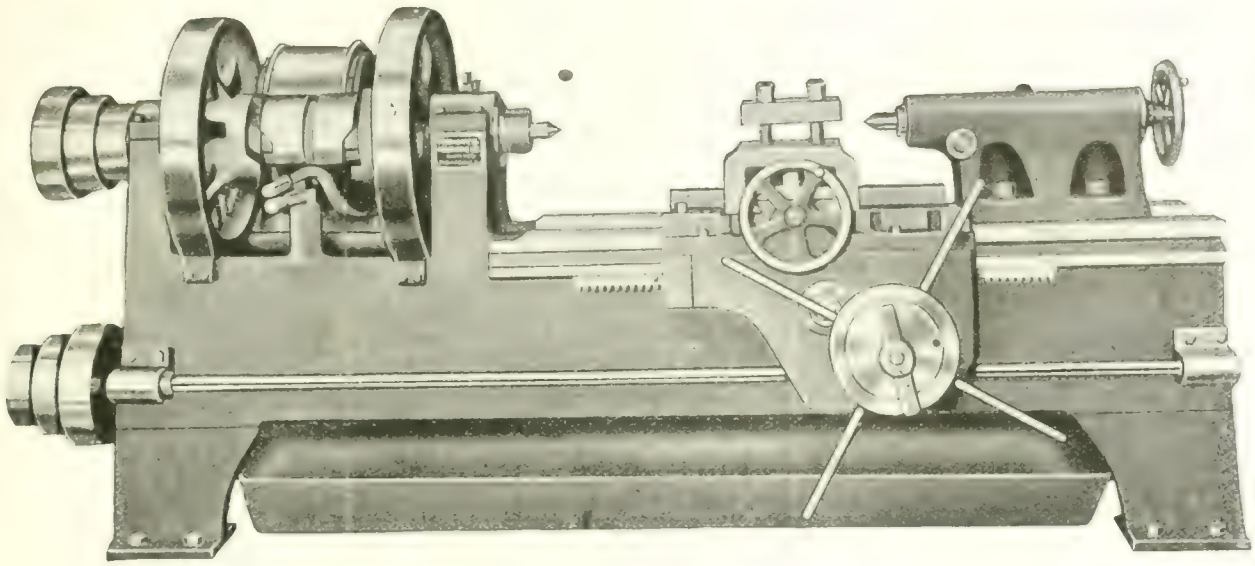
| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $13 25 | $13 25 |
| Sheets, 3½ lbs. sq. ft. | 13 25 | 13 25 |
| Sheets, 4 to 6 lbs. sq. ft. | 12 50 | 12 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS.

| | |
|---|---|
| Acid, boracic | $ .15 |
| Acid, hydrochloric | .05 |
| Acid, hydrofluoric | .14½ |
| Acid, nitric | .10 |
| Acid, sulphuric | .05 |
| Ammonia, aqua | .08 |
| Ammonium carbonate | .15 |
| Ammonium, chloride | .11 |
| Ammonium hydrosulphuret | .40 |
| Ammonium sulphate | .07 |
| Arsenic, white | .12 |
| Copper, carbonate, anhy | .35 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .70 |
| Iron perchloride | .20 |
| Lead acetate | .16 |
| Nickel ammonium sulphate | .12 |
| Nickel carbonate | .35 |
| Nickel sulphate | .15 |
| Potassium carbonate | .75 |
| Potassium sulphide (substitute) | .20 |
| Silver chloride (per oz.) | .65 |
| Silver nitrate (per oz.) | .55 |
| Sodium bisulphite | .10 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .41 |
| Sodium hydrate | .04 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | .14 |
| Tin chloride | .60 |
| Zinc chloride | .60 |
| Zinc sulphate | .09 |

**Prices per lb. unless otherwise stated.**



# *Speed Up Production*

## *with the*

# MONTREAL LATHE

for the economical production of 4.5", 6" and 155 MM. shells. If you are interested in obtaining maximum production at minimum labor expense, investigate the records of the MONTREAL lathe in plants of the largest producers of shells in Canada.

The MONTREAL lathe is wonderfully simple in operation and construction, yet every worth while improvement has been embodied in the design.

A powerful machine—designed to transmit all the power that the cutting tools will stand—with large broad ways, liberal wearing surfaces and unbreakable apron. The MONTREAL lathe comes to you equipped as you need it—with carriage for rough turning—with rigid single bar for boring, or with swivelling bar for inside profiling.

***Write Now for Prices and Delivery.***

## The A. R. Williams Machinery Co.

LIMITED

**64 Front Street West - . - TORONTO**

s very light with more sellers than buyers. The market is easier but quo-

can Government on the imports of ...manum and manufactures thereof has been removed. The market continues ... little demand. Price is un-

l at 53c and strictly at 50c per pound.

## NEARLY COMPLETED

### Plate Rolling Mill Plans

Special to CANADIAN MACHINERY.

WASHINGTON, April 30.—Closest co-operation between the United States and Canada is being planned here in the carrying out of the shipping programs which have been adopted by both countries.

Announcement made here during this week of the ambitious program adopted in Canada under the direction of C. C. Ballantyne, Minister of Marine and Fisheries, has aroused interest and the various administrative bureaus of the United States are now making plans to fit the shipbuilding plans of the two countries together. Announcement that plans are being made for a great steel rolling mill in Canada have been very gratifying to the War Industries Board because such a step will afford considerable relief to the mills in the United States and will relieve the congestion to a considerable degree. The outline of the plans for the Canadian mill have not been made complete here yet but officials are in hopes that a co-operative agreement can be reached between the two governments ... will effect a far greater steel out... for shipbuilding than is now available, without restricting the use of steel for other purposes.

Until Canada can establish the proposed steel rolling mill the United States will furnish that government with the supplies of plates and angles necessary for their shipbuilding program. This has been made possible ... W. Purchases ...nission, the War Industries ... and other government bodies working in co-operation with members of the Canadian War Mission.

It has been announced here that the first order for steel for the Canadian shipping program has been placed in this country and it calls for the delivery of 50,000 tons of steel plate and angles. The agreement made for the purchase of this supply of steel calls for prices for the Canadian Government which correspond to the prices paid by the United States Government. In the meantime the eyes of the industrial leaders of the United States are turned to the efforts of the Dominion Iron and Steel Corporation in its efforts to produce a Canadian steel supply for Canadian use. Close watch is being kept on this proposition because of the fact that it is being carried on with private funds and there has been no government subsidy. Officials of the United States have favored the policy of government subsidy and there are numerous plants now working under this arrangement. The Canadian project is expected to be a fair test of the advisability of allowing private interests to finance projects for the government.

Reports received here indicate that the Canadian plan will call for the adoption of the fabricated steel plan for ship construction. It is likely that efforts will be made to secure the adoption of plans for the Canadian ships which will correspond to the plans for the ships of the United States, in order that there may be the greatest speed in turning out the necessary fabricated parts. Word has also been received here that English shipyards are adopting the fabricated style of ship construction.

The 1919 shipbuilding program of the United States Shipping Board has been almost completely worked out. For military reasons the plans have not been disclosed but from statements made by Chairman Hurley it is generally estimated that the construction in 1919 will be in excess of 10,000,000 tons, the largest amount ever built by any one nation in one year. Before January 1 all of the new shipyards in the United States will have been completed. It is estimated that of the total tonnage about 8,000,000 tons of the program will call for steel vessels and 2,000,000 tons of wooden vessels. This is exclusive of any possible program for concrete ships which may be adopted following tests of a concrete vessel to be carried out next week. The working out of the 1919 program has been in co-operation with Sir Connop Guthrie, the British representative on the ship control committee. It is expected that of this program at least one-fourth will be turned out on the Delaware river. Admiral Bowles of the Shipping Board has estimated that the capacity of the eleven shipyards on the Delaware river will be about 3,200,000 tons.

A new record for construction of steel ships has just been established by the Skinner and Eddy plant in Seattle, Washington, with a record of 55 working days from the laying of keel to launching.

In order to speed up work the United States Shipping Board is now backing a great rivet driving contest among all ship workers. Reports of the records made each week are posted in every yard.

The fuel situation in the United States has not been generally alleviated yet. Reports come in of car congestion and mine owners from many states are reporting to the Fuel Administration that they are not able to produce to their full capacity because of the fact that they are not given sufficient cars. Every effort is being made by the Fuel Administration and the Railroad Administration to straighten out the difficulties in order that there may be no possible shortage next fall. The situation in the east is becoming better and the Fuel Administration is receiving reports which indicate that there is a general disposition on the part of manufacturers to lay in large stores of coal now for the winter season.

The appointment of John D. Ryan, prominent in the copper industry, to be in charge of all aircraft production in the United States has been well received both by the country and the industrial leaders. It is expected that the placing of a practical man of this sort at the head of the industry will give it a great ...

## HEAVY ORDERS FOR STEEL AND TOOLS

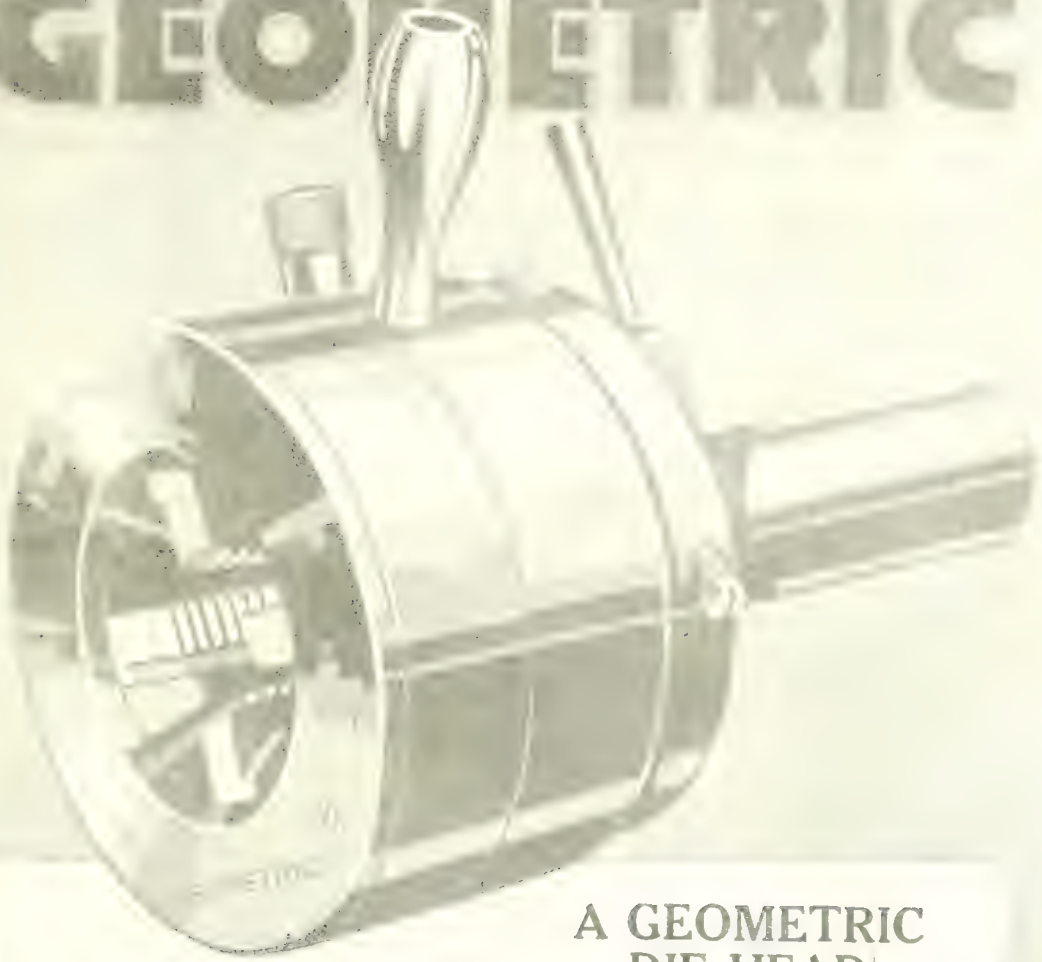
### U. S. Government Buying Machine Tools for Munitions Plants and Shipyards

Special to CANADIAN MACHINERY.

NEW YORK, April 27.—A most important meeting of the steel manufacturers and Government officials representing the War Industries Board was held at New York on Friday and supplementary conferences were held Saturday. No official information is available, but it is understood that the steel requirements of the U. S. and its Allies as detailed by the Director of Steel Supplies was most impressive. Heretofore, at least for the last month or so, war needs have absorbed 70 per cent. of the output of rolled steel and Government needs in the last ten days have grown to 80 per cent. Now it is understood that all commercial contracts will be held in abeyance until the pressing needs of the United States and its Allies have been satisfied.

It is estimated that in the next eight months, steel war needs will amount to 20,000,000 tons, including the manufacture of shells and ordnance, the building of ships and railroad equipment, and the production of wire products, pipe, structural steel and a host of other war munitions. Shell requirements alone are estimated at 6,000,000 tons. Ships, including merchant boats, naval warships for both domestic and foreign service, will amount to 5,000,000 tons, of which 3,000,000 tons will be required at home. Railroad equipment buying in its modified form will call for 4,300,000 tons. Structural steel requirements outside of the tonnage for ships, cars and locomotives will be between 750,000 and 1,000,000 tons. The needs of wire products, including barbed wire, nails, cold rolled strip steel, rivets, bolts and

# GEOMETRIC



## A GEOMETRIC DIE HEAD

### THE MONARCH OF THE SCREW-CUTTING INDUSTRY

For nearly a quarter of a century Geometric Die Heads have been steadily increasing production for the user and increasing business for themselves. Every Geometric Die Head sells another.

Inquire of the established users of Screw Machines and Power Lathes and get their opinion of the Geometric Die Heads.

Whatever your threading problem, there is a Geometric Die Head to solve it—in the most economical way.

Why should you not take advantage of the Geometric method of Screw Cutting? Whenever you are ready to take up your threading proposition with us, you will find us ready to advise with you.

## THE GEOMETRIC TOOL COMPANY

NEW HAVEN CONNECTICUT

Canadian Agents: Williams & Wilson, Ltd., Montreal; The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, and St. John, N.B.

Steel Production Increase

[illegible] now operating at the rate of 95 per [illegible] adequate transportation service the plants will be capable of turning out between 26,000,000 to 27,000,000 tons of rolled products during the remainder of the year, provided that all war requirements will be fully met if Government plans for ships, cars, motive power, ordnance and shells, and for military structures are not changed. Heretofore the mills have been seriously embarrassed by frequent alterations in Government orders which have [illegible] the drawing of new plans, the derangement of mill schedules and the discarding of many thousands of tons of steel previously rolled, resulting in expensive delays in the launching of boats and the manufacture of numerous kinds of war munitions and in the building of military structures.

In the last few days, there has been evidence of reformation which will result in expediting the building of ships and of railroad equipment and large orders for ordnance and shells, long delayed, are on the point of being placed. Contracts for projectiles aggregating $50,000,000 are now ready for distribution. Orders for 30,000 freight cars have been released and the Shipping Board has awarded contracts for 22 more merchant ships to Atlantic and Pacific coast yards and for 66 ships to lake builders.

### Machine Tool Buying

Buying of machine tools has been less active in the East, but there is still some activity in the interior. At Chicago the Pullman Co. has ordered $275,000 worth of shop equipment to be used in making 155 mm. shells. The Buda Co., Harvey, Ill., has placed large orders for machine tools and the Globe Stove & Range Co., Kokomo, Ind., has been buying machinery to execute a contract for trench mortar bombs. In New York, the Raymond Engineering Corp. has come into the market for lathes and milling machines to make gun sights for which it has received a $500,000 Government contract. The Ordnance Department of the Government has been buying machine tools for New England plants that are producing Browning machine guns. The Government has also been buying portable drilling machines at Cincinnati; most of these tools being for export to France and Italy. The Braden Copper Co. is also buying cranes and hoists for shipment to Italy. Shipyards have also come into the market for tools for many new plants now in course of construction.

## GOVERNMENT CONTROLS STEEL DISTRIBUTION

### War Demands More Urgent—Less Steel for Private Enterprises

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., April 30.—One of the most important actions for some time past taken by the War Industries Board is the request recently made to the steel producers to report in full detail the nature of the consumption involved in their commercial orders. The weekly reports that have been made to Washington for some time past, of shipments made during the week and of orders remaining on books, have divided the steel into three classes, that intended for the Government, that intended for the Government's allies, and that intended for the general trade. By means of order numbers or other description the precise character of the steel involved in the first two categories has been given. That in the third category has been given only in lump tonnages.

The object of the War Industries Board in taking fresh measures with regard to steel distribution appears to have been misunderstood in some quarters. At any rate the report that has been circulated, from Washington, that steel deliveries except for war work are to be shut off for the future, is contradicted in the steel trade. The steel manufacturers are in close touch with Washington. While some reports have referred to "nonessentials," their information is that Washington has tabooed the word "nonessential" entirely. No such thing, as regards steel, is recognized. There are "less essentials." Everything in steel is more or less useful, the gradations being in the degree of usefulness. In order to supply the information required by Washington, the steel makers are calling for reports from customers, detailing precisely the use to which the steel now on order is to be put. The authorities will eventually be able to formulate a complete list, showing the sequence of importance of all employment of steel. The conception that steel supply will be extended only so far down the list, as far as it will reach, and then stop absolutely, is erroneous. If there are 1,000 items in the list, and a 75 per cent. steel supply, it will not mean that the first 750 items will be taken care of and the remaining 250 items not get a pound. After a few prime essentials are fully taken care of, the allotment will decrease gradually as one goes down the list. Regulation will be by means of the coal distribution and the allotment of traffic facilities, already invoked in many instances, and through the distribution of steel itself, as defined by the authorities to the steel producers.

### Less Commercial Steel Shipments

Through the double influence of the Government calling upon the steel mills, some three weeks ago, for heavier shipments for shipbuilding and some other purposes, and of this more recent call for detailed information as to the intended employment of steel involved in commercial orders, there is a decrease in the shipments of steel for commercial purposes, not thus far distinguished by any consideration on the part of the Government. This decrease may be only temporary. Steel is scarcer than it was. Deliveries are more difficult to secure, against old orders, and it is still more difficult to place new orders. There is, however, no great clamor on the part of buyers. While there are urgent unsatisfied needs they do not relate to large tonnages.

### Freight Cars Bought

The Railroad Administration has begun to place orders against the program of buying 100,000 freight cars, the first order being placed last Friday, involving 30,000 cars to be furnished by the American Car & Foundry Co. While the specifications are withheld, it is known that the types adopted require less steel, particularly sheared plates, than was involved in the original plans. This is concrete evidence of the seriousness of the apprehensions entertained by the War Industries Board as to the supply of plates for shipbiulding.

As to steel for shipbuilding, an interesting piece of information is furnished by the management of the Hog Island yard, that the management estimates an average of 60 days for the time elapsing from the steel leaving the mill until it reaches the shipyard in fabricated form. The yard, which has 50 ways, some already completed, and will build ships of 7,500 and 8,000 tons deadweight, draws its fabricated parts from more than 35 shops distributed as far west as Minneapolis. Allowing three months from keel laying until the vessel is launched, and one month additional for completion in the fitting-out basin, there is a six months' interval from the time the steel leaves the mill until the ship is delivered. Accordingly, the rate at which ship steel must be produced now is not the rate indicated by the rate at which vessels have lately been completed or launched, which rate recent reports have shown to be such a disappointing one, but the rate that will be obtaining six months hence, and certainly a much higher rate.

### Production

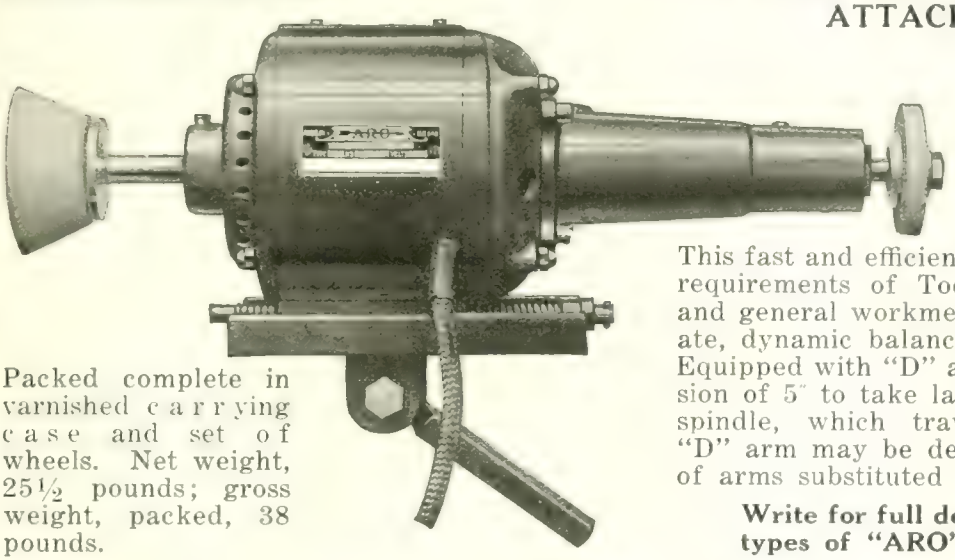
There has not lately been any further increase in the rate of production, in general, of pig iron, of ingots, or of finished steel. The rate as a whole is about 85 per cent. of capacity, which is about the average rate maintained since March 1. Production at this rate, however, means substantially as great a tonnage as was produced in 1916, when operations were practically at capacity. The difference is accounted for by the new construction that has been carried through since. So much has been said about the inability of the industry to operate at capacity that there is danger of a distorted view being created, through the 15 per cent. that is not being produced being emphasized, rather than the 85 per cent. that is being produced. As a matter of fact, this production is about equal to the largest

(Continued on page 89.)

Aikenhead's

# ARO UNIVERSAL
## Portable Electric Grinder

U-2 EQUIPPED WITH "D" ARM ATTACHMENT



Packed complete in varnished carrying case and set of wheels. Net weight, 25½ pounds; gross weight, packed, 38 pounds.

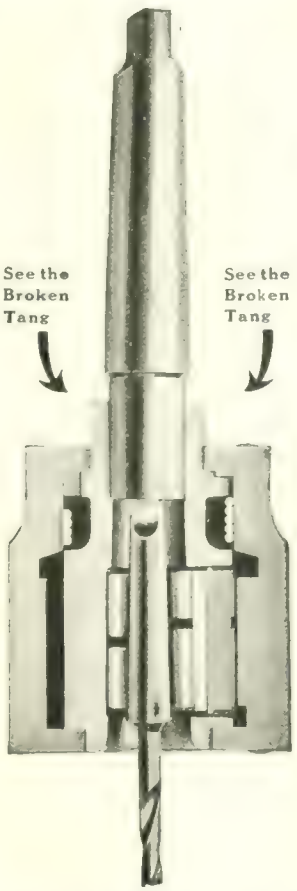
**Correct Surface Speed**

This fast and efficient grinder meets with the requirements of Tool Makers, Die Sinkers and general workmen, where a large, accurate, dynamic balanced machine is required. Equipped with "D" arm, which has an extension of 5" to take large wheels on armature spindle, which travels at 10,000 R.P.M. "D" arm may be detached and other styles of arms substituted to meet requirements.

**Write for full description of various types of "ARO" grinders.**

## AIKENHEAD HARDWARE LIMITED

**17, 19, 21 Temperance Street** **Toronto, Canada**




Aikenhead's

# Wahlstrom Chuck

## Operates Morse Taper Shank Tools with Broken Tangs

**Saves Time and Expense**

Ability to operate M. T. shank tools with or without tangs is one big advantage in using these Wahlstrom Chucks. Grip by the entire shank. No time wasted in lost motion. Acts instantly. Operator can make tool changes in less than two seconds.

And a tool in the grip of this Wahlstrom Chuck can never slip. If the resistance on the tool is great, the holding power of the jaws is great proportionately.

There is an Aikenhead Wahlstrom Chuck for Straight Shank Tools as well as Taper.

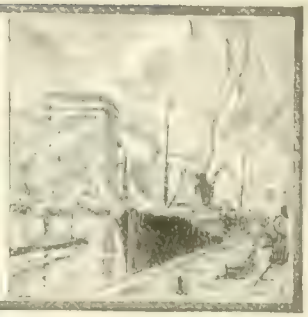
**Write for particulars.**

## AIKENHEAD HARDWARE LIMITED

**17, 19, 21 Temperance St., Toronto, Ontario**

# INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES



## ENGINEERING

Higher Express Rates Wanted. At Guelph, Ont., The Grand Trunk Railway, Limited, has applied to the Hydro-Electric Power Commission of Ontario for permission to put in effect higher express rates between points in the Hydro Electric District.

Chesley, Ont.—Fire destroyed the machine shop and power house of the Canada Bolt, Nut & Rivet Co., Ltd. It is estimated that the loss will be about $40,000.

**Toronto, Ont.**—A roundhouse, coaling plant, ice house, etc., will be built by the C. N. R. at Leaside Junction. The architect is G. C. Briggs, 27 Wellington street east, Toronto.

**Montreal, Que.**—With the plate mill contract and other orders recently closed, it is understood that Dominion Steel Corporation has recently put some $30,000,000 new business on its books.

**Fort William, Ont.**—The Nipigon Reserve Iron Co., has opened an office here with J. W. Newcombe in charge. The company, which is capitalized at $375,000 will develop 200 acres of iron land in the Nipigon district.

**Hull, Que.**—The British American Nickel Co. has purchased the property known as the old Conroy piling grounds at Deschenes, upon which a nickel refining plant, to cost in the neighborhood of $1,000,000, will be erected.

**Welland, Ont.**—The Volta Mfg. Co. will build an addition to its plant here. The extension will be 50 feet by 50 feet, of brick construction, and will be used as a machine shop. The company manufactures electric hoists and electric furnace controllers.

**Montreal, Que.**—S. M. Roberts, of this city, has been appointed president and general manager of the Grain Growers' Auto Tractor Co. It is the intention of the company to manufacture tractors in Canada, and a site may be purchased in Ontario.

**Toronto, Ont.**—The Galena Signal Oil Co. intend to rebuild their plant at once, which was recently destroyed by fire. The general contractors, Archibald & Holmes, Excelsior Life Bldg., are receiving quotations for scrap steel tanks, piping, etc.

Cobourg, Ont.—The Imperial Muni-

purposes, it is said. Work on repairing

M. Jak & Co. have the contract.

be shipped into the Canadian West. Winnipeg will receive a small supply, but western points must depend upon the domestic supply. This decision is said to have been reached at a conference between Western coal operators and Fuel Control officials at Ottawa recently.

**Montreal, Que.**—The Canadian Car and Foundry Co. is operating with the Manitowoc Shipbuilding Co. of Manitowoc, Wis., in the manufacture of twelve mine-sweepers for the French Government. Work has already been started on the shipyard which is located at Fort William. The plant will cost about $200,000.

**Hull, Que.**—The Hull Iron & Steel Foundries, Ltd., is building a new cleaning department with all necessary air hammers, clippers, grinders, etc., also new annealing ovens, together with electric and oxy-acetylene welding outfits. This building will be 100 ft. by 300 ft. long, with private siding for all outgoing shipments. The company has just put into operation a six-ton electric furnace, using a 1,200 k.v.a. transformer and special automatic regulating equipment for raising and lowering electrodes.

**Montreal, Que.**—To aid fuel conservation the Bell Telephone Co. intend to make some changes in their power plant at the head offices in Montreal during the early summer. A steam turbine will be installed to operate the pumps that generate the power for the hydraulic elevators; one of these will be changed over to be run by electric power. Their electrical power is now generated by Robb horizontal steam engines; these are to be replaced by motors, belt connected to the generators.

**Quebec, Que.**—Plans for the erection of yards, shops, sidings, etc., covering over two square miles of ground, near the Quebec bridge, are under way, and so far in the little parish of Charny, County of Levis, a couple of miles off the south side of the St. Lawrence, options have been taken on most of the ground that will be used for the erection of said plants. This would mean the co-operation of eleven railroads, both American and Canadian, in the erection of fthe said yards and shops. The whole enterprise would mean the spending of over seven million dollars.

**Victoria, B.C.**—The mirror for the telescope located at Observatory Hill, near here, has arrived from Pittsburg, and will be installed in the course of the next few weeks. It is 73 inches in diameter and weighs two and a quarter tons, and is the second largest mirror in the world, the largest being the one-hundred-inch lens made for the observatory at Mount Wilson, California. The mirror was made in Belgium, and left Antwerp one week before war was declared. It was ground in the workshops of Dr. John A. Brasser, of Pittsburg, the operation taking three and a half years.

**Boston Creek, Ont.**—Underground developments continue highly satisfactory at the Patricia Syndicate property here. It is anticipated the work of installation of the new mill will be completed by the last week in May. It is less than six months since the first ground was broken on this property, and with the erection of the mill and commencement of production by the end of May, a new record will be established in mine operation in the North Country. The capacity of the new mill for which the equipment is now on the ground, will be between 50 and 60 tons per day. The machinery consists of the following: 5 x 9 Blake crusher, 5 ft. x 6 ft. Allis-Chalmers ball-granular, classifier, amalgamating plates and Wilfley tables.

**Hamilton, Ont.**—Officials of the Steel Company of Canada are making efforts to secure coal mines of their own so that they will not have a recurrence of the trouble experienced last winter in getting coal supplies. This follows the important success of the company in purchasing iron ore deposits. It is vital that the big Canadian steel industries have their own raw materials if they are to wage successfully the post-bellum commercial wars. F. H. Whitton, the general manager, stated recently that there would be no difficulty in placing the entire 1918 output. He pointed out, however, that prices for most products would probably be lower and cost would be higher, wages already having been advanced. The company contemplate making considerable extensions to the plant this year.

## ELECTRICAL

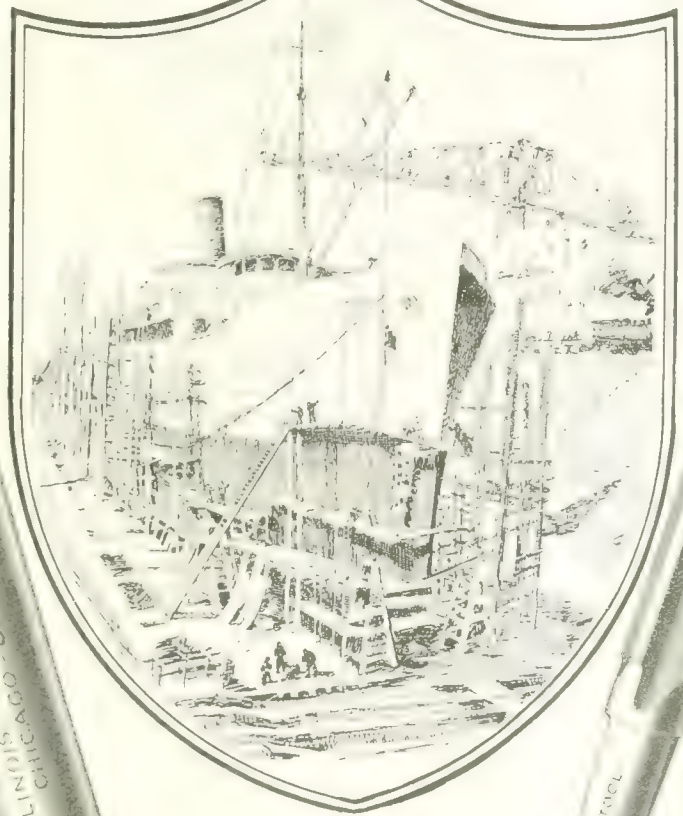
**Sherbrooke, Que.**—The City Council will call for tenders shortly for an electric distributing station.

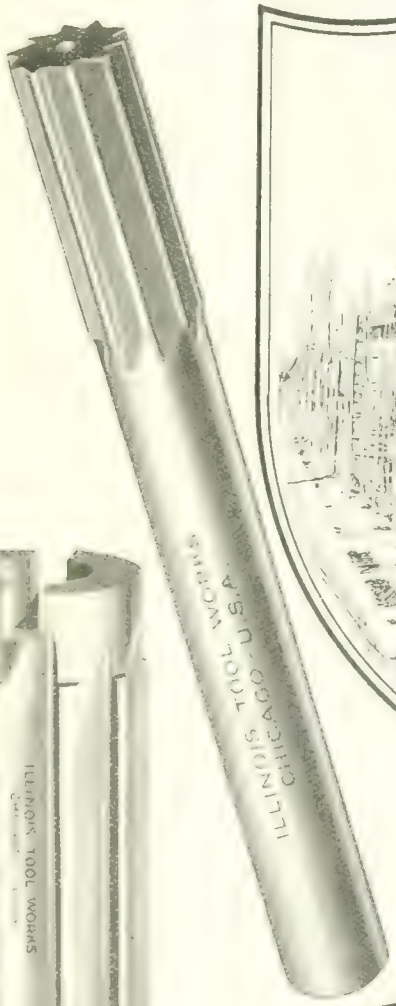
## MUNICIPAL

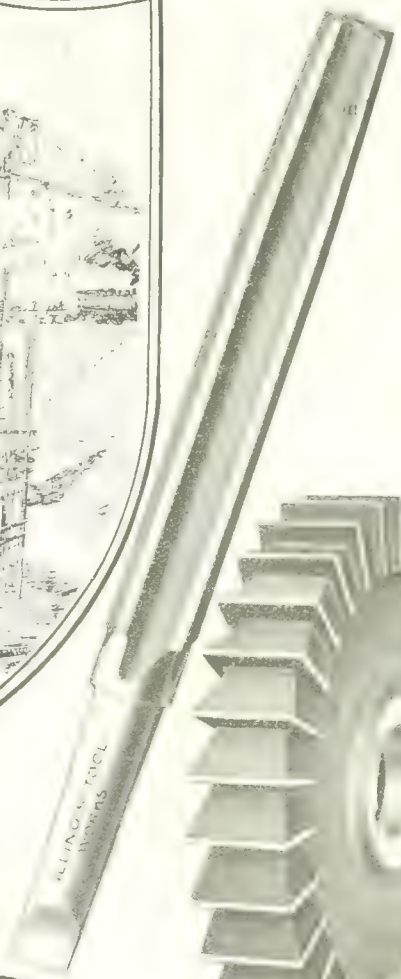
**Cobourg, Ont.**—The Town Council will ask the Federal Government to repair the breakwater at an estimated cost of $7,000.

**Lachine, Que.**—Tenders are being received for cast iron pipe and specials.

# ILLINOIS TOOLS







In the shipyards of the Pacific coast, the Atlantic seaboard and the Great Lakes,

## "ILLINOIS" BRIDGE AND BOILER REAMERS

are being used in constantly increasing numbers to expedite the building of ships—freighters, transports and dreadnaughts. Standard Cutters and Reamers in stock. Punctual delivery on specials. Write or wire for quotations.

## ILLINOIS TOOL WORKS, CHICAGO.

[illegible] from the [illegible]

[illegible] Ont.—A [illegible] will be [illegible] May 6, [illegible] of $25,000 to the Huntley Mfg. Co., to assist in the reconstruction of the factory which was destroyed by fire.

[illegible] Ont.—Council will accept [illegible] submitted by the Hugh C. Cameron Co., in spite of the fact that it does not comply with the requirements of the Fire Marshal, as it has been shown that the apparatus was built according to specifications supplied by Fire Chief Smith.

**Winnipeg, Man.**—The Manitoba Government has tentatively decided that [illegible] shall be a city of automatic telephones, it has been authoritatively announced. The change will be made gradually, the whole Winnipeg system will probably not be automatic before five years, it is declared.

**Comber, Ont.**—Tenders will be received by S. T. Anderson, township clerk, Comber, Ont., up till May 10, 1918, for the construction of two concrete bridges over the west branch of Big Creek, in the township of Tilbury West. Plans and specifications may be seen at the office of S. T. Anderson, clerk, Comber, or J. J. Newman, C.E., Windsor.

**Mimico, Ont.**—By-laws to raise $28,376 were passed by the Mimico Town Council at its meeting in the public library. Of the total, $16,460 is for sewers and $11,910 for waterworks purposes. Council deferred decision on the purchase of motor fire truck and decided to ask for tenders from various concerns before accepting one for $1,600 on a motor chemical truck.

## GENERAL

**Toronto, Ont.**—Fire completely destroyed a warehouse of the Hortop Milling Co., 47 Shaftesbury Avenue, Saturday night, and spreading to the adjoining buildings on either side damaged the storehouse of Risburg and Jackson, hay and straw merchants, and the North Toronto branch of the Western Canada Flour Mills Co. The damage to the Hortop building and contents is placed at $3,000, while a similar amount is estimated to that of the Western Canada Flour Mills branch.

## PERSONAL

**N. W. VanWyck** has been appointed purchasing agent of the Canada Steamship Lines at Montreal, vice P. Paton, resigned to engage in other business.

**John Reekie**, office manager of the Chapman Double Bearing Co., Sorauren Ave., Toronto, has just recovered from a dangerous attack of pneumonia and is now well enough to resume his duties.

**Albert Deschamps**, of the Atlas Construction Co., Montreal, and one of the engineers in charge of construction in the building of the concrete boat "Concretia," is about to leave on a vacation of several weeks into Northern Ontario.

**Harry M. Marsh**, for the past six years Commissioner of Industries and Publicity for the City of Hamilton, resigned that office on April 1. **C. W. Kirkpatrick**, well known newspaper man, was appointed by the City Council to the position and assumed his duties on April 15.

**H. L. Peiler**, general manager of the Mason Regulator and Engineering Co., Ltd., Montreal, has received word that his son, Second Lieutenant Maurice F. Peiler, R.F.C., is a prisoner, unwounded, in Germany. He had previously been reported missing on April 6.

**R. D. Smith** has recently been appointed to the position of Steam Superintendent for the Wayagamack Pulp Mills at Three Rivers, Que. Previous to his leaving for Three Rivers, Mr. Smith was chief engineer at the Windsor Station, Montreal, Que.

**Pte. Harold F. Fogarty**, formerly on the editorial staff of CANADIAN MACHINERY, is in a hospital in France suffering from a gunshot wound in the chest. Pte. Fogarty went overseas with the 198th Battalion early in 1917, but was later transferred to another unit. His home is in Port Hope, Ont.

**U. Valiquet**, M. Can. Soc. C. E., who is Superintendent of Public Works at Ottawa, was to have read a paper on the "Champlain Dry Dock for Quebec Harbor," but owing to illness and urgent business at the capital was prevented from attending the last meeting of the Society of Engineers. In his absence the paper was ably presented by F. H. McGuigan, jr.

**C. G. Bowker**, of Montreal, who has been superintendent of the G.T.R. eastern lines for five years, has been appointed to the position of general superintendent of Ontario lines with headquarters in Toronto. Mr. Bowker has been in railroad service for thirty years, starting his career as a telegraph operator. He has been with the Grand Trunk Railway System as train despatcher, chief despatcher, trainmaster, assistant superintendent and superintendent.

**Lieut.-Col. C. N. Monsarrat**, chairman of the Quebec Bridge Commission, is at present in Montreal arranging for the transfer of the commission's offices to Ottawa for the work connected with the winding-up of its activities, which will probably take about a year. The offices will be moved to Ottawa within a short time. In addition to his work with the Bridge Commission, Lieut.-Col. Monsarratt has been appointed consulting engineer to the railways department of the government.

## TRADE GOSSIP.

**Montreal.**—At the annual general meeting of the Canadian Express Co., held in Montreal recently, the president, Howard G. Kelley, stated that it might be necessary to ask the railway board for permission to increase its rates.

**Acquire Zinc Concentrates.**—A report from Melbourne, Australia, states that the British Government has contracted for the purchase of virtually the whole product of Australian zinc concentrates for the period of the war and a decade thereafter.

**Build New Plant.**—The firm of Fred Thompson Co., Ltd., has recently constructed a new three-storey and basement brick building to take care of their increasing business. This firm is manufacturing all kinds of electrical supplies; the new location is at 9 St. Genevieve St., Montreal.

**Bromption Pulp and Paper Co. Purchase Mill.**—It is understood that the Brompton Pulp and Paper Co. has made another addition to its property through the purchase of a sulphite mill at Holland, Maine. No official announcement of this purchase has been made as yet, but it is expected within a few days.

**The New Brunswick Power Co.** has during the past year made extensive additions to its plant, $72,112 being spent on power house, $14,543 on new railway equipment, and $11,803 for replacement of special work. In addition to this $24,477 was spent on additions and extensions in the electric and gas departments.

**Australian Importations of Galvanized Sheets.**—The average annual importation of galvanized corrugated iron into Australia during the past four years was 950,000 hundredweight, and importations of galvanized iron, not corrugated, were in the neighborhood of 800,000 hundredweight. Great Britain supplied over 90 per cent. and the United States most of the balance.

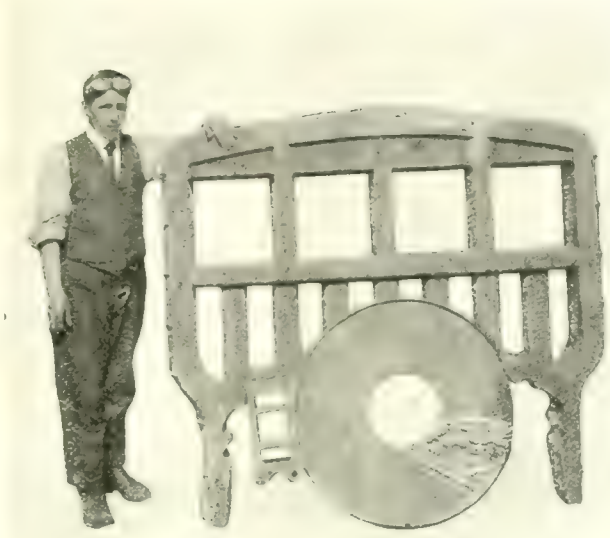
**Filling Big Orders.**—The National Steel Car, Hamilton, has completed shipping 1,000 cars for the Canadian Government railways. This will be followed up with 200 cars for the Bengal and Nagpur Railway, India. It is expected that another thousand cars will be completed for the Canadian Government railways. Twelve locomotives are in the process of construction for the Hydro-Electric.

**The Abitibi Power and Paper Co.** is one of the largest companies engaged in the production of newsprint paper and sulphite and ground wood pulp. Its mills are located at Iroquois Falls, Ont., and have an annual capacity of 62,000 tons of newsprint paper, 21,000 surplus tons of sulphite pulp and 22,500 surplus tons of groundwood pulp. The company controls under lease over 1,000,000 acres of pulpwood.

**Cuba Very Prosperous.**—Business conditions are wonderfully prosperous throughout Cuba, according to Sir Herbert Holt, president of the Royal Bank of Canada, who returned recently from a trip to Cuba, where he inspected the bank's branch system. He said there was probably as much building going on in Havana at the present time as in the whole of Canada. The boom in sugar has stimulated development to a wonderful extent.

**More Contracts Placed for Ships in U. S.**—Another U. S. Government-owned shipbuilding plant will be constructed on the Atlantic coast, in fact preliminary work has already begun at Wilmington, N.C., where the Carolina

# Saved by Oxy-Acetylene Welding



These two Boiler sections were quite unserviceable until the damaged parts were welded, which restored them to use again in condition equal to new.

There is no necessity to scrap broken parts of machinery, etc., paying exhorbitant prices and waiting weeks for replacements, and having your plant "tied up" in the meantime.

## "PRODUCE AND SAVE"
BY UTILIZING
## The Oxy-Acetylene Process

It is indispensable in all industries for practically all purposes involving the joining of metals and cutting wrought iron and steel, with a saving of Time, Labor and Money.
Your enquiries are solicited and will receive prompt attention.

## L'Air Liquide Society

*The Pioneers of the Presses throughout the World*

Canadian Factories:
**Toronto Montreal Winnipeg Halifax**

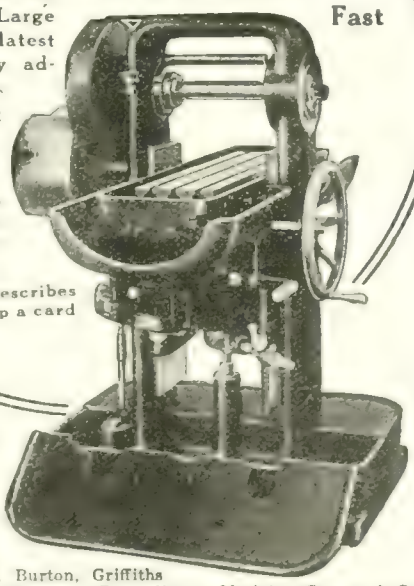
## *For Rapid Production and Accurate Work*
USE THE
# "BRIGGS"

**The Briggs Miller handles work no other machine of its size can touch.** It is a manufacturing machine. On account of its rigid construction it will produce accurate work when running at a high rate of speed and feed.

**The Base Tank and Large Gear Pump is the latest addition to its many advantages.** Tank holds 20 gallons of cutting lubricant

Pump never requires priming and will deliver ten gallons per minute to the cutters, keeping them cool when running at very high speed.

**Fast**



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Foreign Agents: Allied Machinery Co. of America, Paris, Petrograd, Turin; Machinery Company of Russia, Scandinavia; C. W. Burton, Griffiths Co., London, Manchester and Glasgow; Barandiaran, Metivier, Gazeau & Cia., San Sebastian, Spain.

# Chilled Iron Dies
**for making**
## 75-mm. Shell Forgings

Chilled Iron Dies are harder on the wearing surface than tempered steel. The best cold chisel will make no impression on its wearing surface. But back of the hardened or chilled portion the metal is soft and easily machined. That is why it is the best material for these Dies.

In addition to the Nosing Dies we now make

DRAWING DIES
PIERCING DIES

for shaping the forgings for making 75-mm. shells.

Let us quote you on these for use in your shops.

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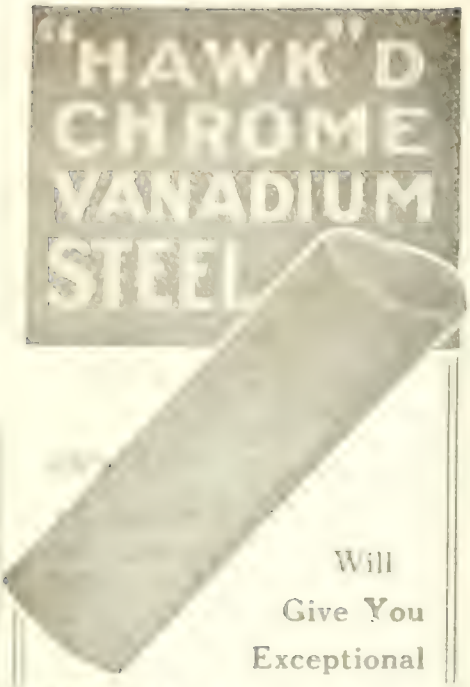
## Marsh Engineering Works, Ltd.
BELLEVILLE, ONT.




Will
Give You
Exceptional

**Shell Forging Production**

WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

[illegible] In your heat treated and ready for use.

It [illegible] to the work.

There are many cases where each punch has turned out over 2,000 shells.

It means more shells, per machine per day.

STEEL OF EVERY DESCRIPTION.

**Hawkridge Brothers Company**

303 Congress St., BOSTON, MASS.
U. S. A.

STERILIZED WIPERS
NO LINT
E-PHILAN WASTE CO. TORONTO

KINDLY MENTION THIS PAPER WHEN WRITING ADVERTISERS


Shipbuilding Corporation has secured a site on deep water to construct large steel ships. A contract has been signed for twelve 9,600-ton steel ships to cost approximately $[illegible],000,000. To save time the entire [illegible] ships will be built [illegible] the Federal Shipbuilding Company for the Emergency Fleet Corporation.

**Conserve Natural Gas for Domestic Uses.**—After hearing W. R. Nickle, a Government expert, explain the natural gas situation in Western Ontario, more than [illegible] municipalities of Western and adjacent border cities passed resolutions endorsing the Government's plan to conserve natural gas for domestic consumers by cutting off factories from the supply. It was decided, however, to send a recommendation to the Ontario Railway and Municipal Board to allow manufacturers the use of gas in small quantities for certain processes until a supply of artificial gas is available.

**Canadian Railway Earnings Increase.**—Railway earnings of the three principal [illegible] for the first week of April show increases, as compared with the same period in 1917. In the case of the Canadian Pacific Railway earnings for the week ending April 21 were [illegible], a gain of [illegible] per cent. over the same week last year. Grand Trunk earnings were $1,085,972, the increase amounting to $273,941, or 25.24 per cent. The total for the third week in April earned by the Canadian Northern was at $929,500, or $163,900 more than last year. The percentage of increase was 21.42 per cent.

**New Patents Issued.**—The following is a list of Canadian patents recently issued through the agency of Messrs. Ridout & Maybee, 59 Yonge street, Toronto, from whom further particulars may be obtained: Wm. Ross, centrifugal pump; McDonald & Willson, Limited, indirect lighting fixtures; Borden Milk Co., liquid measuring and container charging machine; J. Stone & Co., apparatus for controlling the order or sequence of operations of mechanical devices, particularly valvular devices, employed in ships' ash expellers; Soren C. Jensen, safety device for small firearms; Fred Gilbert, bronzing apparatus; Robert R. Jackson, tire inflator.

**New Ferrosilicon Plant in Quebec.**—Walter Sharpe, 314 Grand Allee, Quebec, has the general contract and the Eastern Canada Steel & Iron Works, Ltd., the steel contract for the erection of a ferrosilicon plant at Beaupre, Que., for the Laurentian Power Co., Seven Falls, Que., to cost $300,000. The plant will be of brick and steel construction, and will have three furnace rooms, each 15 x 50 ft. The electric station for supplying the furnaces with power will be 20 x 160 ft. It is exepected that the plant will be completed and in operation within three months. The company has a large contract with the Imperial Munitions Board. The plant will have a capacity of from 12 to 15 tons per day.

**Price Bros. & Co. Develop Plants.**—Sir William Price, president of Price Bros. & Co., in his report states that a new unit was added to the Kenogami mill during the year, bringing the capacity up to 200 tons of newsprint a day, while the Shipshaw Power development was also completed and is supplying the company with 10,000 h.p. The development includes a storage dam with a capacity of nearly seven billion cubic feet. As to general conditions, the president says: "The pulp and paper branches of the business have been somewhat hampered in their operations and supplies, and difficulties experienced in procuring necessary transportation for the finished product."

**East and West Coal Production.**—At a conference at Ottawa recently the Western coal operators stated their ability to increase the production of bituminous coal by 1,280,000 tons and of lignite coal by 1,225,000 tons. The figures would not hold good unless the same amount of labor was available as last year, and unless the railways were able to furnish transportation required. The memorandum of the Nova Scotia operators stated that the production of Nova Scotia mines had been estimated at 5,950,000 tons, but the production actually attained was 5,660,000 tons. The operators reported a considerable improvement in transportation facilities.

**Emergency Fleet Corporation Orders More Ships.**—The biggest contract for ships ever placed on Great Lakes was booked recently by American Shipbuilding Co. The order was placed by the Emergency Fleet Corporation, and calls for sixty-six steamers for salt water service for delivery in 1919. Something more than 90,000 tons of steel will be used in their construction, and they will cost more than $50,000,000. The steamers will be full Welland Canal size, but sixty of the boats will be deeper than the freighters of that class now being turned out. Six of the steamers will be 22 ft. 6 ins. deep and will have 3,500 tons capacity, and six will be 28 ft. 2 ins. deep, with 4,200 tons capacity. The boats will all be 261 feet long and 45 ft. 3 ins. feet beam.

**More Ships From Lakes for Ocean Trade.**—A dispatch from Washington states that thirty-four new ships of 105,000 tonnage, completed during the winter and spring in Great Lakes yards, will begin moving to the Atlantic shortly for service overseas. No alterations will be required for the ships to pass through the locks. Cargoes are being put aboard for the voyage east. All of the vessels were requisitioned by the United States Shipping Board in the early stages of construction. They were designed for overseas trade and are of the Frederickstadt type, 3,100 tons, 261 feet over-all, 43 ft. 6 in. beam, and 20 feet depth. Before the ice season set in the Shipping Board moved forty-three ships, including twenty-four of new construction, from the lakes to the ocean.

**Big Nickel Merger Contemplated.**—The amalgamation of the International Nickel Co. of Canada and Canadian Copper Co., of Sudbury, Ont. in a fifty-million-dollar concern, with the ultimate purpose of making Ontario not only the dominant producer of nickel ore, but the centre of the world's nickel refining industry as well, is stated to be the plan upon which those interested in the industry are now working. No official confirmation of the report is available, but Mr. Britton Osler, provisional director of the International Nickel Co. of Canada, admitted that the increase in the company's stock from $5,000,000 to $50,000,000, which was approved at Ottawa recently, was "suggestive." The circumstances in connection with the increase in the company's capital indicate that important plans are under consideration. The International Nickel Co. of Canada came into existence on July 25th, 1916. The International Nickel Co. is building a large refinery at Port Colborne, Ont.

**Quebec Railway Prospects Favorable.**—Satisfactory progress is being made in the work of completing the Quebec and Saguenay Railway. When work on the line was shut down last fall rail had reached to within three miles of [illegible] track-laying was recommenced, and in early May the rails will be at Baie St. Paul, while it is estimated that the rails will reach Murray Bay towards the end of July. All the heavy work on the whole line has been completed, and probably in excess of 90 per cent. of the total work of grading has been done. The end of this summer, therefore, should see a train service established between Quebec and Murray Bay. At Baie St. Paul, a titanium ore mine has been operating for a number of years, and no doubt now that the railroad is approaching completion the owners of the mine will build a spur line of nine miles so as to be able to get out their product by rail. There are [illegible] of pulpwood and considerable lumber in the district. Something like 100,000 cords of pulpwood which now come down every year to Baie St. Paul will in future be taken to destination by rail. At Murray Bay there is the pulp mill of the Nairn Falls Power and Pulp Co., which is a new and up-to-date plant that will supply considerable freight for the road.

## TENDERS

**Melbourne, Australia.**—Tenders will be received until June 6, 1918, by the Commonwealth Railways Commissioner, Department of Works and Railways, Melbourne, for the manufacture, supply and delivery of material for ten "G" class locomotive boilers.

**Melbourne, Australia.**—Tenders will be received until July 3, 1918, for the following electrical instruments for the Victorian State Railways: Eleven integrating wattmeters, 500 amps; six integrating wattmeters, 100 amps; four integrating wattmeters, 50 amps.

**Telephone Equipment Wanted.**—Tenders will be received by the Deputy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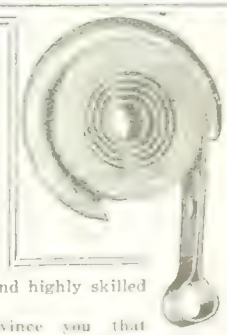

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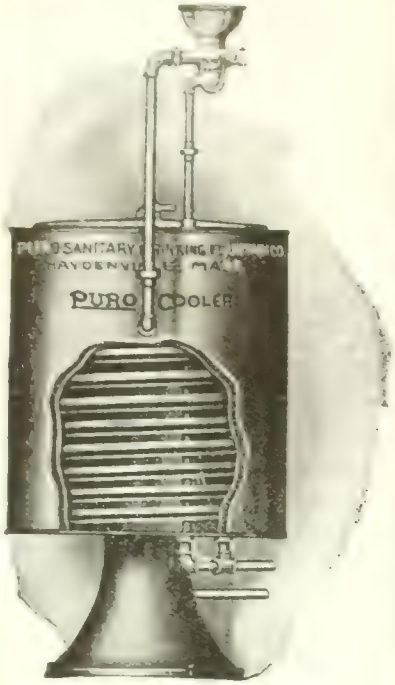


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**Windsor, Que.**—Tenders will be received by the undersigned until May 25, 1918 for the reconstruction in cement of two piers of the Windsor and Brompton Bridge, crossing the River St. Francis, between the municipalities of the town of Windsor and of the parish of St. Francois Xavier de Brompton. Plans and specifications of said piers are deposited with the undersigned and can be seen at any time at his office. J. A. Lagasse, secretary Windsor and Brompton Bridge Committee, Windsor, Que.

## BUILDING

**Woodstock, Ont.**—The Standard Tube & Fence Co., of Woodstock, is building a warehouse, 125 feet x 52 feet. Concrete is being largely used in the work of construction.

**Georgetown, Ont.**—A serious fire occurred here last Thursday, when the Georgetown "Herald" plant was completely destroyed and the building badly gutted. The loss on the newspaper plant will be $5,000, and on the building $3,500, partly covered by insurance.

## CONTRACTS

**Renfrew, Ont.**—The Roberts Filter Mfg. Co., Philadelphia, have the contract for filters costing $6,000, for the City Council.

**Springfield, Ont.**—The Canadian Ice Machine Co., Toronto, have the contract for refrigerating plant for the Springfield Milk Co., who are receiving prices for the supply of piping for water, steam and air.

**The Dominion Bridge Co.,** Montreal, have received an order from the Dominion Government for eight 2,500 h.p. marine steam turbines; these turbines are to have a speed reduction from 3,500 to 100 revolutions per minute.

**Toronto, Ont.**—The Board of Control has carried the report of Commissioner Harris to accept tenders from the Drummond, McCall Co., to supply steel poles for the Bloor Street viaduct at a cost of $5,467.88. The department will need twelve 30-foot poles, forty 28-foot poles, and twenty-one of 24-foot length. Pole accessories costing $766.65 will also be bought in this connection.

**Ottawa, Ont.**—The tender of E. W. Edge, Ltd., Ottawa, for the heating and ventilating equipment for the new parliament buildings at Ottawa has been accepted. Their figure, at $386,000, was the lowest submitted, all others exceeding $400,000. McFarlane-Douglas were the successful tenderers for the bronze-covered frames and sash, at $32,500, and the Otis-Fensom Elevator Co. got the contract for equipment for two elevators, at $31,940.

## MARINE

**Gananoque, Ont.**—The lighthouses in this district of the Thousand Islands are in operation.

**Toronto, Ont.**—It is understood that the Dominion Government will spend $425,000 on harbor improvements here and not $550,000 as previously reported.

**Kingston, Ont.**—It is understood the Kingston Shipbuilding Co. has work ahead for a considerable time and some big vessels will be built.

**Levis, Que.**—The Davie Shipbuilding & Repairing Co. will build dry dock sheds at a cost of $600,000. The Dominion Bridge Co. have the steel contract.

**Sarnia, Ont.**—The sand barge Ontario and tug Annie Moiles are employed deepening the channel leading from Sarnia Bay up to the Dominion Salt plant. The work is necessary to enable coal boats to carry full loads to the works.

**Montreal, Que.**—Good progress is being made in fitting out the "Concretia," the concrete vessel lately constructed by the Atlas Construction Co. Work is now nearly completed on the superstructure, and it is anticipated that the boat will be ready for her trial trip within a few weeks.

**Sarnia.**—The plant of the Reid Drydock Co. at Port Huron has been taken over by the Foundation Corporation of New York, and the works will be greatly increased in size. The new company has a contract for building a fleet of steam trawlers for the ocean and also small war vessels.

**Vancouver, B.C.**—Sponsored by Mrs. W. E. Collings, of Seattle, the ship War Haida was launched from the Cameron-Genoa shipbuilding plant last Friday. The ship is the second to be launched of the four wooden steamers the Cameron-Genoa Mills Ship Builders, Ltd., contracted to build for the British Government.

## RAILWAYS

**Vancouver B.C.**—At an expense of one million dollars a branch of the Kettle Valley Railway from Princeton to Copper Mountain will be extended this year. The branch line will be fifteen miles in length.

**Victoria, B.C.**—The provincial railway department has been advised by the United States Steel Corporation that shipments of steel rails for use in extending the P. G. E. will commence within the next 30 days. The steel rail shipments will total 20,000 tons and will arrive at the rate of 1,500 tons per week. Ten thousand tons will be sent over the Grand Trunk to Prince George, to be laid southward from that point, and the other 10,000 tons will be sent to Squamish. The work of laying rail will commence at both ends of the route.

**Bridgeburg, Ont.**—The New York Central, Toronto, Hamilton and Buffalo and the Canadian Pacific Railway are behind the project to build a general traffic bridge across the Niagara River near Bridgeburg. An application for a charter will

be made to parliament this session. The provisional directors of the Canadian-Niagara Bridge Co. include A. H. Smith, president of the New York Central lines, and Lord Shaughnessy, president of the C.P.R. It is assumed that it is planned to build the bridge at a point about two miles below Bridgeburg, where surveys were made two years ago.

## CATALOGUES

**Metlskin Boiler Preservative.**—A folder giving particulars of the Metlskin boiler preservative manufactured by the Metlskin Co. of Rochester, N.Y. The Canadian Fairbanks-Morse Co. are the Canadian distributors.

**The Link-Belt Co.**, Chicago, Ill., has recently distributed a new publication, No. 359, entitled "Chain Driven Motor Trucks and Tractors." The bulletin describes in detail the principal features and advantages of the Link-Belt chain-drive. It also contains particulars of the chain and a number of illustrations of tractors and trucks equipped with the chain drive.

**America's Airplanes** is the title of an interesting book published by the Gisholt Machine Co., Madison, Wis., giving a brief pictorial history of aircraft development and showing how the Gisholt turret lathes are used to manufacture some of the mechanical parts. The first section illustrates a few of the more notable airplanes and hydro-aeroplanes, showing the development that has been made in the design of aircraft. The second section shows the Gisholt turret lathes and how they are tooled for the various operations for producing some of the more important mechanical parts. This section includes the operations performed for the production of cylinders for Gnome engines.

### PITTSBURG MARKET LETTER

(Continued from page 80.)

output ever made before the war by the original belligerents, Britain, France, Russia, Germany and Austria-Hungary. It is materially in excess of the tonnage these countries actually made during the first twelvemonth of war. Were only 50 per cent. of the United States output passing to war use, the contribution would be a very large one, but the proportion is undoubtedly higher than 50 per cent.

The chief restrictive influence is the insufficient car supply in the Connellsville coke region. For three successive weeks the reports of the *Connellsville Courier* have shown slightly decreasing shipments. There is probably a normal number of cars in the service, but they do not make the round trip as expeditiously as in 1916, for instance. Thus supplies of Connellsville coke have been less in April than in March, rather than greater. The by-product coke ovens, however, have done somewhat better this month, and have been operating substantially at capacity.

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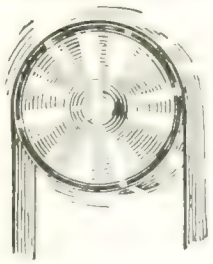

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*A weekly newspaper devoted to the machinery and manufacturing interests.*

Vol. XIX. TORONTO, MAY 9, 1918 No. 19


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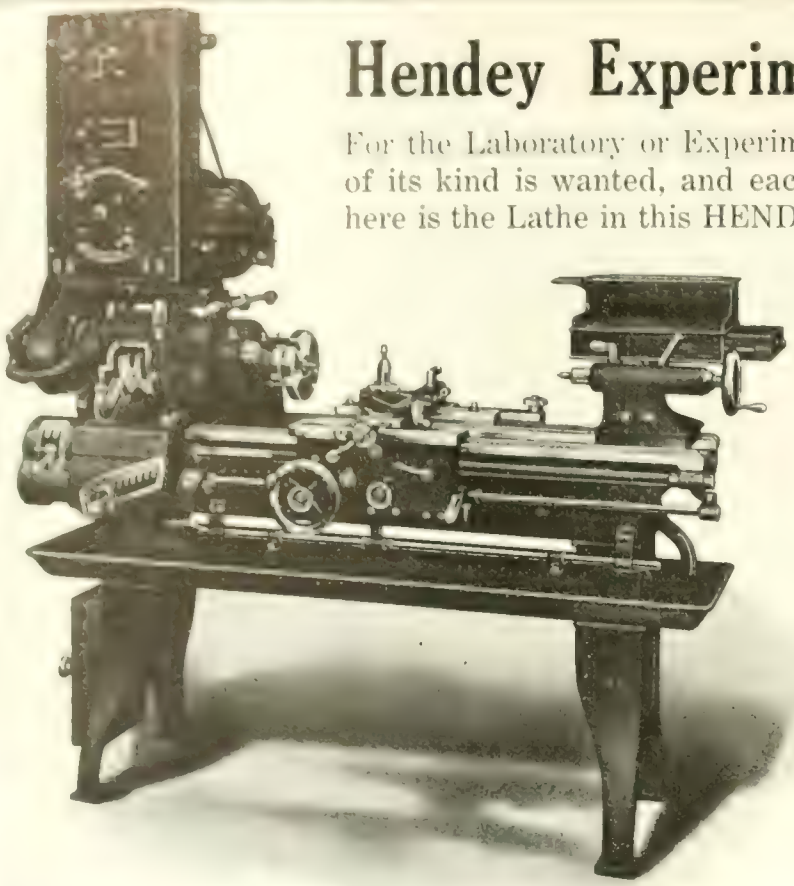

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Volume XIX No. 19 May 9, 1918

# FORGING BLANKS FOR 6 in. AND 75 mm. SHELLS

BY
A. G. Webster

ALTHOUGH the Cluff Ammunition Co.'s forging plant has been in operation for some time, more recently extensive alterations have increased its capacity and scope. Experience gained formerly has also enabled the production to be materially increased. The company is now making 6-inch and 75 m m. forgings, the latter for the American Government. There has also been installed a plant for re-treating or heat treating forgings which have been rejected on account of their not being up to tensile test requirements. By means of this treatment many forgings are ultimately used which otherwise would be scrapped. The capacity of the re-treating plant is such that forgings from other shops in the district can be treated in addition to those rejected at the Cluff plant. This plant is an interesting feature of the company's activities and is one of the more recent developments in the munitions industry.

As will be noted later, the layout of the forging plant is so arranged that there is a minimum amount of wasted effort from the time the billets leave the cars until the forgings are shipped. From the piles to the furnaces, then to the presses and so forth, each operation follows the other in regular sequence without any lost motion, the steel going forward all the time until the product is shipped. In this connection a great deal of time and labor is saved by means of a gravity conveyor. This conveyor, which runs parallel to the line of presses, and along the cooling floor, carries the forgings direct from the presses to the cooling floor and afterwards to the cars for shipment. The carrier was supplied by the Canadian Matthews Gravity Carrier Co., Toronto.

### Heat Numbers Kept Separate

An important feature in the operations at this plant is the care which is taken in treating and keeping together all billets and forgings, as the case may be, according to the heat number. It is of

*Associate editor Canadian Machinery.

[illegible] AND DRAWING 75 MM. FORGINGS SHOWING CUPPING OPERATION.

course well known that each billet is stamped with a certain heat number before being shipped from the steel plant. This heat number is retained throughout the various operations which are regulated according to the analysis of the steel. In the first place the billets are removed from the cars, under cover, and piled on the floor according to the heat numbers. The billets are not mixed together but are arranged in separate piles, each pile comprising billets of a uniform analysis. The piles are situated at the back of the furnaces and [illegible] lets. A 6-inch billet weighs about 158 pounds, is 17¼ inches long and 6½ inches diameter.

### Furnace Installation

The furnaces are of the continuous type, receiving the billets direct from the piles at the back and delivering at the front end to the presses. There are nine furnaces altogether arranged in one long row, two furnaces are used in connection with the 6-inch presses and the other three for the 75 m.m. presses. They can however, be used either for the 6-inch [illegible] of the situation. The furnaces are oil fired, the oil pressure being 40 pounds and air pressure 10 ounces. Each furnace has a capacity of about 75 6-inch or 250 75 m.m. billets at one charge. The front end of each furnace is equipped with a water curtain to protect the men from excessive heat, particularly in the summer time. The device consists of a sloping galvanized sheet covering the entire furnace front with the exception of the place left for removing the billets. A perforated pipe runs along the top of the galvanized sheet, distributing cold water, which runs down on the inside and is collected in a trough at the bottom, thus forming a curtain dissipating considerable heat and making the work less arduous for the men. The water supply is part of the circulating system which is also utilized for cooling the punches and dies in the presses.

An interesting system is seen here in connection with the furnaces for recording the heat in each furnace. Each furnace has a pyrometer for ascertaining the heat in the furnace. The pyrometers are all connected to two tapalogs installed in an office in the forge-shop, one tapalog being connected to furnaces No. 1 to 4 inclusive and the other No. 5 to 9 inclusive. The tapalog gives a continuous record for 24 hours, different colored inks for the various furnaces being used for marking the charts. The tapalogs and pyrometers were supplied by the Wilson-Mauler Co., New York City.

### Six-inch Shell Forgings

The plant for producing the forgings for the 6-inch shells comprises three 500-ton "Southwark" hydraulic presses giving a production ranging from 900 to 1,000 forgings in twelve hours. The billets are heated in continuous furnaces already described, each furnace having a capacity of about 75 billets. The billets are kept in the furnaces about 1½ to 2 hours, the time varying according to the speed of operation at the presses. The temperature in the furnaces ranges from 1,900 to 2,200 degrees Fahr., according to the carbon content of the steel. The billets, while being heated, are turned over five or six times to ensure their being heated uniformly. The billets after being drawn from the front end of the furnace are scaled and then lifted to the presses by means of tongs suspended from an overhead runway. It is essential that the scale should be removed otherwise the dies might be damaged and it might also prevent the steel from drawing uniformly when the punch is being forced into the billet.

The billet is dropped into the die and a centering ring placed on the upper end of billet to guide the punch. A forging for a 6-inch shell is produced at one operation, that is to say the piercing and drawing are done with one stroke of the punch, the piercing causing an upward extension of metal out of the die. The return stroke of the press withdraws the punch and the forging is forced up from the die by means of a hydraulic kicker. The forging is then removed and placed on a gravity carrier system and carried

INTERIOR OF FORGE PLANT SHOWING INSTALLATION OF PRESSES FOR 6 INCH AND 75 MM. FORGINGS

to the other end of the shop to the cooling floor. The punch and dies are cooled by means of water distributed from a perforated pipe ring around the base of the punch. The return water from the presses flows back to an underground tank and is pumped back to the main feed tanks.

### Cooling System

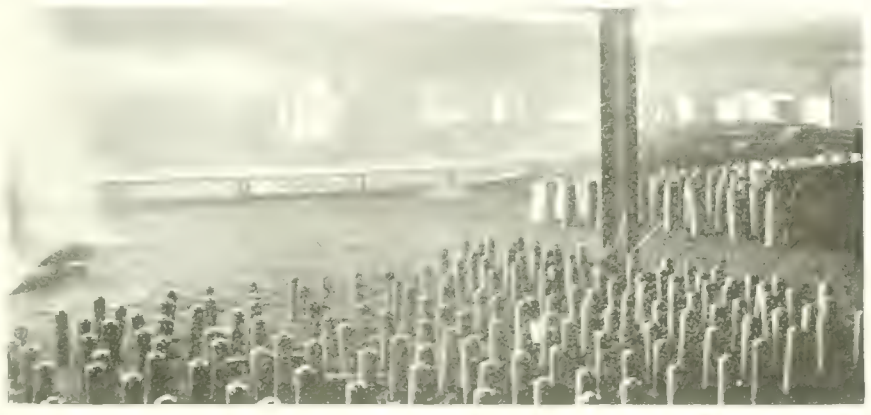
A considerable floor area is devoted to the cooling of forgings, the entire end of the shop being used for this purpose. A large floor area is required because the forgings are not piled but spread around on the floor, end up, which consequently takes up considerable space. During cooling the forgings are laid out in batches according to the heat number, these having already been stamped on the forgings to correspond with the numbers on the billets. The time occupied in cooling and the distance separating each forging during the process varies according to the heat number, precisely as the temperature of the furnaces varies.

The analysis of each batch of forgings is known and is identified by means of the heat number. The cooling must be done slowly or quickly to correct any deficiency or otherwise in the analysis. For slow cooling the forgings are piled close together and protected from draughts by sheet iron. For quick cooling a reverse process is used, that is, the forgings are placed some distance apart and air allowed to circulate freely. Rapid cooling hardens the steel and conversely slow cooling anneals the metal.

### Testing Six-inch Forgings

When each batch of forgings has been cooled, they are stacked up, the piles still being kept distinct according to the heat number. Two or three forgings are selected at random from each pile and then taken over to the machine shop, where two test pieces are cut from the walls of each shell at a point about 4 to 5 inches from the base. The test pieces are milled down and sawn out and then turned up on a lathe to the required form. They are then sent to the Government laboratory to be tested.

Each batch of forgings remains piled until the results of the test are known. If the test is satisfactory the forgings are shipped and if faulty, the batch has to be heat treated. Each forging is also inspected for size and uniformity. In this test the forgings are placed in a mandril, gauged and carefully examined. Any forging that does not conform to the specifications is placed on one side and rectified. The base of each test forging is cut off, split in two and examined for piping or other flaws.

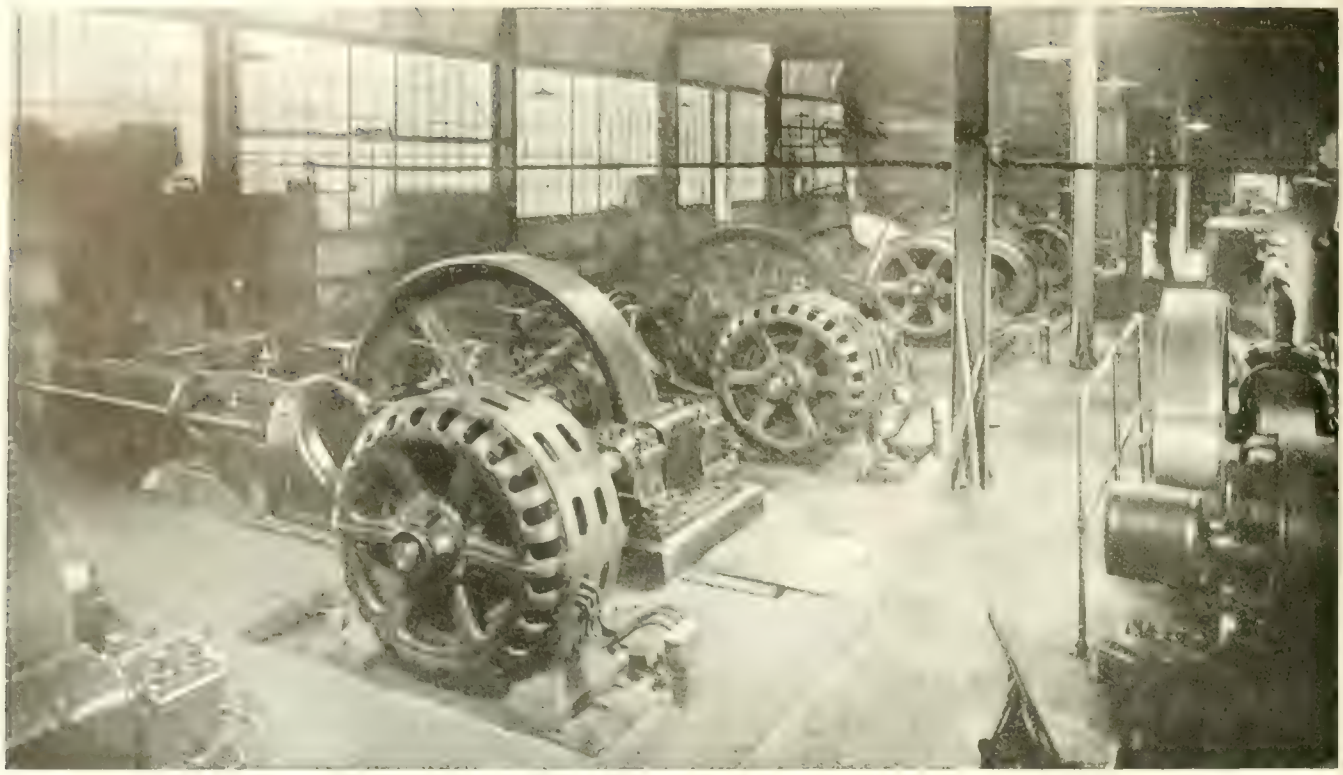


COOLING FLOOR SHOWING 75 MM. FORGING IN THE FOREGROUND AND 6-INCH ON THE RIGHT. GRAVITY CRANE SHOWN IN THE MIDDLE DISTANCE.

### 75 m.m. Billet Plant

The 75 m.m. high explosive shell is a French type of shell which has been adopted by the American Government for the field artillery. It is rather smaller than the 18-pounder, shrapnel being approximately 2 15 16 diameter. The forging operation is similar to that used for the shrapnel shell. The bars from which the billets or blanks are made come to this plant in 10-foot lengths. They weight about 300 pounds and are 3 1 3-inch diameter. They are rolled bars of special steel and carry a heat number which is carefully maintained throughout all operations. The bars are piled after being taken from the cars, each pile containing bars of a uniform analysis; the same procedure being adopted as for the 6-inch billets. From the piles the bars are carried on a conveyor to a table to be nicked preparatory to being broken into short lengths. The nicking is done by an oxy-acetylene blow pipe. By means of this process it has been found that a clean fracture can be obtained without any splinters or damage to the billet. Along the edge of the table at the end are a number of wood blocks set at equal and fixed dis-

HEAT TREATING DEPARTMENT, SHOWING COOLING MACHINE ON [illegible] THE BILLETS ARRIVE IN PILES BEFORE BEING [illegible]



BATTERY OF SIX DEANE PUMPS FOR SUPPLYING POWER FOR HYDRAULIC PRESSES

for the blow pipe so that the operator can cut the nick in the correct position without having to previously mark the bar. The blow pipe is fitted with a flat plate which rests against the wood block when in operation; the oxy-acetylene outfit was supplied by the Carter Welding Co., Toronto. When the nicking operation has been completed, which occupies a very few minutes, the bars are rolled along the table to vertical, motor-driven punching machine or breaker where the bars are broken into short lengths. The breaker, which was supplied by the Hilles & Jones Co., Wilmington, Del., is equipped with a V-shaped tool. The bars are placed in the breaker with the nicked side underneath which, on account of the nick, obviates splintering the billets. This machine is fitted with a stop to regulate the length of the billets, the stop automatically falling down when the punch begins to travel down so to as permit the billet to fall clear. A high rate of production is obtained on this machine. The billets are piled in this department and taken over when required to the piles back of the furnaces. The billets in each pile have a uniform analysis, the heat number having been stamped on each section of the bar after the nicking operation. The billets are 10 inches long and weight 22 lbs.

### 75 m.m. Forging Plant

The furnaces employed for heating the 75 m.m. billets have already been described. They are continuous furnaces, the same type as are used for the 6-inch billets. Three of the nine furnaces are used for the 75 m.m. forgings operation, each furnace having a capacity of 250 billets. The temperature in the furnace is the same as for the 6-inch and the time occupied in heating is about the same, varying according to the demands of the presses. The billets are fed in at the back and drawn at the front end of the furnace. Three presses are used for making the 75 m.m. forgings, two for the drawing and one for the piercing operation, the former being 210-ton presses and the latter a 300-ton press. The capacity of the three presses ranges from 1,400 to 1,800 forgings in twelve hours.

Each press has two sets of punches and dies. The piercing press is equipped with automatic picker for lifting the forgings from the dies and the draw presses have strippers which release the forgings from the dies, allowing them to fall to the ground. The punches and dies are cooled with water and the dies greased after each operation. The forgings, immediately after passing through the piercing operation, are carried to the next presses to be drawn without any intermediate heating. The 75 m.m. forging is practically the same diameter and weight as the billet but is 13½ inches long. The heat number is stamped on the forging as it comes from the drawing press.

### Cooling and Testing 75 m.m. Forgings

The procedure adopted for cooling the

NICKING THE BAR WITH THE OXY-ACETYLENE TORCH

75 m.m. forgings is practically the same as for the 6-inch. That is to say, the analysis of the steel has to be taken into consideration in the time allowed for cooling and arrangement of forgings on the floor during that process. The forgings are carried from the presses to the cooling floors by means of the gravity carrier already mentioned. When the forgings have cooled off they are laid in piles according to the heat number and a few forgings selected for testing purposes. The test pieces are cut out and prepared in the same way as for the 6-inch, and each forging is carefully gauged and examined.

### Machine Shop

The company have a well equipped machine shop for making and repairing punches and dies, which are vanadium steel, and also for effecting repairs required to be done for any equipment in the plant. Adjoining the machine shop is another shop where test pieces are cut out and prepared. In this department is a battery of sixteen-inch Racine hack saw machines used for cutting off the crop ends of the 75 m.m. billets.

### Retreating Plant

Owing to the rigid specifications covering the analysis of the steel used for shells it often happens that some shells are either above or below the limit of carbon content. Forgings rejected on this account can be heat treated and saved from the scrap heap. The company have equipped a special plant for retreating rejects either from their own plant or any other in the district. The plant comprises two batch furnaces and eight specially designed cooling machines for cooling forgings rapidly. The furnaces will hold 85 to 90 6-inch forgings. They are oil fired, the temperature ranging from 1,500 to 1,650 degrees Fahr., according to the condition of the forgings being treated. The forgings are piled on a truck and run into the furnace. At the proper time the trucks are run out at the opposite end and the forgings laid out on the floor or taken to the cooling machines as the case may be. The tracks are laid out so as to occupy a minimum amount of room.

SHEARING 75 MM. BILLETS FROM BAR ON BILLES & JONES BREAKER BAND SAW MACHINE FOR CUTTING METALS

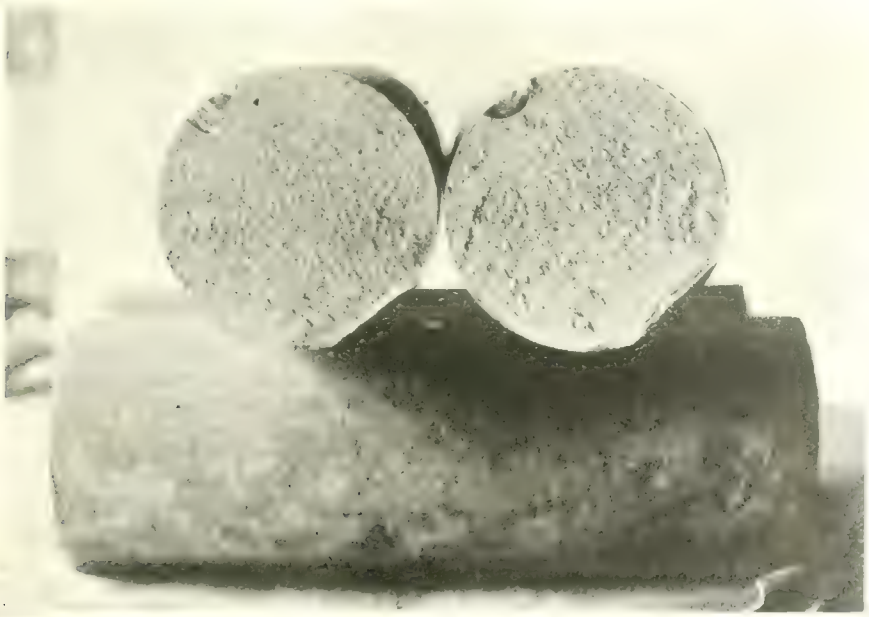
The extreme soft forgings are treated in the air cooling machines after being first heated in the furnace. The cooling machine consists of a cylindrical iron casting for containing the forging. At the open end a perforated pipe is introduced into the bore of the shell while at the back end another pipe delivers air around the base and outside of the forging. By this method the forging is cooled rapidly and consequently hardened. Air is supplied from Roots rotary pressure blower having a capacity of 13,000 cubic feet of air per minute, and operated by a Canadian Westinghouse motor.

Some forgings are annealed in the furnace, being heated for about two hours, and then allowed to cool gradually in the furnace. Some are normalized by being hardened a few degrees, while a common process is to heat the forgings and then lay them out on the floor to cool gradually, the time depending upon results required.

### Hydraulic Plant

The hydraulic plant for operating the presses consists of two large accumulators and six motor-driven pumps. One accumulator has an 18-inch ram and the other a 15-inch ram, both operating at a pressure of 1,500 pounds. Five of the pumps have a capacity of 200 g. p. m. The pumps were supplied by the Deane Steam Pump Co., Holyoke, Mass., and the motors by the Canadian Westinghouse Co., Hamilton. The pumps are all horizontal direct acting units driven through gearing. The motors are 200 h.p. machines, running at 480 r. m. p. and use hydro current at 550 volts, which is reduced from 2,000 volts by transformers. The fan for supplying air to the oil burners is driven by a 28 h.p. Canadian General Electric motor running at 100 r. p. m.

The fan was supplied by the Canadian Blower Co., Kitchener, Ont. The returns from the hydraulic presses pass to an underground tank and are then pumped to another tank above the floor by a centrifugal pump. The latter tank is the supply for the accumulator pumps.



SHELL BILLETS AFTER BREAKING TO LENGTH, SHOWING CLEAN AND SILKY FRACTURE. THE NICK PRODUCED BY THE TORCH IS PLAINLY SHOWN

Aeroplanes for carrying mails are the subject of a call for bids recently issued by the U. S. Post Office Department. The specifications call for five machines, each capable of carrying 300 pounds of mail a distance of not less than 200 miles, nonstop, maximum speed under full load, 100 miles per hour, minimum speed under full load, 45 miles per hour, climbing speed 6,000 feet in 10 minutes, equipped with a 150-horse-power motor.

# 160 Brake Horse Power Semi-Diesel Marine Oil Engine

*The Beardmore semi-Diesel engine is a type of prime mover which has demonstrated its suitability for developing power such as is required for coasting vessels and fishing boats. By operating on the four-stroke cycle, the required power is developed at a moderate speed and the resulting propeller efficiency makes this type of motor of interest to owners of vessels with limited draft. Constructional and operating features are fully dealt with.*

THE advantages of the internal-combustion engine as a means of marine propulsion is undoubtedly the principal reason for its application to the smaller types of vessels, and the development of the modern type of oil engine, together with the rapid increase in power developed per unit, has made it possible to use this type of engine for the propulsion of even the largest vessels. Quite recently this type of engine was universally regarded as being suitable for the development of only relatively small powers, say, 25 brake horse-power to 30 brake horse-power per cylinder, but recent modifications in design and the virtues of rigid simplicity have brought into favor even for powers up to 130 brake horse-power per cylinder.

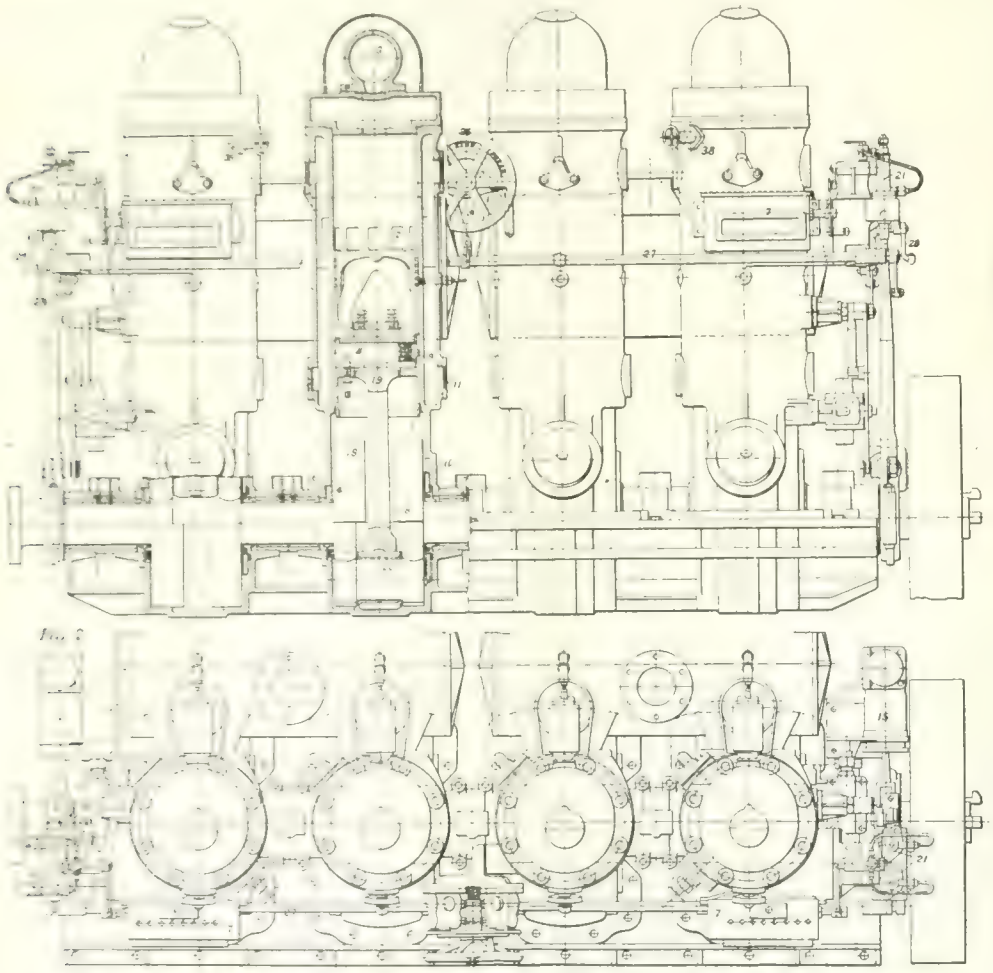
### Field of Application

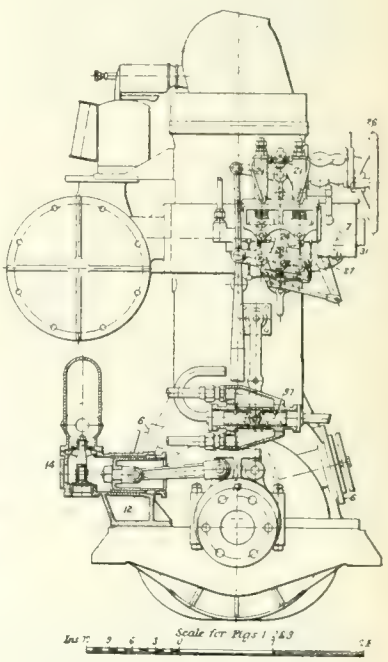
The great majority of marine semi-Diesel engines have points of similarity in the system upon which they work, and practically all are of the two-stroke cycle, utilising the enclosed crank chamber for the compression of scavenging air. The Beardmore engine has been designed essentially to meet the peculiar requirements of marine propulsion, and is the result of much experience with this type of engine installed in yachts, coasters, lighters and fishing vessels.

It is particularly suited to consume fuels ranging from 0.8 to 0.9 specific gravity, but can be adjusted to use either slightly lighter or heavier oils. Working on the two-stroke cycle, it develops 160-brake horse-power while running at 280 r.p.m. This relatively slow speed of revolution is, of course, conducive to high propeller efficiency. As all bearing surfaces are liberal and materials carefully selected an outstanding feature of the engine is its capacity for long and hard service. The engine is directly reversible by means of compressed air, and requires no disconnecting clutch between the engine and propeller, the latter advantage being one that appeals very strongly to marine engineers in general and oil-engine users in particular. Fig. 1 gives sections and elevations of the engine, Fig. 3 details of the main valves, Fig. 4 diagrams from the cylinder and crank chamber, and Figs. 5 to 8 are general arrangements of an installation on board ship.

### Chief Features

In the main engine there are four cylinders, each 11 in. diameter by 15 in stroke, and the cycle of operations may be briefly described as follows, the reference numbers being those shown on the section of one of the cylinders in Fig. 1:—During the upward stroke of the piston air is drawn through non-return valves into the crank chamber 1, to be compressed on the downward stroke and admitted into the cylinder at the correct moment through scavenging air ports located directly opposite to the exhaust ports 2. These ports are covered and uncovered by the piston, on the top of which a deflector is arranged to give to the air blast the direction most suitable for efficient scavenging. While the under side of the piston is performing the functions of a scavenging air pump the upper side compresses the contents of the previously scavenged





ELEVATION PLAN AND END VIEW OF "BEARDMORE" MARINE OIL ENGINE.

cylinder on the upward stroke in preparation for the downward or power stroke.

A separate fuel pump is provided for each cylinder, and once in each revolution of the engine fuel is sprayed directly into the combustion chamber 3, through pulverising nozzles fitted with automatic check valves, and ignition is

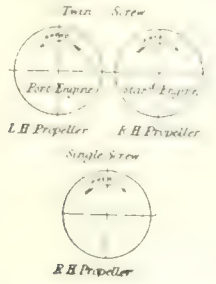



FIG. 2. DIRECTIONS OF ROTATION LOOKING FORWARD

obtained through the fuel impinging on on the heated surface of the combustion chamber.

The combined heat of compression and combustion sustains the temperature necesary for ignition, and consequently no blow lamps are required except for a few minutes before starting the engine. The various operations of working cycle can be clearly understood from an inspection of the indicator diagrams taken from the cylinder and crank chamber and reproduced in Fig. 4, and the sequence and correlation of the operations will be appreciated. These diagrams show the excellent results obtainable by careful design based on extensive experience.

### Scavenging Arrangements

As already stated, scanvenging air is compressed in the enclosed crank chamber, and in order to obtain the necessary quantity of air at a suitable pressure for efficent scavenging the volume of the crank chamber is reduced to a minimum and the whole is made as nearly as possible airtight. The latter condition is difficult to attain where the shaft passes through the walls of the crank chamber, and the method adopted on this engine is interesting. A bronze ring, 4, Fig. 1, is carefully bedded to the body of the shaft close to the crank-web, and is pressed against a machined surface on the inner side of the crank chamber by springs, 5, between the ring and crank-web. The ring revolves with the shaft, and consequently wear is confined to the flat surface and automatically corrected by the springs, which exert sufficient pressure to prevent the ring leaving its face when the air pressure in the crank chamber is below that of the atmosphere.

Since inefficient scavenging is necessarily accompanied by loss of power and waste of fuel, the problem of rendering the crank chamber airtight is of the utmost importance and has received much attention from engineers, but perfect airtightness has not yet been achieved. Channels are therefore provided on this engine between the main-bearing cap and the side of the crank chamber to allow the free escape of any trifling leakage past the ring, and thus to prevent the possibility of interference with the lubrication of the main-bearing bush.

Air is admitted to the crank chamber through grids at the front and back covered by flexible plate valves backed by light springs, and these are mounted on large doors, 6, Fig. 8, the removal of which gives easy access to the crank-pin bushes.

### Lubrication Problem

It will be obvious that with this enclosed type of crank chamber, which is utilised as a scavenging pump, forced lubrication cannot be applied to the crank-pin bearings, because a large quantity of the overflow would be taken up by the air and eventually find its way into the working cylinders, with the attendant result of excessive consumption of lubricant. The question of lubrication, therefore, is a difficult one, but has been solved in this engine in a most satisfactory manner. A forced sight-feed system, with separate plunger pump and oil tube to each point where lubrication must be positive and regular, has been adopted, and by this means the quantity of lubricant supplied to any point is definitely controlled by the attendant, while any interruption of the supply due to a choked tube or faulty valve can be instantly detected and the sight glass shows clearly which point is affected.

Two eight-feed lubricator boxes, 7, Fig. 1, are employed on this four-cylinder engine, and the reciprocating drive is obtained from the fuel-pump actuating gear. The 16 feeds are distributed as follow: three to each cylinder and one to each crank-pin. The cylinder feeds are disposed in such a way as to lubricate the entire working surfaces of the piston and cylinder wall, while one feed also serves to lubricate the gudgeon pin.

The gudgeon pin is hollow, as shown at 8, and is secured in place by a screwed pin, which is split at the point to prevent the possibility of falling out. At the other end of the hollow gudgeon pin is a plunger with a scoop end, 9, which is forced against the cylinder wall by means of a spring and collects oil from the lubricating tube already mentioned. The feed for the crank-pin is carried through the side of the crank chamber and led to the interior of a revolving ring, 10, from which the oil is carried by centrifugal force to its destination. The lubrication of the main bearings is effected by means of siphon tubes—an accepted marine practice.

### Cylinder Construction

The cylinders are cast separately and are extended below the working barrels to form the upper halves of the crank chambers. The cylinder bodies are completely encircled by ample water jackets, and large access doors, 11, are provided to facilitate the removal of any deposit which may be formed therein. The cylinder covers and silencers are also jacketed, and the circulating water is supplied by a reciprocating pump, 12, placed at one end of the bedplate and actuated by an eccentric, 13, on the crankshaft.

The pump body is of cast iron lined with brass and is provided with brass

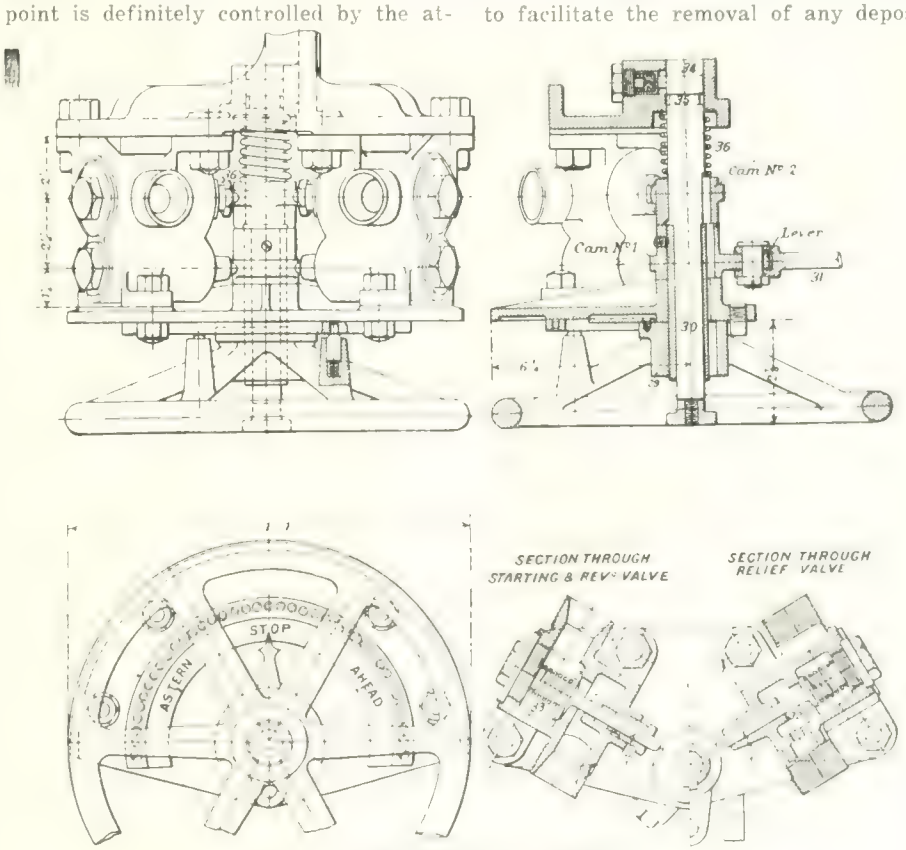



FIG. DETAIL OF MAIN VALVES

seating in the ship, and is provided with 16, Fig. 1, are readily accessible for removal, and when removed the bushes, 17, their outer diameter, can easily be bushes are of Admiralty quality gun-

### Crank Shaft and Rods

Siemens-Martin steel and is machined 1, are secured to the crank-webs, and evenness of turning moment and a desirable freedom from vibration, but also serve to reduce the clearance volume of the crank chamber, and thus increase the scavenging efficiency.

The connecting rods are machined steel forgings fitted with adjustable bearings at top and bottom ends. The top end, 19, of each rod is of special design to allow of easy adjustment, and the bearing surface is of phosphor-bronze. Examination of the gudgeon pin and brush, also piston and piston rings, after the lower end of the connecting rod has been disconnected. The marine-type crank-pin bush, 20, is of Admiralty quality gun-metal, with white metal lining, and is accessible for examination or adjustment through the doors, 6, arranged at the front and the back of the crank chamber.

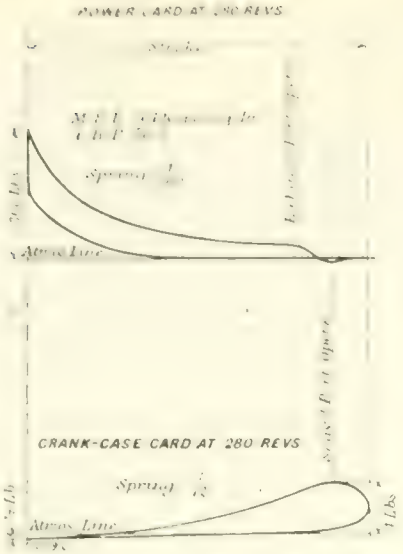



FIG. 4. DIAGRAMS FROM CYLINDER AND CRANK CASE.

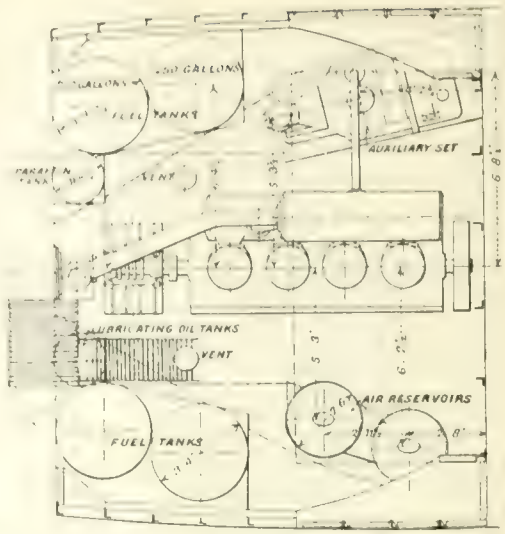



FIG. 5.

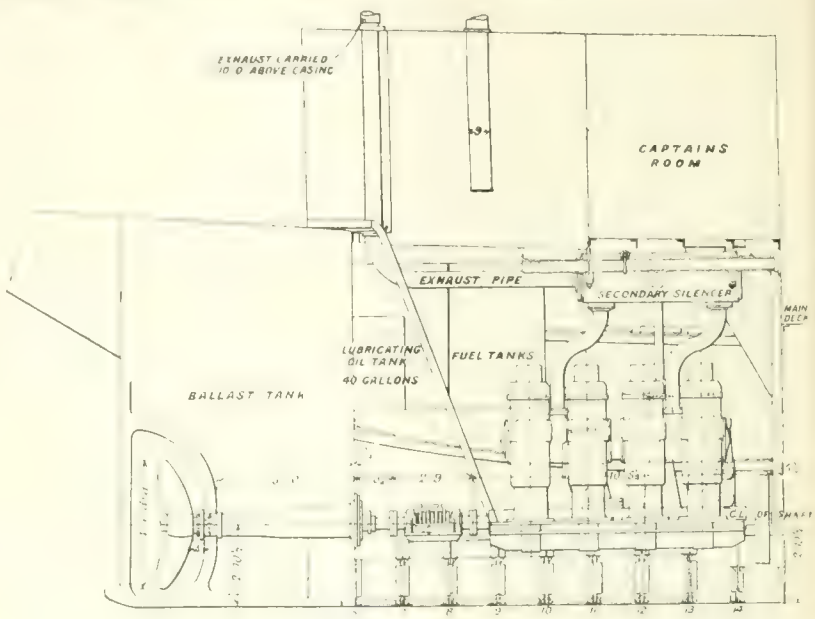



FIG. 8.

### Fuel Pumps

The four fuel pumps, 21, are grouped in pairs at opposite ends of the engine and are operated by the eccentrics, 13, previously mentioned in connection with the water pumps, a horizontal rocking lever, 22, fulcrummed at its centre, being employed to carry the fuel-pump strikers, 23. The stroke of the strikers is, of course, very much in excess of that to be communicated to the fuel-pump of fuel to the combustion chambers is restricted to a very short period. The idle portion of the stroke is utilised for governing purposes, and as the action of one is identical with the others it will be sufficent to describe one. The pump striker is pivoted on the rocking lever and is free to rotate but for the action of a light spring, 24, drawing it towards its guide. On the face of the guide a step is formed which throws the striker off its original course but as this effect is counteracted by the spring already mentioned the engine speed determines whether the striker shall hit or miss the pump plunger.

The tension of the spring can be adjusted to cut out at any engine speed, and when that adjustment has been made the following conditions are fulfilled:—At all engine speeds up to and including a predetermined limit the fuel pump delivers a definite quantity of fuel during a definite fraction of each engine stroke, the quantity delivered being entirely under the control of the attendant on the starting platform, and when the engine speed exceeds the predetermined limit the pump automatically ceases to operate until the normal speed is regained. When it is remembered that all four fuel pumps are alike it will be readily understood that the system of governing is very sensitive and quick in action, and it is worthy of note that the tension of the governor springs can be adjusted either individually or collectively while the engine is running.

The maximum quantity of fuel to be delivered at full power is determined by a screwed collar, 25, Fig. 1, on the lower end of the pump plunger. By turning this collar to right or left the plunger is raised or lowered relatively to the striker and consequently the stroke of the plunger is limited, but this adjustment, of course, is only required when tuning the engine to suit a given quality of fuel and should not be used for any other purpose.

### Engine Control

The ordinary control of the engine speed is effected through a hand wheel, 26, Fig. 1, placed at the centre of the engine. The fuel-pump strikers are mounted on eccentrics in the rocking lever, and these eccentrics are connected by a system of levers and links to a horizontal shaft, 27, running along the front of the engine. Any rotary movement of this shaft is therefore transmitted to the eccentrics, and the strikers are thus raised or lowered collectively according to the direction of movement imparted to the horizontal shaft by the hand wheel. Very fine graduations of

the engine speed are obtainable in this way. A priming handle, 28, is fitted to each fuel pump for charging the pipes before starting, and any pump can be put out of action instantaneously by raising the handle to a horizontal position.

Should it become necessary for a pump to be put out of action permanently the screwed collar already referred to in connection with tuning meets this requirement, and when thus cut out the suction and delivery valves and springs can be removed for examination by simply disconnecting the delivery pipe and screwing out the plug in the top of the pump barrel.

Starting and reversing are effected by means of compressed air and the details of the gear, Fig. 3 show how all the operations of the engine are controlled by a single hand wheel. The hand wheel is mounted on a sleeve, 29, which also carries a lever and cam No. 1, while a central spindle, 30, passing through the sleeve, carries cam No. 2. The lever is connected by a link, 31, Fig. 1 and 3 to the central spindle towards the back, the air-valve spindle drops og the cam and a spring plunger, 32, Fig. 3, entering a groove, 35, in the central spindle, locks it in the new position. The hand wheel can now be used to regulate the speed of the engine without having any effect on the closed air valves, but whenever the wheel is placed in the stop position the central spindle is automatically released and is returned by a spring, 36, to its original position in readiness for a fresh start in either direction.

A start in the astern direction is effected by turning the hand wheel anticlockwise, and thus placing the astern distributing valves in communication with the compressed air reservoirs and opening the ahead distributing valves to the atmosphere. Moving the hand wheel in either direction from the stop position brings the fuel pumps into action, and it is noteworthy that the driver's attention is confined to two simple operations, viz., turning the hand wheel in the proper direction and pushing the

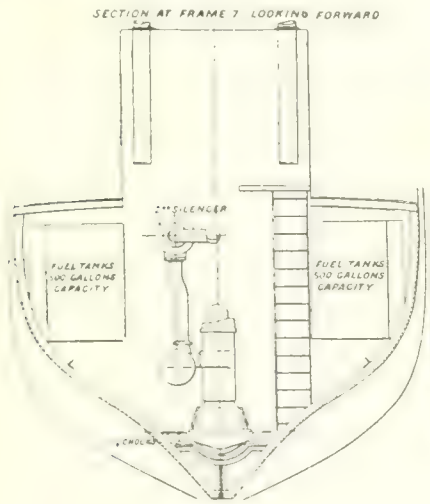



FIG. 6

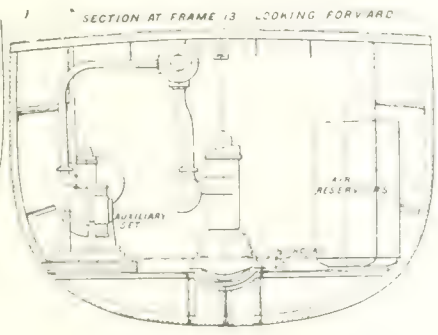



FIG. 7

fuel pump controlling shaft, 27, Figs. 1 and 3, the cam No. 1 opens one of the two relief valves, 32, Fig. 3, and the cam No. 2 opens one of the two high-pressure air valves, 33, Fig. 3. The air valves are directly connected with the compressed-air reservoirs, Figs. 5 and 7 on the one side and with mechanically-operated distributing valves on the other side.

### Manoeuvre Power

It will now be understood that when the hand wheel is turned clockwise the cam No. 2 opens the air valve on the left and admits compressed air to the ahead distributing valves, the cam No. 1 opens the relief valve on the right and places the stern distributing valves in communication with the atmosphere, while the lever brings the fuel pumps into action. The engine then starts on compressed air, but as the fuel pumps operate immediately the engine starts, the air connection can be closed on the completion of one revolution. The latter is the function of the central spindle which carries the cam No. 2. By pushing central spindle when engine has started.

The air-distributing valves, 37, Fig. 1, are actuated by the eccentrics provided for operating the water and fuel pumps, but are brought into operation only when compressed air is admitted to them, and consequently there is no wear and tear of the reversing mechanism while the engine is running. It is an admirable feature of this gear that no part of it is in motion except for a few seconds during each start or reverse of the engine, and it is therefore an easy matter to withdraw valves and other parts for examination or overhaul while the engine is at work.

Two of the engine cylinders are fitted with spring-loaded non-return valves, 38, Fig. 1, through which the air reservoirs can be charged while the engine is running. A sufficient supply can be maintained in this way for all ordinary purposes, but an independent power-driven air compressor is supplied to meet the requirements of excessive manoeuvring and to renew the supply should it be lost from any cause.

Figs. 5 to 8 show a 160 brake horsepower engine installed in a typical British coaster, 75 ft. long between perpendiculars, 18 ft. beam, and 8. ft. 6 in. draught. The auxiliary set consists of an air compressor and general service water pump driven by an independent oil engine, which operates on the same fuel as the main engine. The compressor is capable of charging the air reservoirs to a pressure of 350 lb. per square inch, although the main engine can be started or reversed by air at 100 lb. pressure, and this allows air to be stored in excess of the quantity required for ordinary purposes. In fact the air reservoirs are of such capacity that ordinary manoeuvring requirements can be fully met by one while the other is kept charged for emergencies.

The water pump is capable of performing all the duties of the main bilge and circulating pumps, and is also arranged to deal with water ballast. Fuel is stored in cylindrical tanks having a total capacity of 1,000 gallons, and this quantity gives the vessel an acting radius of 750 nautical miles. The propeller is of cast iron and has three blades of large surface, the propeller shaft is of mild steel encased in a continuous gun-metal liner, and the stern tube is of cast iron fitted with renewable lignum-vitae bearings.

The thrust block is of the most approved marine type, having individually adjustable shoes faced with white metal and a shaft-bearing at each end. The engine in this ship is 10 ft. 5 in. long from the forward face of the flywheel to the aft face of the crankshaft coupling, 5 ft. 4 in. high from centre of shaft to top of combustion chambers, and weighs 145 cwt. with silencers, flywheel, mountings and piping. The weight of the complete installation, including fuel tanks, floor plates, pipes and connections. is 14 tons, and the engine-room bulkheads are 15 ft. apart.

We are indebted to "Engineering" for the data and illustrations contained in this article.

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THE power from a gallon of gasoline is generally rated in these days by the distance it will propel an automobile. But the same energy, if directed to other and more varied purposes, will milk three hundred cows, bale four tons of hay, mix thirty-five cubic yards of cement, plow three-fifths of an acre of ground, or it will generate enough electricity to light a large farmhouse for thirty hours."

ADVOCATES of all-welded piping systems will be pleased to know that a brewery having a very extensive suction-gas (ammonia) piping system, has just completed remodeling the system, welding the whole to do away with joints. Oxyacetylene was the process used. The progress in this field generally is indicative that the days of flanged headers, receivers, manifolds, etc., as well as piping systems with numerous flanged joints are soon to pass away.

# Advantages of Heat Treatment in Gear Blank Manufacture*

By C. R. Poole**

*... heating and annealing operations connected with the manufacture ... in the machine shop to a considerable degree. ... the advantages of thoroughly annealing the blanks subsequent ... of machining and hardening.*

In this advancement the chemical and metallurgical laboratory have played no small part. During this time, however, the condition of the blanks given the machine shop to be machined, has not received its share of attention in the heat-treating department of many forge shops, and in many cases has been neglected or not considered by the machine shops themselves. This is especially true of shops using only the lower carbon steels.

There are two distinct types of gears, both types having their champions, namely, carbonized and heat-treated. The difference between the two in the matter of steel composition is entirely in the carbon content, the carbon never running higher than twenty-five point in the carbonizing type, while in the heat-treated gears the carbon is seldom lower than thirty-five point. The difference in the final gear is the hardness. ... surface with a soft, tough and ductile core to withstand shock, while the heat-treated gear has a surface that can be touched by a file with a core of the same hardness as the outer surface.

With the exception of several of the higher types of alloy steels, where the percentages of special elements run quite high, which causes a slight air-hardening action, the carbonizing steels are soft enough for machining when air cooled from any temperature, including the finishing temperature at the hammer. This condition has led many drop forge and manufacturing concerns to consider annealing as an unnecessary operation and expense. In many cases the drop forge has only heated to a low temperature, many times just until the piece showed color, to relieve the so-called "hammerstrains." While this has been only a compromise it has been better than no reheating at all, although it has not properly refined the grain which is necessary for good machining conditions.

### Heat Treatment

Before going to the effects of proper annealing temperatures for the most commonly used steels, we will briefly consider the theory of heat-treatment. Heat-treatment, in the broad sense, is the thermal refinement of the structure of steel and covers the four operations, namely: annealing, carbonizing, hardening and drawing or tempering as it is commonly called. All of these operations are based on the fact that in heating a piece of steel the structure undergoes a change at from one to three points on heating and a corresponding number of changes on cooling, these changes being caused by a molecular rearrangement of the carbon and iron. The points are known as "critical points" or "critical ranges" and vary in number according to the composition of the steel. These points on heating are often referred to as "decalescent point" and on cooling as "recalescent point." Carbon exerts the greatest influence on the location of the critical points with nickel and chromium coming next. A straight carbon steel up to thirty-five point carbon has three critical points, from thirty-five to eighty-nine point carbon two critical points are found and over eighty-nine point carbon only one critical temperature is found. Each one per cent. of nickel will lower the critical point twenty degrees Fahr., while each 1 per cent. chromium raises the point ten degrees Fahr. Of the critical points those found on a rising temperature are higher than the corresponding points on a falling temperature. Rising temperatures are always considered in correctly heat-treating a piece of steel. In order to produce the most complete rearrangement of the molecules of carbon and iron and therefore the greatest refinement it is necessary to heat to a temperature slightly in excess of the highest critical point.

Annealing is the heating to a temperature slightly above the highest critical point and cooling slowly either in the air or in the furnace. Annealing is done to accomplish two purposes: (1) to relieve mechanical strains; (2) to soften and produce a maximum refinement of grain.

### Carbonizing

Carbonizing is the operation of imparting to a low carbon steel a shell of high carbon content. This produces what might be termed a "dual" steel, allowing for an outer shell which, when hardened, would withstand wear and a soft ductile core to produce ductility and withstand shock. The operation is carried out by packing the work to be carbonized in boxes with a material rich in carbon and maintaining the box so charged at a temperature in excess of the highest critical point for a length of time to produce the desired depth of carbonized zone. Generally, maintaining at 1650-1700° Fahr. for seven hours will produce a carbonized zone one-thirty-second of an inch deep.

Hardening is the heating to a temperature slightly above the highest critical point and cooling suddenly in some quenching medium such as water or oil. This treatment produces a maximum refinement with the maximum strength.

Drawing is the heating to a temperature below the highest critical point, the temperature used being governed by the results required. This treatment is used to relieve the hardening strains set up by quenching as well as the reducing of the hardness and brittleness of hardened steel.

As the maximum refinement of the grain size of a piece of steel takes place at a temperature at or just slightly above the critical point, increasing temperatures over that point correspondingly increase the grain size. The grain size of a piece of steel is governed by the maximum temperature reached after passing over the highest critical point or by the temperature at which the last mechanical working was given the steel, providing the mechanical work was done at a temperature in excess of the highest critical point.

### The Structure of Annealed Steels

Annealed steels are called pearlitic, pearlite being the name applied to the microstructure of slowly cooled steels. Pearlite is a mechanical mixture consisting of alternate masses of fewite (pure iron) and cementite (cementite being a compound made up of 6 6 per cent. carbon and 93.4 per cent. fewite) with the resultant mixture containing .89 per cent. carbon. Pearlite may be present in two forms, lamellar and granular; with the granular occuring either coarse or fine or elongated with bands of fewite separating the elongated grains of pearlite.

When etched in a weak alcholic solution of picric or nitric acid and examined under the microscope the fewite, untouched by the etching solution appears white, while the pearlite is shown up as a black constituent.

Proper annealing of low carbon steels causes a complete solution or combination to take place between the fewite and pearlite, producing a homogeneous mass of small grains of each, the grains of the pearlite being surrounded by grains of fewite. A steel of this refinement will machine to good advantage, due to the fact that the cutting tool will at all times be in contact with metal of uniform composition and will not be alternately coming in contact with the soft fewite constituent and the harder carbon particles. While the alternate bands of fewite and pearlite are microscopically

sized, it has been found that with a Gleason or Fellows gear cutter that rough cutting can be traced to poorly annealed steels, having either a pronounced banded structure or a coarse granular structure. A study of the microphotographs of several of the widely-used low carbon steels in gear manufacture will show the condition of the structure direct from the drop hammer, the pronounced banded structure of fewite and pearlite and the change produced by thorough annealing.

### Annealing Temperatures

Theoretically annealing should be accomplished at a temperature at just slightly above the critical point. However, in practice, the temperature is raised to a higher point in order to allow for the solution of the carbon and iron to be produced more rapidly as the time required to produce complete solution is reduced as the temperature increases past the critical point. Temperatures, exceeding the critical point by over 100° Fahr., should never be used on account of the enlargement of the grains of pearlite and fewite. Microphotographs of a piece of steel annealed at temperatures increasing by 25° from a point below the critical point to the burning point shows clearly the effects of temperature on the grain size.

For annealing the simpler types of low carbon steels the following temperatures have been found to produce uniform machining conditions on account of producing uniform fine grain pearlite structure.

1.15—.25 carbon straight carbon steel.
Heat to 1650° Fahr. Hold at this temperature until the work is uniformly heated, pull from the furnace and cool in air.

.15—.25carbon 1½ per cent. nickel, ½ per cent. chromium steel.
Heat to 1600° Fahr. Hold at this temperature until the work is uniformly heated, pull from the furnace and cool in air.

.15—.25 carbon 3½ per cent. nickel steel.
Heat to 1575° Fahr. Hold at this temperature until the work is uniformly heated, pull from the furnace and cool in air.

In the annealing of the higher types of chrome nickel steel, with the nickel content running about 3 per cent. and the chromium about 1 per cent. the operation is more difficult, as rapid cooling through the upper critical range produces a hardness due to the slight air hardening properties of steel of this composition. The annealing of this type of steel requires considerable more attention both in the heating and cooling. To produce the best machinability of this steel the following practice will give very satisfactory results:

Heat to a temperature in excess of the critical point about 100° Fahr., holding at this temperature for a considerable time to allow for thorough heating and complete solution of the cementite; cool rapidly, either by pulling from the furnace into air or opening up the furnace doors, to a point at which the forgings show no color in daylight; reheat to a point just in excess of the highest critical point and cool slowly in the furnace. The temperatures, length of heating, time and rate of cooling, are dependent on analysis, size of forging and weight of the load of forgings in the furnace.

Not only will benefits in machining be found by careful annealing of forgings but the subsequent troubles in the hardening plant will be greatly reduced. The advantages in the hardening start with the carbonizing operation, as a steel of uniform and fine grain size will carbonize more uniformly, producing a more even hardness and less chances for soft spots. The holes in the gears will also "close in more uniformly," not causing some gears to require excessive grinding and others with just enough stock. Also all strains will have been removed from the forging, eliminating to a great extent distortion and the resulting noisy gears.

While the steel used for the heat-treated gears is always of a higher carbon content, treatment after forging is necessary for machining, as it would be impossible to get the required production from untreated forgings especially in the alloy steels. The treatment is more delicate, due to the higher percentage of carbon and the natural increase in cementite, together with complex carbides which are present in some of the higher types of alloys. Due to the many analyses of heat-treated gear steel it is impossible to give in this paper specific treatments, but the general procedure is practically the same as for the case hardening, 3 per cent. nickel, 1 per cent. chromium steel given earlier. More time should be given to permit the complex solution to take place and the rate of cooling watched closely, together with the temperature at which the forgings are pulled from the furnace. For a furnace load, weighing 550 lbs., of medium section forgings made from a steel of 50 carbon, 60 manganese, 3 per cent. nickel, 1 per cent. chromium the following treatment gave very good machining conditions on turning operations as well as on the Fellows gear shapers:

Heat to 1330° Fahr., taking 2 hours to heat to the temperature. Hold at the temperature for 1½ hours and allow to cool in furnace to 1170° Fahr., taking about 1 hour to cool. Reheat to 1230° Fahr., consuming ¾ hours to reheat. Hold at 1230° Fahr. for 1¼ hours. Cool slowly in furnace, not faster than 75° for the first hour until 900° Fahr., then cool in air.

In the heat-treated steels poor machining conditions are present, generally due to incomplete solution of cementine rather than bands of free fewite, as in the case of case-hardening steels. This segregation of carbon, as it is sometimes referred to, caused hard spots which, in the forming of the tooth, causes the cutter to ride over the hard metal, producing high spots on the face of the tooth which is as detrimental to satisfactory gear cutting as the drops or low spots produced on the face of the teeth when the pearlite is coarse-grained or in the banded condition.

In the simpler carbonized steels it is not necessary to test the forgings for hardness after the anneal, but with the high percentages of alloys in the carbonizing steels and the heat-treated steels a hardness test is essential. For this test the Brinell hardness tester is far more accurate than the sclerescope test. However, the Brinell test should not be used without the aid of the microscope. To obtain the best results in machining, the microstructure of the metal should be determined and a hardness range set that covers the variations in structure that produce good machining results. By careful control of the heat-treating operation and with the aid of the Brinell hardness tester and the microscope it is possible to continually give forgings that machine uniformly and be soft enough to give desired production. The following gives a few of the hardness numerals on steel used in gear manufacture that produce good machining qualities.

20 carbon, 3 per cent. nickel, 1¼ per cent. chromium—Brinell 156-170.

50 carbon, 3 per cent. nickel, 1 per cent. chromium—Brinell 179-187.

50 carbon chrome vanadium—Brinell 170-179.

## TOOL SCARCITY HAMPERS JAPS

GEORGE SEIDMORE, United States Consul-General at Yokohama, reports that ship carpenters' tools have become so scarce in Japan that the Government is put to great straits to provide a supply. Old tools and second-hand ones are in great demand. Almost any price can be asked for saws and drills. Even the lumbermen are short of axes and circular saws. Before the war Japan looked to England for tools, and they were to be had at reasonable prices and of good quality. Ship riveting drills are especially desired. The British embargoes on these tool supplies threw the Japanese trade to the United States, but of late the demand in this country has caused the export to fall off, and then our embargoes added to the difficulty. Mr. Seidmore says that second-hand tools are now being sold for twice as much as new ones brought three years ago. A similar complaint comes from the Japanese cotton mills. They cannot get their equipment, which formerly came from England, where now these articles cannot be made in quantity enough for home use, and manufacturers are tied up with Government contracts along other lines. The spindles supplied from the United States the Japanese do not like, as they are accustomed to the British makes.

# FROM THE MEN WHO PRODUCE

Methods, Machining, Devices, Systems and Suggestions From Shop And Drafting Room

## PRODUCING THE SAME PART IN THREE TYPES OF DIES

By F. Sefton

One of the problems which confronts the die-maker when given a part to manufacture is what type of tool to make so that a low will do the work properly and get out the desired production. There is considerable latitude in this respect and it does not always pay to make the cheapest possible tool, more especially is this true where large production and accurate work is desired.

The purpose of this article is to show three different die constructions which may be used for producing the same piece, together with a brief description of some of the advantages or disadvantages of each type.

The part to be made is shown in the upper left hand corner of Fig. 1, and the die in question is for perforating the hole and blanking out the shape shown. The other two views in this illustration show the appearance of the stock as it comes from the three types of dies and reference to these will be made in connection with description.

The first die to be described, Fig. 2, which is also the simplest in construction, consists of a plain die block A with a stripper plate B. This die block is held in a standard die dish by the beveled surfaces X, the large punch C for cutting out the blank is held in a standard punch holder, while the small punch D is set into the large punch in the manner shown. In setting this punch in, it is simply driven into a hole in the flange of the large punch with a pin E through the shank to prevent it from being pulled out, while the large shoulder takes the thrust of cutting through the stock. This type of punch and die make a cheap construction when they can be made to do the work. In setting this up on the machine it is necessary to be careful and have the die line up exactly with the punch, otherwise the die or punch will be damaged as there is nothing to prevent the two cutting faces from coming in contact.

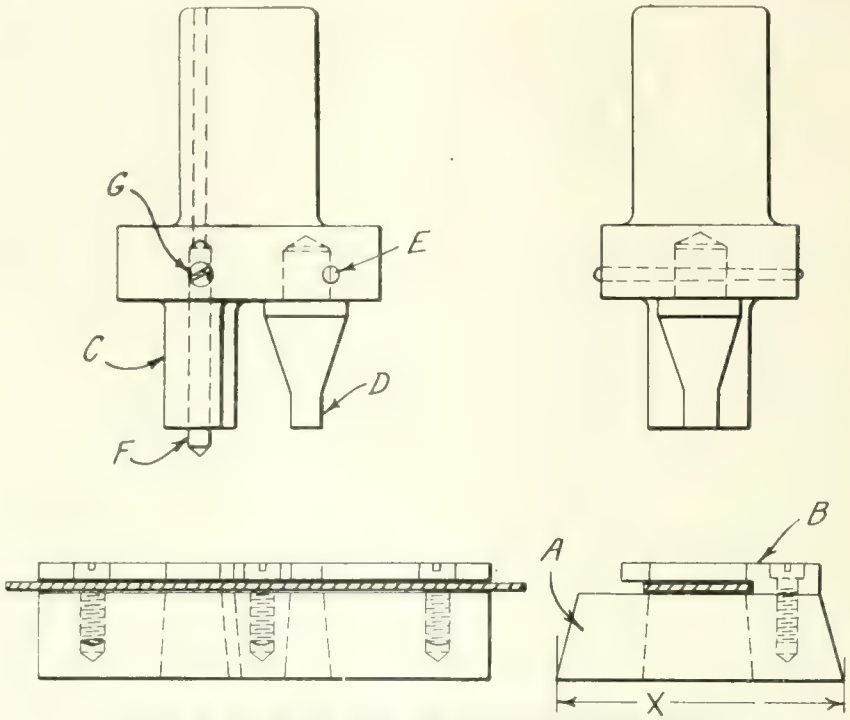
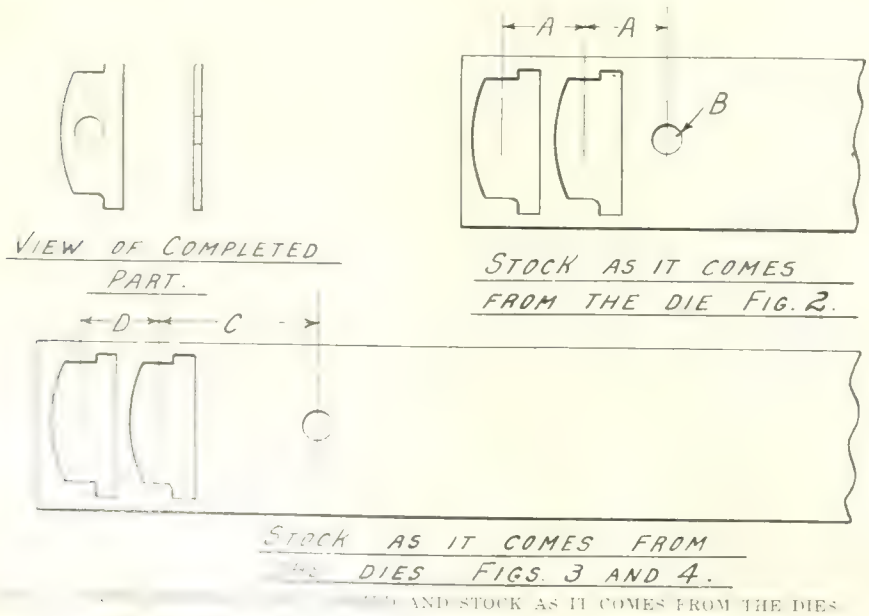



FIG. 2. PLAIN DIE FOR USE IN BEVELED DIE DISH.

The stripper plate on this tool at B is made open at the front and the stock is fed by hand and in so doing the operator must use care in handling the same to obtain perfect blanks. This die can be improved somewhat in regard to the last feature by putting a couple of pins at the open side to prevent the stock from coming out. When this is done a roll feed may be used which will facilitate the operation of the die and speed up the production.

It will be noticed that in the large punch a pilot pin F is used, the purpose of this being that it will enter the hole previously pierced and locate the stock for the blanking operation. This is held in place by the screw G and as the stock is fed through this die, it will appear as shown in the upper right hand corner of Fig. 1, and the distance A is equal to the distance necessary to make one blank. When the stock enters the die the first time the punch comes down it




AND STOCK AS IT COMES FROM THE DIES

simply perforates the hole B and as the punch comes up the stock is fed forward equal to the distance A again. When the punch comes down it of course perforates another hole and blanks one part; this is then continued successively for the entire length of the stock.

In the lower view of Fig. 1 it will be noticed that the distance between the hole and the first blank C is equal to twice the blanking width D. The object of this is to spread the holes in the die further apart and make it stronger as there will thus be more metal between the holes. This has been done in the remaining two dies to be described, and this view therefore represents the stock as it will come from them.

The tool shown in Fig. 3 consists of the punch holder A, a large punch B, a small punch C, and guide pin D. There is also a die E held on the die plate F and a stripper plate G, in addition to this finger stops and an automatic stop for convenience when feeding the stock are shown. When using this die the stock is fed through the stripper plate in the manner shown, the stripper plate having been cut out so as to hold it from getting out of line sideways. In handling the stock it is first fed until the end comes against the finger stop H and the first hole is pierced. It is next fed until the end comes against the finger stop I and the second hole is pierced, following this it is again fed until it comes against the automatic stop J. At this time a hole is pierced and the first blank is cut out of the stock. This die then operates automatically by using a roll or ratchet feed for the stock. The operation of the automatic stop on the die will be described in connection with the next tool as it is part of the die construction and is made slightly different in various tools depending on the nature of the work.

This die is rugged in construction and is a good producing die, being more economical with the stock than the one shown in Fig. 2, although somewhat more expensive to make. One difficulty met with in punch press work is the necessity for keeping the ram tight or free from side play, for unless this is done the punch will not come down in line with the die, also irregularities in stock will throw the punch out of line with the die, thus causing the same to become chipped. To overcome this difficulty a punch and die are often made with posts or guide rods as shown in Fig. 4. This die is considered first-class construction and contains all of the features of that shown in Fig. 3, with the addition of the guide rods and a die bushing for piercing the small hole.

The parts of this tool consist of a punch holder A, also a die holder B, two guide rods C hold the punch in line with the die, and these rods are provided with oil grooves. The punch holder and the die holder have a slot cut through them at D and E and the large punch F and the die G respectively are fitted into these slots; they are then held securely in place by screws and dowels, thus insuring that the location will be permanent on the holders. The small piercing punch H is driven in the large punch F, and this has a head on it at X so the same will not pull out should it get stuck in the stock.

The pilot pin I completes the punch construction. The die has a bushing J in it, this being ground in place when the face of the die is ground, and it may be removed and replaced should it become damaged as this small hole is considered the weakest part of the die. Two finger stops K and L are provided with this die, and these are held in place by the springs M, the springs in turn being held to the die by means of screws. The automatic stop N, with the tripping screw P and a post for holding the same Q complete the construction of this tool with the exception of a pivot pin R upon which the automatic stop swings and a spring S for operating the automatic stop.

The stock in this instance as in the preceding die is first fed against the finger stop K; this stop is pushed in by the finger of the operator, or better still by a suitable rod in the hand of the operator and the first [illegible]

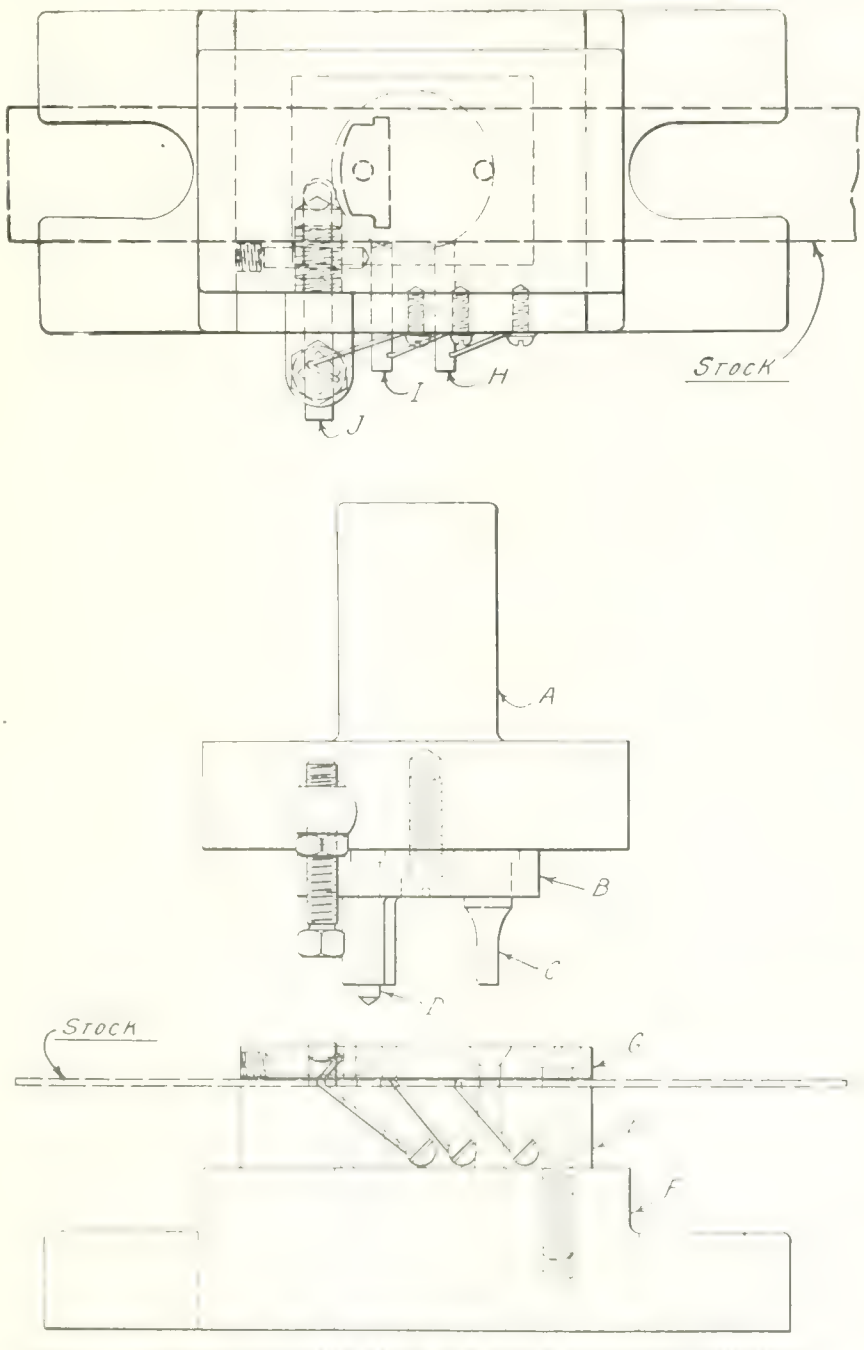
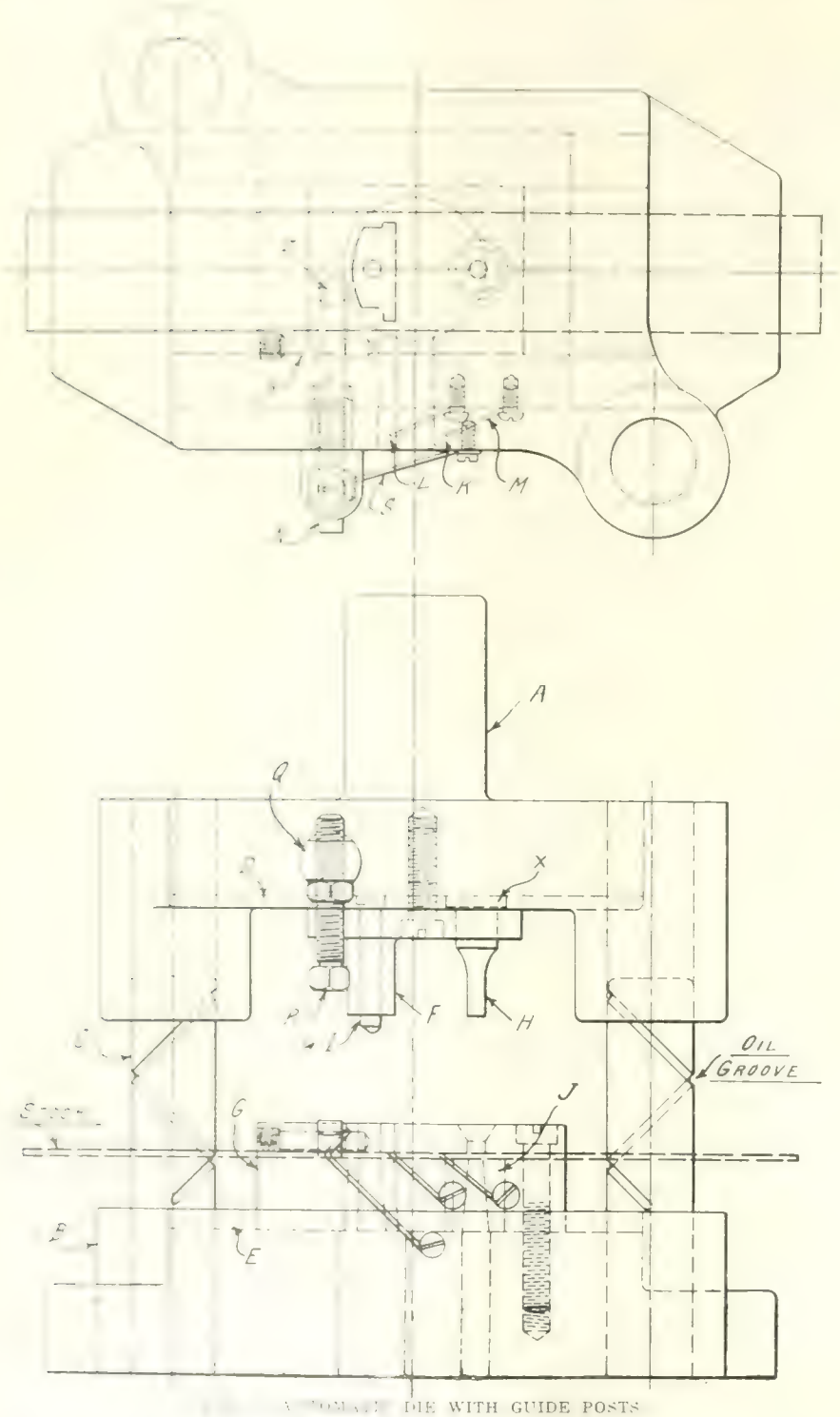



FIG. [illegible] AUTOMATIC DIE WITH FLAT DIE BLOCK AND PUNCH HOLDER

The operator then releases the stop and pushes the finger stop L in and pierces the second hole; he then releases the finger stop and the stock is fed against the automatic stop, where another hole is perforated and the first blank is cut. When, by throwing in the clutch on the press, this tool operates automatically as the automatic stop will drop into each hole in the stock made by the blank successively, thus locating the stock in the

through the perforated holes. The strip-

so that the punch goes up the automatic stop rests on top of the stock. When the automatic feed pushes the stock along, the stop drops into the hole left by the last blank and of course when the end of the hole comes against the stop the stock is thereby located so




AUTOMATIC DIE WITH GUIDE POSTS

In regard to the operation of the

the stud R the rounded end Z tips up out of the hole in the stop, when the

when the punch comes down the pilot pin I will enter a hole previously pierced. This operation is repeated automatically for the length of the stock, thus requiring little attention from the operator. The automatic stop shown in Fig. 4 is also operated in the same manner.

## MUST INCREASE EXPORTS

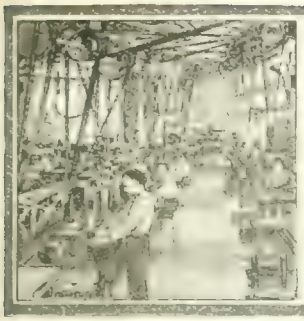
IN the face of the United States' enormous foreign trade credit balance it is evident that, owing to the inability of European Allies to liquidate their indebtedness for some years to come, the United States is facing a situation in which it will be compelled to increase exports to South American and non-belligerent countries, if the resources of the country are to be saved from excessive strain. Unless the situation is improved within the next three or four years, all the surplus of gold accumulated during the first three years of the war will be exhausted and the basis for the large credit operations in Europe seriously weakened.

This is the gist of a report by the National Foreign Trade Council. "So long as the war continues," reads the report, "the shipments to the European Allies and to Canada must be at least maintained at their present volume, and no increased imports of merchandise from Europe can be expected in payments. Such gold shipments as can be made will be a drop in the bucket (the United States having already more than 1-3 of the total visible gold supply of the world) and American securities which can be sent back from Europe to the United States are daily becoming scarcer. Hence, the conclusion is inevitable that the United States must from necessity export yearly on credit, pure and simple, merchandise to the value of at least $4,000,000,000, and this represents nearly two-thirds of the total exports."

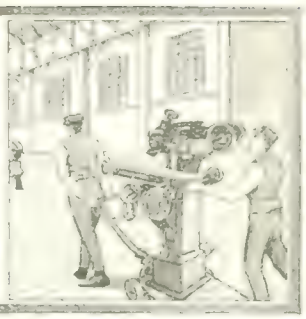
A clear idea of the situation is apparent from the following distribution of our imports and exports for the past calendar year, as regards the Allies and the South American and non-belligerent countries, leaving out, however, the European neutral and enemy countries (last three figures omitted):

| | Imports into U.S. From | Exports from U.S. To |
|---|---|---|
| Europe (Allies) | $ 445,415 | $3,732,836 |
| Canada | 413,674 | 829,972 |
| British and French Oceania | 36,128 | 78,563 |
| British Africa | 40,951 | 39,023 |
| Total | $ 936,288 | $4,680,394 |
| Peru-ma | 7,484 | 28,140 |
| Africa (Non-British) | 32,112 | 12,441 |
| Asia | 758,237 | 431,149 |
| Mexico and Cent. America | 161,575 | 135,177 |
| West Indies | 280,990 | 255,591 |
| South America | 598,818 | 312,420 |
| Philippines | 62,986 | 38,148 |
| Total | $1,894,118 | $1,184,926 |
| | $2,837,810 | $5,893,460 |

It is evident that the United States looks and must continue to look to the second group of countries, above referred to, as the only possible sources of supply for certain raw products absolutely needed for the manufacture of material which must be sent to Canada and to Europe, and food products must be imported on an enormous scale to take the place of those which must be sent out of the country.



# DEVELOPMENTS IN SHOP EQUIPMENT



*Makers of equipment and devices for use in machine shop and metal working plants should submit descriptions and illustrations to Editorial Department for review in this section.*

## CUTTING-OFF AND FACING MACHINE

The achievement of shell-making during the past three years has been due very largely to the success that has been attained through the adoption of the single purpose machine. Without this particular type of equipment it is doubtful if anything like present performance would have been possible. A design that has not been generally known to the trade, but one that has given exceptional satisfaction in the plant where it has been extensively used, is shown in the accompanying cut. This line of equipment, which covers a range of several designs for various operations, has many interesting features in its construction. The illustration herewith shows the type used for cutting-off and facing; either operation being performed by simply changing the tool post on the cross slide rest. These machines are fitted with a self-contained counter-shaft, the supports being firmly secured to the rear of the machine bed. From this counter-shaft to the main spindle is fitted a short length of chain belt, giving a direct but positive drive to the main spindle. This method of transmitting the power gives an exceptionally powerful drive, one that will stand up to any cut that can be placed upon the tool or the machine.

CUTTING OFF AND FACING MACHINE

The protection of the workman is amply provided for by the use of a suitable guard. Starting and stopping of the machine is obtained by the movement of a handle located just in front of the chain guard. Power feed is obtained by means of a belt connecting the main spindle with the feed shaft that is located in the front of the machine, the cross feed being derived by suitable bevel gearing. Contained in the main spindle is the pneumatic chuck for holding the work, the air being controlled by means of the small handle situated immediately above the main front bearing.

When used for cutting off the open end the machine is fitted with a special bracket extending out from the right hand end; this bracket carries the gaging rod that is operated by the toggle levers shown. This rod can be accurately adjusted to suit the length desired. Special provision is made for the automatic ejection of the shell after the operation has been completed and the air released. These machines are being manufactured by L. A. Desy, Montreal, P. Q.

## ANGLE BENDING MACHINES

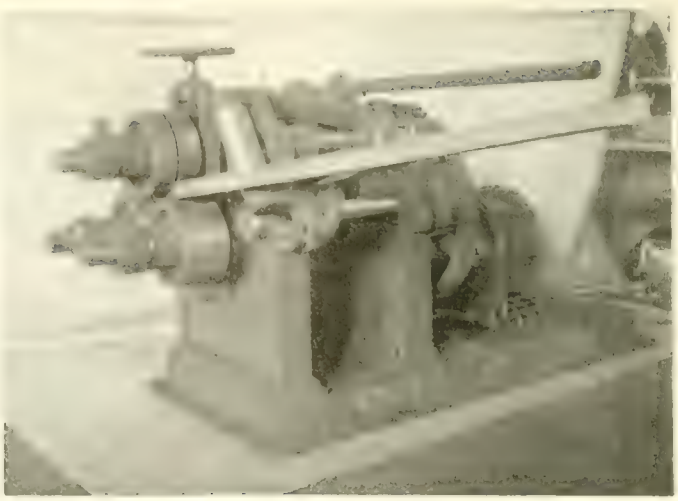
THE accompanying illustrations show several types of power bending machines developed by Kane & Roach, Syracuse, N.Y., for the bending of angles and other structural shapes.

In working out the design of these machines, the bending rolls were placed as close to the floor as possible in order to facilitate the placing of heavy work in the machine. These machines may be equipped for either individual motor or belt drive with reversing pulleys as shown in the illustrations. In cases where belt drive is employed the shifters are so constructed that the operator of the machine can manipulate either shifter to provide for running the machine forward or back, as required. In handling certain classes of work it is necessary to reverse the machine several times to provide for running the work back and forth, and in such cases a conveniently located operating lever is particularly important. It will be noticed that the bending rolls are almost in contact with each other, which results in several desirable features. In the first place, having the rolls close together practically avoids the flat or straight spot at either end of a piece that is being bent, this not only saving time in bending the ends of the work to the required curvature, but also saving material through avoiding the necessity of cropping off the extreme ends of the work which can not be bent to the desired form.

BENDING MACHINES FOR LIGHT ANGLES

Another advantage of having the rolls close together is that the material can be started into the roll to be bent without having to start the bend by hand. This is the means of making a very important reduction in the cost of bending work. A sliding gag under the adjusting screw provides for holding down the top roll, and this gag can be slid out from under

[illegible] ANGLE BENDING MACHINE



MOTOR DRIVEN ANGLE BENDING MACHINE SHOWING ANGLE IN ROLLS

to put work in the machine or take it out after a bend has been completed. With this arrangement the screw adjustment does not have to be altered. When one piece has been removed and another piece has been put into position on the lower rolls the upper roll is dropped into place and the gag slid back under the adjusting screw, after which the machine is ready to continue its operation.

Side rolls are provided at each side of the bending rolls, and these may be swiveled to any angle according to the radius of the curve to which work is being bent. These side rolls can also be adjusted in or out to meet the requirements of different classes of work. They effectually prevent side twisting or buckling of the work during the bending operation and enable the piece to come out perfectly true. The rolls are made of high carbon steel, and the outside sections slide in or out to provide for handling any width of work that comes within the capacity of the machine. The shafts carrying these rolls are exceedingly heavy, and all the front bearings that carry the roller shafts are bushed with bronze. The driving gears are made of steel with cut teeth. With the exception of differences in size the design of all three of these machines is the same. Each machine is provided with a scale and pointer to show just where to set the rolls for bending work to any desired radius of curvature, which is an important feature in simplifying the setting of the machine for any given job.

All three rolls are positively driven by means of gears, thus avoiding any slip.

On the No. 14 angle bending machine light angles up to 2½ in. x 2½ in. x ¼ in. can be bent. To provide for bending larger angles, the manufacturers have brought out a heavy-duty machine that is built in three sizes. The No. 22 machines handles angle irons up to 3 in. x 3 in. x ⅜ in.; the No. 23 machine handles work up to 4 in. x 4 in. x ½ in.; and the No. 26 machine handles work up to 6 in. x 6 in. x ⅝ in. In addition to bending angles, these machines can be employed for bending equivalent sizes of I-beams, channels, T-irons, rounds, squares, tubular stock, flat stock, and other shapes by simply making "filling in" collars or rolls to suit any particular kind of work. It is also possible to bend either one angle or two angles at a time, according to the quantity of work which is being handled.

EDGES FROM THE SHELL BASE.

## SHELL GAS CHECK PEINING MACHINE

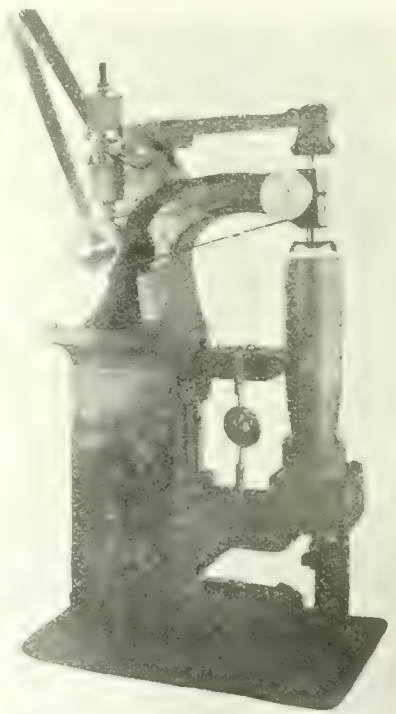
THE accompanying illustrations show two views of a new machine, manufactured by the High-Speed Hammer Co., Rochester, N.Y., which is especially adapted for caulking or peining the gas checks in the base of the 155 mm. shell

After placing a shell in the machine the combination burring and crimping tool as shown in photo No. 1 is applied. One or two revolutions of this tool (which is revolved by means of handles) under slight pressure will remove any burrs or sharp edges from the angular groove in base of the shell. If these are not removed there is danger that the gas check may be cut through during the peining operation.

The copper gas check is placed in position and the crimping operation is accomplished by a half turn. The burring and crimping tool is now removed.

With the gas check in place the lead wire gasket is inserted and the machine as shown in photo No. 2 is started by foot treadle. Controlled elastic blows, at the rate of 900 per minute are struck, and the pein slowly revolves, thus caulking the lead firmly into the angular groove, and also caulking the lead to conform to angle required.

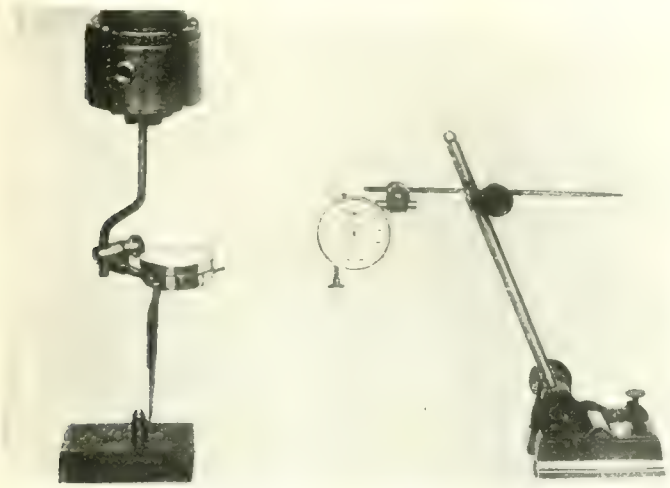
The operation is completed in less than 30 seconds.



[illegible] SHELL IN POSITION READY FOR CAULKING.

## DIAL INDICATOR

A dial indicator with a wide range of adaptability has recently been developed by B. L. Gates, 125 South Wells St., Chicago. The accompanying illustrations show some of the uses of this indicator



SOME USES OF A DIAL INDICATOR

and illustrate the way in which it may be attached to the ordinary tools and instruments of everyday use.

The connections are universal and can be placed in any position. The bent connecting rod is advantageous, making heavy and cumbersome connections unnecessary.

In measuring the plunger is brought down until the hand indicates .003 or more, it being easier to calculate the measurements from a reading than to bring the initial reading to zero.

The indicator measures by 1,000ths of an inch to .130, and by attaching it to a height gauge or by the use of blocks any distance can be measured. The dial indicator may be used on vertical milling machines, horizontal or vertical boring machines and is always in such a position that the dial can be seen. The workman is not obliged to walk around a machine to true up a job.

An extension is provided for machine work where the job or some part of it is to be made central. This extension will enter a very small hole and will reach the depth of 3 inches.

## METAL CUTTING BAND SAW

THE band saw machine illustrated herewith is a recent product of the Napier Saw Works, Springfield, Mass., and is adapted to the rapid cutting of soft steel, tool steel and soft metals of all kinds.

A gravity feed operated by the balanced weight of the tilting head is used. A spring at the back of the machine is in such a position and of such tension that the feeding weight is constant from the start to the finish of any cut which can be made on the machine.

The base is of cabinet type with lubricating tank enclosed. All bearings are extra large. The bearings in the clutch pulley, and in the driving and idle wheels, which carry the tension of the saw, are heavy and rigid.

The cutting band is lower than the returning band thus making it possible to cut off any length required. The cutting band is supported by truss arms, each carrying a pair of guides specially designed.

By means of the roll guides the band saw is directed so that its travel between the truss arms is absolutely vertical, thus assuring straight cutting. These guides once set are in perfect adjustment for any saw which may be placed on the machine. This is a feature not found on any other machine.

A rotary pump of simple design provides amply cutting compound for the saw. The teeth of the band saw are downward in the cut which insures that the cutting compound flows at once to the point of the saw tooth where it is needed.

The manufacturers recommend a saw speed of 120 lin. ft. per min. for soft steel, 100 lin. ft. per min. for tool steel and 150 lin. ft. per min. for soft metals. A one-horsepower motor is required for the operation of the saw which occupies a floor space 4 ft. x 6 ft.

## STEEL TRADE MEETS DEMAND

REMARKABLE expansion in the steel output of Great Britain has been an outstanding feature of the war. The production has grown so that now it is 50 per cent. greater than it was before the war started. The following comment from the London *Iron and Coal Trades Review* explains this unusual growth:

"The work of extending existing plants and of putting down steel works has proceeded very satisfactorily during 1917, notwithstanding the obvious difficulties occasioned by the state of war. Several entirely new undertakings are now in active, though not yet in the fullest, operation, and a number of others will be ready early this year. The output of acid and basic steel (excluding steel castings and crucible steel) in the United Kingdom in 1914 was not more than about 7,800,000 tons. In 1916, including steel castings, it had been brought up to about 9,200,000 tons. During the year just ended, taking account of the extensions in hand, it has been increased to 10,500,000 or 11,000,000 tons. This is a remarkable achievement, but when all the new plants are completed the annual production should not be less than about 12,000,000 tons. Government control during 1917 has not only been maintained, but intensified, for practically the whole production has been required, directly and indirectly, for purposes of the war. All engaged have worked with felicitous harmony and goodwill, anxious only to forward the great cause in which they are privileged to play so important and, indeed, vital, part."

[illegible] A BAND SAW FOR CUTTING METAL

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H. T. HUNTER, Vice-President

# CANADIAN MACHINERY
## AND MANUFACTURING NEWS

A. R. KENNEDY, Asst. Editor

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W. F. SUTHERLAND

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### WAR TIME PERSPECTIVE

THE relative importance of different lines of activity becomes more apparent as conditions become more serious. Human endeavor must be directed in whatever direction is most necessary.

The activities of the Food Controller indicate that fighting is the prime necessity, with food a good second. The food, however, is being watched in view of military requirements and not because of philanthropic considerations for the general public.

Confirmatory evidence of this feature of national policy is an agreement just arrived at by American steel makers regarding the disposal of commercial steel as distinct from straight war work. Priority is given to steel involving oil development and transportation, followed by steel involved in agriculture.

These two considerations indicate the true perspective which is gradually becoming more apparent. Oil development is necessary for fuel, because without fuel there would be very restricted transportation, as well as much less efficient operation of naval forces. Smoke barrage at sea is a development rendered possible by the close control of combustion obtainable with oil fuel when burned under boilers. When used in internal combustion engines, oil fuel becomes the most efficient method of power generation from heat.

Recognition of the demands of agriculture is evidenced by the second consideration. Tractor importation and manufacture should be pushed to the limit for the immediate future. Tractors take time to make, material takes time to get, crops take time to grow; a tractor on the farm this season will be worth ten in the maker's catalog next spring.

Apart altogether from the political aspect, the expediency of remitting the duty on tractor material is evident to all. The relatively small amount of revenue lost thereby to the country would be a small price to pay in order to insure the possible maximum production, this season and next. The partial disintegration of shop organizations manufacturing plans in this case have a direct detrimental affect on the trade balance, and in addition to military reasons, future economic considerations render the development of the tractor and allied industries most essential.

Importation is necessary for the present, but manufacture should be kept in a healthy state to assure independence in the future.

### GRAFT, TREACHERY AND INEFFICIENCY

THE occurrence of charges, baseless or otherwise, seems at some time or another to be part of the lot of every warring nation.

Whether, if the events of the past four years were to happen again, and taking into account the changed condition of the national mind, such incidents would reoccur, is not of present importance. The point is that no matter how high the ideals and good the intentions of a belligerent in the national sense there is always opportunity for graft if some one wishes to practise it.

The most dangerous form of graft is that which originates from enemy sources. It is not so concerned with actual money losses which it can cause the Allies but more with retardation of production and inefficient material. It seems as if the distorted Hun intellect was designed to fit the requirements of predestined iniquity and specialize in the devious ways of the devil.

When gas masks and aeroplanes are tampered with not only is danger and death brought to the forces but untold anguish caused to non-combatant friends and relatives as well as anxiety to officials.

Charges of a serious nature have been made in Washington by Gutzom Borglum and an investigation ordered by President Wilson. Pro-German influence is hinted at and a general cleaning up of the whole aircraft position seems imminent. The day when military considerations rendered secrecy in this respect vital would seem to be approaching an end. If production is good and at a rate sufficient to influence results soon, the German nation which is now at the extreme peak of production will be more likely to be discouraged if it were made aware of actual facts.

On the other hand, if production has been seriously handicapped an exposure of the methods would strengthen home public opinion and put many additional individuals on the qui vive for what is nothing less than treachery.

Inefficiency is not such a vital factor as the two foregoing as its effects are closely circumscribed by inspection methods. Any weakness in this respect is more likely to react on the producer as witnessed by a recent incident where a plant was closed down because of the misdirected energies of a subordinate who wished to reduce the cost of machining by performing an additional operation on the shell blanks.

Had the matter been discussed with government officials first, a clear understanding would have been arrived at, but the fact that they and the firm also were unaware was sufficient grounds for the authorities to refuse to run the risk of further digression from specification, however unintentional and harmless, etc.

### INCREASE PRODUCTION AND REDUCE CONSUMPTION

EVIDENCE regarding the ever-increasing necessity for greater effort and denial on the part of every subject of the allied nations continues to accumulate. The calling to the colors unconditionally of men between 20 and 23 years of age and the registration of men 19 years old has impressed both the public and manufacturers with the importance of man-power.

Government distribution of tractors has given further impetus to the greater production campaign while the activities of food and fuel controllers serve to remind us that the increased production is for others, not for us.

The cumulative effects of the war are destined to become more apparent this year than last. The loss of 250,000 effectives from the combatant strength of the British army means that some other strata of national life and activity must suffer so that the effects of the loss may be counteracted.

Increased use of mechanical appliances in the army and the further drain on British manhood by the fifty-year limit are two ominous factors whose influence on Canadian industrial activity may soon become apparent.

Every ton of steel produced in the United States which can be utilized by the Government and its Allies will be made available for their use. Following a meeting in New York recently between the Director of Steel Supplies and about fifty steel manufacturers, Judge Gary, as president of the American Iron and Steel Institute, requested that each manufacturer sign a pledge to do his utmost.

Authorities state that at the beginning of April the general outlook was that there would be an ample supply of steel for war purposes with a sufficiency for commercial use, but developments since, both military and otherwise, have reversed such a prospect.

# MUST LIKE YOUR WORK TO GET BEST RESULTS

**Enoch Cronk Has Been With The A. R. Williams In Various Capacities For Almost 36 Years**

IF a person were to ask Enoch Cronk point blank to name his "official capacity" with the A. R. Williams Machinery Co., we doubt if he could do it in one or two words. The chances are he would have to use from a half dozen up. He's not a highly trained mechanical expert, never served an apprenticeship in a machine shop, never studied law nor did he ever have a special course

ENOCH CRONK

in the fine but delicate art of repossessing machinery when the ownership of it becomes a disputed point.

But Mr. Cronk knows a good deal about machinery, has a pretty clear idea of what a man requires in the way of equipment for a stated performance, knows absolutely and without apology enough fine points in law to hang up his shingle, and when it comes to the matter of leading a sawmill plant back to the company yards, and still live on good terms with the people who fail to observe agreements—well, Enoch Cronk is right in his element.

Mr. Cronk didn't exactly tell his story for publication, but it's going to be published. In fact, during a conversation CANADIAN MACHINERY had with him he kept up a barrage fire of warning that he wasn't speaking for print. However, we'll fight that out with him later on.

### Came From the Farm

"I don't know the machinery trade," said Mr. Cronk, "that is I never served an apprenticeship at it. But I have been around here for thirty-four years with the A. R. Williams Co. In that time I've been in charge of the supply department, shipping department, and acted as salesman, looked after collections and the taking back of plants when payments have dropped."

In answer to a query as to what he did before coming to Toronto, Mr. Cronk remarked: "I was a farmer, a plain, hand-working and hard-luck farmer. I had a place in Prince Edward County. I was burned out once, and not long after the same thing happened again. That settled it for me. A few days after I told my wife 'I've ploughed my last furrow.' I meant it and I lived up to it. I came to Toronto and got a place with the late Mr. Williams. I told him then I would try it for a month and see if I'd stay on. I remember quite well that I told him if I didn't love my labor I would not stay. No man can do his best if he doesn't like what he's working at. Well," continued Mr. Cronk, "that was just about thirty-six years ago, so you see I stayed a little longer than the month I started on. I've been here ever since. I like it and I'm going to stay as long as my working days last."

### Lots of Hard Work, Too

Mr. Cronk returned a few weeks ago from taking out a sawmill plant near Monteith, in Northern Ontario. Rather a strenuous piece of work for a man 76 years of age. He doesn't look it. The CANADIAN MACHINERY man guessed him at 65, but Mr. Cronk was willing to have us add ten and a little more. The mill up north went through the fire. The Monteith Pulp & Paper Co. took up property a little piece off and started to develop water power, flooding the old mill property. "It was only about ten feet to the Driftwood river," stated Mr. Cronk, "but there was a bad bank and about fourteen feet up on the other side. The river was about thirty feet over, deep and fast. And remember that in a place like that we haven't got all the equipment under the sun to work with. A jack screw, stumping machine, some good horses, that's the outfit. We had a hard job getting a crossing built for the river. We had to have tree trunks that would be of such size as to take the load evenly or else we'd have it dumped in the river. We had a boiler and engine and the mill machinery—I suppose five or six tons in all. Snow? They wanted us to take the regular road for it. I didn't. If I had we'd been there yet. We dug out a new road where the snow hadn't been over four feet. On that old road there were places where it was a good twenty feet deep. Well, we finally did the trick, put it down the bank, over the river and up the other side and on the Monteith station."

### One Wanted to Use a Gun

"Don't you get rough usage at times, especially when you go to repossess plants?" queried the reporter.

"Well," laughed Mr. Cronk, "that all depends on how you go about it. One man used a gun on us once. A few weeks later he bought my dinner. I don't go looking for trouble. It doesn't pay. The man with the gun was up near Bala. That was some years ago. I went in and took possession, and stayed right in his camp. I could see that he was simply trying to bluff me. I remained six days. At last I took my watch out and put it up to him to

IN THE NORTH COUNTRY

# MARKET DEVELOPMENTS

# U.S. War Business Being Placed in Canada--Non-War Work Receives Scant Consideration

## The War-Grip Takes Entire Output of U.S. Pig Iron and Steel for 60 Days—Canadians Cannot Import Now for Warehouse Purposes — New Plants to Handle U.S. Orders Being Placed in Canadian Centres

THE war grip is felt to-day as it has never been felt before. The steel industry of Canada has already felt the action taken by the United States War Board in getting the Iron and Steel Institute to pledge its output at full speed for sixty days to war work. It means closer buying by Canadian jobbers. Orders will have to be placed for actual needs and import purchasing for warehouse purposes is now out of the question.

American war business is coming to Canada. The 155-mm. contracts have been placed in some cases, while others are pending. United States business coming to this side of the border will also include the 9.2 shell, one Toronto firm expecting to turn to this on completion of its 6-in. orders about the end of June. Machine tools and supplies are in big demand in consequence. High speed steel has already felt the trend and advances in cutters and drills are noted. In fact the high speed product requires very little urging to reach higher levels as the supply is never equal to the tremendous war-time demand.

The scarcity of small size boiler tubes is not relieved. There is a scarcity—a decided one—of skelp, and as long as the open-hearth output is insufficient to overcome this the scarcity will continue to be acute.

Evidence is not wanting that United States means what it says regarding giving preference to war orders. The American War Board this week entered the premises of a non-war manufacturer, took 8,000 tons of pig iron and transferred it to a war work plant.

Scrap material is strong, although the prices have not advanced. As giving an idea of the volume of business being done now in this market one Toronto firm, dealing in scrap metals, is about concluding an agreement with a munition firm for their cuttings for three months, the amount involved being not far from $200,000.

## MONTREAL FIRMS PREPARING TO HANDLE MORE AMERICAN ORDERS

Special to CANADIAN MACHINERY.

MONTREAL, Que., May 8.—Local industrial activity has been stimulated by the announcement that in all probability more American shell orders will be placed with Canadian firms. It seems unlikely that any 12-inch shells will be placed here, as the firm that was supposed to have received an order for this size will not proceed with this work owing to certain unfavorable conditions. Considerable activity is displayed in local machine circles and several plants here are busy constructing tools of a special character for the making of the 155 M.M. shells. Shipbuilding is abnormally active, but firms report continued difficulty in the securing of materials, particularly in connection with steel plates. River navigation is now in full swing, and has given much relief to railroad transportation; upper lake traffic has suffered a slight inconvenience in the destruction of one of the lower locks in the Lachine Canal, the gates having been carried away by the loss of control of the collier Henry B. Hall on the last day of April. With the exception of a few of the larger vessels no serious delay was experienced, as the lighter craft were transferred through the northern section of the canal. Local plants requiring the services of skilled workmen are experiencing some difficulty owing to the pronounced shortage. A maker of machine tools and gears reported to CANADIAN MACHINERY that it was almost impossible to secure men adapted for their work owing to the heavy demand in the munition plants.

### Steel

Canadian conditions in the steel activity, particularly in connection with the consumption, are becoming more and more acute owing to the conditions that prevail in the industry across the line. The difficulty of obtaining steel from points in the States increases as the demand of the American Government for urgent war requirements continues to grow; the needs at the present time are so abnormal that little material is now available for ordinary purposes. This condition is naturally reflected throughout Canada owing to the dependence of Canadian consumers on the production in the States. All the mills in this country are operating to the full extent of their capacity, but the output is more along the lines of lighter shapes and plates and steel for shell-making purposes. The bulk of the material that is required in the construction of the steel vessels must be obtained from the mills in the States. Dealers here are apparently not enthusiastic regarding the early future. The unsettled condition has had the tendency to create a nominal market and quotations remain unchanged and very firm.

### High Speed Steel

The present demand for high speed steel is just about normal, but manufacturers and dealers are anticipating further activity in the near future or as soon as the experimental stage of the new shell developments have advanced far enough for manufacturers to decide definitely as to the tooling operations. Shell makers are still in the market for considerable quantities of high speed tool steels, and the price is still around the average of $2.25 per lb.

### Metals

Meta's generally are developing strength and the demand is apparently increasing in volume. Better transportation has resulted in increased produc-

tion and delivery to consumers is more regular in character. Copper is steady, with the possibility of a revision in the fixed price. Tin is very strong and also uncertain owing to non-delivery of expected supplies. Spelter is developing strength. Lead has a weaker tendency. Antimony is in good demand and has a better undertone. Aluminum is firm and unchanged.

**Copper.**—Activity is normal, with prices firm. The situation in the States is without feature, although the trade is anticipating a slight advance on the first ensuing month when any contemplated change will go into effect. Just what action the Government will take is not yet known, but it is not unlikely that a concession of about 2c may be allowed to producers to meet the increased cost that has developed since the fixing of the initial price. The situation here is not marked by any special feature, and dealers continue to quote last week's prices—29c and 30c per lb.

**Tin.**—Uncertainty is the dominating feature in the tin situation, and it is this factor that is tending to place this metal in a relatively impossible position. The indefinite delivery of tin from England has placed the dealers here in a difficult position, as they are unable to establish a basis for their operations. Dealers' supplies here are gradually being reduced, and sales are made only to those in urgent need, and at present prices it might be said that little buying is done unless the requirements are absolutely essential. The rapid advance on the London market has been reflected on this side; no quotations are obtainable on the New York market, and dealers here have advanced their quotations to $1.25 per lb., this being an advance over last week's price of 15c per lb.

**Spelter.**—While the demand has not been pronounced, the market has a strong undertone and the tendency is upward. Dealers here report a very good market, and are inclined to think that an advance may be anticipated. Quotations are firm at 10c per lb.

**Lead.**—This metal is not active, and the outlook is for easier prices. Local quotations are firm at 9½c per lb.

**Antimony.**—The market is taking on a firmer tone, due to the better demand. The New York market has advanced ⅜c over the week, but local dealers are holding firm on the quotation of 15c per lb., reporting a stronger situation.

**Aluminum.**—The market is quiet and with a weaker tendency; local quotations are unchanged at 50c per lb.

### Machine Tools and Supplies

The activity in the demand for machine tools has shown an increase owing to the placing of additional orders for American shells. Some weeks ago it was anticipated that contracts would be placed in Canada for 12-inch shells, but owing to the difficulty regarding the supplying of forgings this class of shell has apparently been withdrawn as a possible Canadian product. Several Canadian plants are, however, preparing to start operations on the 9.2-inch for the American Government and renewals for 4.5-inch have been placed in comparatively large quantities; in addition to these contracts have been let for 155 M.M. shells, and the demand for suitable equipment has been quite brisk. One Montreal firm are busily engaged fitting out for the manufacture of these shells and have recently contracted for about 80 Desy turning lathes of special design. Dealers here report that the demand for machine tools is quite normal, and inquiries for medium heavy shell equipment during the past week have been above the average. General service tools are in fair demand, and the requirements for small supplies are still of considerable volume; transportation has been improved, but definite delivery is not yet a pronounced factor, and manufacturers are still handicapped from shortage of certain supplies.

### Scrap

Nothing of importance has developed in the market on old materials and business in general has been quiet. Dealers report that sales have been light, and consumers are apparently buying only what they require for immediate needs. The better conditions that have recently been granted to dealers in American markets has created renewed interest over there, but so far this tendency has not been shown in the Canadian situation. Business is normal in heavy melting steel scrap, and brass scraps are in good demand, but the general market is quiet. Quotations are unchanged and firm.

## POINTS IN WEEK'S MARKETING NOTES

**U. S. War Board took 8,000 tons of pig iron from non-war plant and shipped it to war work plant.**

**Pleasure autos are placed by U. S. in the non-war class.**

**War account orders placed by U. S. Government are running ahead of deliveries.**

**"Commercial Steel" orders getting a preference will include (1) orders for oil development and transportation, and (2) steel involved in agriculture.**

**U. S. business men aroused by report that Ontario Hydro-Electric energy is drawing U. S. firms to locate in this province.**

**Cars leaving U. S. points for Canada must be loaded to capacity.**

**Steel and pig iron supply of United States commandeered by the government, but Canadian war business will be protected, although non-war orders will be harder hit.**

**Advances in high-speed goods are again noted. Some of the cutters and drills go from list plus 40 to 60 on.**

**American orders for munitions are coming to Canada. Toronto plants now are preparing for the 155 mm., while one concern will change over from 6 inch to U. S. 9.2 about the end of June.**

**Canadian users of plate have been notified that they cannot purchase for warehouse purposes. The process from rollers to finished article must be made more direct.**

**Scrap metal prices, although not changed yet show a tendency to go to higher levels in some lines.**

**Steel plate prices are likely to revert to former high marks although Toronto lists are unchanged yet.**

**Boiler tubes are scarce and the situation is not improving. This is true especially of small sizes. The scarcity of skelp is given as the cause.**

## MUNITIONS ORDERS ARE COMING THROUGH

**The 155 M.M. Will be First Start, to be Followed by the 9.2 Order**

TORONTO.—The steady trend of prices that has been current for the past few weeks in the local market shows signs of breaking, and it begins to look as though the break were going to be on the upward plane. High speed goods in some lines go from 40 to 60 per cent. on list figures. Jobbers in steel plate say that although they have not advanced prices so far, they are about to do so. It was only a month ago that plate dropped from the ten-dollar mark to the nine (per hundred). It looks as though this figure would be of rather short duration, and although it is much higher than the fixed price quoted in the United States, the tendency is that the ten-dollar mark would be restored in a few days.

Dealers in scrap metals are in the same position. Local figures have not been advanced, but the tendency is towards higher price. The action of the American Government in making a demand for all material for war work for sixty days is, the dealers state, going to make a bigger demand for heavy melting steel and for its counterpart in scrap metals.

The munitions business keeps up a brisk demand in the machine tool and supply business. Orders for the 155 m.m. shell are being placed, and a new plant is being erected for one Toronto firm to do this class of work. Other plants that have been handling six-inch work are turning over to this business, for the 155 m.m. is in reality a slightly changed form of the six-inch, orders for which have formed the backbone of the muni-

time

### Steel May Go Up

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The Canadian dealers have been informed by
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tion means that there is no chance now of passing any of this material into stock, as the situation is so imperative that it is necessary that all this material should pass into actual war construction as soon as possible after leaving the rollers. The effect of this is that the dealers are going to conserve the stock they have on hand by increasing the prices. Buying will be more limited than formerly, and every effort will be made to see the motive prompting the latest decree from the War Board is carried in practice. Boiler makers will also find that they must carry on their business on a more hand to mouth scale than ever, and their purchases will have to be made largely for the special jobs that they have in hand. It may make work a little slower, as it will be impossible to keep stocks on hand in anticipation of orders that might be legitimately expected to come in.

The supply of tubes, especially for the smaller sizes, around two inches, does not improve, and prospects are not good for any betterment in this direction. The four-inch shipments are coming in a little better, some cars of these having reached Toronto to-day. The scarcity of small tubes can probably go right back and be blamed on the shortage of all material that passes through the open hearth furnaces. Just now there is a very de-
situation is bad in consequence. Boat owners are in a better position than might be imagined, as they anticipated the situation and made their purchases for winter repairs in good season.

### Scrap Metals

Dealers are not anxious to take on much business just now until they are a little more certain of the future prices. In common with other products, the scrap metal stock is coming to the point where higher values are in sight. One dealer said to MACHINERY this morning, "We are paying more for scrap metals in
than they would sell for in the United States centres." He produced correspondence to prove his point, and had he sold at the prices offered in Boston he would have lost by the transaction. This same dealer intimated that a contract was in the making whereby his firm would take in cuttings from a munition plant that would run into figures from $150,000 to $200,000 in a period of three months, giving some idea of the extent of the trade in this direction. Some copper and brass in the way of scrap metal crosses the border, this being possible under license only. Other lines are barred by the Canadian embargo. The dealers anticipate the next move will bring higher figures, anticipating a demand for heavy melting steel, although there is the fixed value of $24, past which the price cannot go. The action of the United States Government in using all the mill output for sixty days will mean increases in the scrap trade, at least that is the interpretation of the dealers.

### Machine Tools and Supplies

High speed goods are quoted up again, the incessant demand for war machinery being undoubtedly the cause. Brown & Sharpe cutters have been 40 on the list price, but to-day the price is given out as plus 60. Drills are up aagin, and the double list is used to indicate their price. The placing of American munitions orders in Canada keeps the supply houses busy. The business offering now consists largely in the 155 m.m. on American orders, and at least one plant in Toronto is being fitted out for this business. American business is desirable now, highly so, as every dollar of this sort helps to correct the balance of trade which has come to the point where it is a matter of serious inconvenience.

One Toronto firm that has had a very large and successful run on the 6-inch business, is making preparations now to turn over to American business, the 9.2 being the size they will turn out.

### Metals

Prices of non-ferrous metals, locally, are holding firm, but tin is the only one that has advanced. The tin situation continues acute with no relief in sight. A meeting was held in Washington last week to consider the question of raising the prices of copper, but no decision was arrived at. In the meantime the market is steady and firm. Lead, spelter, antimony and aluminum are steady and unchanged. Business locally continues brisk.

**Copper.**—The War Industries Board and the copper interests met in conference in Washington last Thursday but adjourned until May 22 without arriving at any decision in regard to revising the fixed price of copper. It it understood that an increase from 23½c to 24½c a pound will be asked, the advance to be used chiefly to offset the higher refinery costs. Consumers are reported to be well covered by contract and apparently there is no shortage of metal for any purpose. Lake and electrolytic are quoted at 28½c and casting at 28c per pound.

**Tin.**—The tin situation is unchanged and the shortage continues acute. There is no spot metal for any grade for sale and only Chinese tin apparently can now be purchased for future shipment from the Far East. Tin has again advanced locally and is now quoted at $1.15 per pound or 10c higher than last week.

**Spelter.**—The market is firmer, due to a report that the U. S. Government has purchased a large quantity of high grade spelter, 9,000 tons it is said, at around 10c, St. Louis basis. Prime Western spelter continues quiet and the market featureless. The local price of spelter is unchanged at 9½c per pound.

**Lead.**—The primary market is easier and lower prices are anticipated. The weakness in the market is attributed to an increase in Mexican production and lack of buying for domestic account, the latter being probably due to the expectation that the market will go lower. In the meantime local price of lead is unchanged at 8½c per pound.

**Antimony.**—The demand is more active and firmer again. It is understood that the U. S. Government has asked bids on 1,000 tons of antimony for May-June delivery. Prices here are firm and unchanged at 16c per pound.

**Aluminum.** — The market continues steady. Practically all the aluminum output is being taken by the U. S. Government at the fixed price of 32c for 98 to 99 per cent., in 50 ton lots: Local price 50c per pound.

# THERE'S ALWAYS A NEW CROP COMING ON TO FALL FOR THE SHOP JOKES

On being made acquainted with some of the difficulties that superintendents and foremen are experiencing at present, in training some of the new men in their employ, for better efficiency, the writer was reminded of an incident that happened in a large plant in central Ontario some years ago, where a young fellow (green) was engaged to work in a repair gang, the duties of which took them to all portions of the plant. On the afternoon of the first day some of the other men, wishing to have some fun with the new recruit, advised him he would require to obtain a set of calipers for certain work he would be called upon to do. Asking where he could secure these, he was instructed to apply to the blacksmith, who would willingly make a pair for him. The smith, being an obliging fellow, and one of those who appreciated a joke, asked the young chap what kind of caliper he desired, inside or outside. Said the young man, "Well, just now I am working in the shop and will need an inside pair, but I will be working in the yard to-morrow and then I will require an outside pair." The smith had considerable difficulty in suppressing his amusement but advised the fellow that he would do his best to make him the tools. The outside job, however, did not require the services of the outside calipers.

# CANADIAN WANTS WILL BE PROTECTED

**United States Order Means All Energy Must Go to War Work at Once**

Special to CANADIAN MACHINERY.

WASHINGTON, May 8.—The entire steel and pig iron supply of the United States has been virtually commandeered by the Government, for war purposes. This action taken by the War Industries Board has just become known here. All steel supplies not used for war purposes will be distributed to the non-war industries through the War Industries Board. This action is taken with the consent of the steel manufacturers.

J. Leonard Replogle, director of steel for the War Industries Board, this week held a meeting with the large steel producers when they gave their promise to devote their entire capacity to producing steel for war purposes. The War Industries Board is given the right to direct the shipment of completed steel, and the entire steel supply of the nation will be disposed of as the War Industries Board sees fit. The first example of the working of the new plan came on Friday when eight thousand tons of pig iron were taken from one steel mill which has been furnishing supplies for non-war work and shipped to a plant where war work is being done.

Pleasure automobiles have been placed in the class of non-war work and already there has been a curtailment of steel for this purpose.

### To Protect Canada

Supplies of steel for Canadian war work will be insured. The War Industries Board, working in co-operation with the Canadian War Mission and other Canadian official bodies, will work in close co-operation so that there will be no restriction on the supplying of steel and pig iron for those Canadian industries engaged in war work. Non-war industries in Canada will be placed on the same basis as the non-war industries of the United States.

Congress is awakened to the need for water power legislation which will enable the development of America's greatest water power resources. This sudden impetus has been given to Congress by statements made on the floor by Senator Jones of Washington and others to the effect that American industries, lacking power, are moving their businesses to Canada. Sir Adam Beck of the Hydro-Electric Commission of the Province of Ontario, testified before a Congressional committee recently and described the impetus given to the industrial growth in Canada through the delivery of 315,000 Hydro-electric horsepower generated at Niagara Falls. He announced that further water power developments were to be undertaken that would increase the production of power in Ontario by 1921 to 750,000 horsepower.

### Sir Adam's Speech

Sir Adam Beck spoke as follows:—"I wish to tell you that we are now short in the Niagara district, in the Province of Ontario, at least 100,000 horsepower that is essential and necessary at this time, and largely for munition purposes. We have three large American plants on the Canadian side manufacturing explosives and essentials in the Carbide Company, the Electro-Metals Company, and the Cynamide Company and they use between them in the neighborhood of 75,000 horsepower. We have received repeated appeals from Washington to increase these quantities and we have done everything to curtail the use of power so that these large industries can keep their businesses going.

"Of course if we were as greedy as we might be—and I suppose we are human—we would not encourage in any way by an object lesson such as we have here to have you nationalize the water powers on the American side, because these large industries you have will be more likely to establish branch industries in the Province of Ontario to take care of their foreign trade, having labor conditions equally favorable and a much cheaper price of electricity and no fear of an increase in that price of electricity. We have a large industry now on the St. Lawrence in the British Chemical Company. It is American, however, entirely. They are establishing a large industry and only using 4,000, but want 8,000. They are quite safe in assuming that the price will not be raised and that they will not be deprived of that power."

### To Develop Power

This statement made by Sir Adam Beck has aroused Congress to action and it appears now that legislation will soon be passed to develop the waterpower resources on the American side of the St. Lawrence.

The Shipping Board has announced that thirty-four Great Lake steamers have this week been ordered removed to the Atlantic trade.

The report of the progress made in the construction of ships for the month of April as announced by the United States Shipping Board shows that during that month there was a construction of 236,000 deadweight tons. The best previous record for construction during one month was that of June of last year when there was a construction of 152,136 deadweight tons. The report shows that during the last week in April there was a construction of 41,105 deadweight tons of both steel and wooden vessels.

### Must Load to Capacity

The President has this week appointed the members of the War Finance Corporation who will have control of nearly five billions of dollars which is to be used for the aid of industries in the United States engaged in war work.

Orders have been issued by the Interstate Commerce Commission regarding the loading of cars for Canadian points. The regulations issued provide for capacity loading for all cars.

Manufacturers of all non-essential war industries are now being called to Washington to confer with the Fuel Administration regarding orders which are to be issued shortly regarding the curtailment of coal shipments to non-essential industries.

# LITTLE STEEL NOW FOR NON-WAR WORK

**Iron and Steel Makers Pledged to Devote Entire Plants to War Orders**

Special to CANADIAN MACHINERY.

NEW YORK, May 8th.—On Monday of this week every member of the Iron & Steel Institute received a circular letter from President Elbert H. Gary, in which was enclosed a pledge, acquainting them with the result of the meeting held April 26th between 50 of the principal steel manufacturing companies' representatives, and J. L. Replogle, director of

# DIRECT AND INDIRECT CONTRACTS CLOSELY RELATED IN THE WAR WORK

Appreciation of the fact that manufacturers who have direct war contracts are dependent to a very large extent upon those who have indirect contracts would save much time under pressing conditions, said a manufacturer to CANADIAN MACHINERY to-day. He has one of those so-called indirect contracts for the production of very essential parts, while another manufacturer has the master contract calling for the delivery of the completed work.

"It seems impossible to make department heads understand," said he, "that the whole job may be tied up if work on these secondary contracts is subjected to red tape methods. There seems to be a rule that materials must first go to direct contracts.

### Causes Much Delay

"This, in my opinion, has been the cause of much of the delay in the United States. Men who direct this work must realize that efficient production calls for co-operation in the industries affected, and that the main show cannot go ahead while certain necessary parts are held up. To illustrate: If a man gets a contract for wagons, he will not make very much progress if the man who supplies him with certain parts, patented or otherwise, is denied material. It is equally unreasonable if electric power is denied an indirect contract, while the main job may be waiting for parts. Too literal a construction is placed on the terms "direct" and "indirect" and too little thought given to conditions that impose inter-dependence.

"In Canada it is not so bad, and it is to be hoped that in U. S. the problem will be worked out along more practical lines than heretofore. It might be a good plan for the manufacturers themselves to take united action in presenting conditions before the proper people."

minutes of the meeting, held the preceding [illegible] by Judge Gary. Mr. Replogle's remarks brought out the [illegible] given in last week's letter to CANADIAN MACHINERY.

### They Have the Facts

Steel manufacturers, themselves, to within the last few days, have believed that the Government would call for 100 per cent. of the steel output for war purposes [illegible] but they are now aroused to the full magnitude of war requirements and the significance of the revelations made by the Director of Steel Supplies. Of course, some shipments of steel products previously rolled, will be made to consumers, but hereafter little or no steel will be available for [illegible] engaged in war work, except on special permit from the Government. War needs, according to Mr. Replogle, now actually in hand will absorb all rolled steel output for the next eight months.

### Very Large Figures

One of the surprising statements made by Mr. Replogle referred to the construction of military buildings and plans now under development which will call for structural steel exceeding by 20 per cent. the total steel used in building construction in the entire United States during 1915, 1916 and 1917. If this estimate is correct, Government structural requirements will amount to 3,200,000 tons approximately, but this probably covers structures which will be built in 1919 and 1920 as well as during the current year.

Orders for 100,000 freight cars, 70,000 of which were placed this week, will call for 1,000,000 tons of steel and the 1,300 locomotives which have been ordered or are pending will call for 260,000 tons of steel. Most of this tonnage was included in Mr. Replogle's total of approximately 20,000,000 tons.

### For Machine Tools

Government requirements of machine tools in the next few months will be enormous. It is estimated that purchases of necessary machinery mainly as a result of the contracts to be placed by the Ordnance Bureau of the War Department, will call for the expenditure of $80,000,000. In the last week the Navy Department has ordered $600,000 worth [illegible] orders for cranes. Contractors holding orders for military buildings have also inery which in the aggregate have called for the expenditure of upward of $800,000.

The Wright-Martin Aircraft Corp., New Brunswick, N.J., has finally distributed orders for 400 machine tools among dealers and manufacturers calling for the expenditure of $1,000,000. The Aircraft Corp, it is now understood will utilize the Government factory at Long Island City, formery owned by the General Vehicle Co., to manufacture a heavy type of Hispano-Suiza motors for the Government. The Savage Arms Corp. and several other gun makers in New England, are buying more machinery to rush production of machine guns. Many machinery shops having sub-contracts for gun parts, are also in the market for tools.

## THE WAR GRIP GETS THE STEEL OUTPUT

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., May 8. — The grip of the Government upon the steel supply has become complete. All producers have acceded to the demand of the authorities that every available ton of steel be shipped for account of the Government and its Allies. Following the meeting in New York, Friday, April 26, between J. Leonard Replogle, Director of Steel Supplies, and about fifty representative steel manufacturers, Judge Gary, as president of the American Iron and Steel Institute, sent a request to each manufacturer to do his utmost, and asked that a pledge to the effect be signed.

As illustrative of the situation, the Carnegie Steel Company last week made the statement that every ton of open-hearth ingots the company cast, except ingots rejected as not coming up to specifications, was being applied to orders of the Government and its Allies, and the rejections were very few. Apart from the rejected ingots there is left, of course, the crops from ingots intended for shell steel, such crops being available for rolling a limited tonnage of commercial steel, such as light rails, and in addition there is the production of Bessemer steel not taken up by war requirements. Only one-fourth of the total steel output of the country, however, is in the form of Bessemer steel, and the tin plate requirements absorb a great deal of that, while the Railroad Administration apparently intends to take Bessemer rails only, so as to conserve open-hearth steel for purposes which demand that grade of steel. This is the situation as applied to the largest single producer, but it should be noted that there are small producers having a limited range of finished products, and of some of these products the Government cannot possibly use the entire tonnage. In the final line-up, however, there may not be a great deal of such products available for commercial purposes. For illustration, the Government cannot use anything like the normal tonnage of wire produced in the country, and there are some mills that can make little except wire, but the mills that can make wire only may be given the wire orders, and mills that can divert steel from their wire departments to other departments making finished products greatly needed by the Government may be pushed with orders for the other products so that their wire production will be light.

### A Complete Change

A restrospective glance shows that the situation and prospects as to supplies of steel for the so-called "commercial" purposes has changed entirely in the past 30 days. At the beginning of April the outlook, in the minds of many observers, and probably the great majority of steel producers, was that there would be an ample supply of steel for war purposes, and a surplus that would perhaps be entirely sufficient for commercial purposes. This expectation was based on the large increase that had occurred in shipments, through the passing of a winter which had so greatly cut down production, but it did not allow sufficiently for the increase in commercial demand that evidently was occurring at the same time nor, more important still in the mind of the Director of Steel supplies, did it allow for the expanding needs of the Government and its Allies. While all producers are probably not converted to the idea that steel is going to be scarce continuously, the philosophy of the remainder is that their duty is to act, and furnish all the steel asked for, and if meanwhile they cherish the theory that a couple of months of such action will result in the authorities relaxing their pressure, no harm will have been done by their entertaining the theory.

### War Orders Heavy

It is understood that the orders currently placed by the Government, or placed indirectly for war account, are regularly running ahead of the deliveries. In several important lines the war orders on books are equal to several months of shipments at the present rate. Considering these circumstances, together with the fact that the Allies abroad desire more and more steel, as available, by reason of the shortage of man power at home, and the further fact that the authorities at Washington wish to play safe this summer and fall and accumulate steel if possible against any traffic difficulties next winter, it becomes clear that the war requirements of the next few months are going to prove much heavier, in proportion to productive capacity, than was assumed only recently.

### Export Steel

The pledge taken by the steel producers, to divert all possible steel to the war work, has a particular bearing upon shipments of commercial steel for export. Such material does not come under the price agreement, and thus if the producer exercised his choice it would frequently be to ship such steel, on account of the higher price involved. This is prevented by the pledge.

On the other hand the authorities at Washington, as indicated in last report,

(Continued on page 69.)

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago | 37 50 |
| Standard low phos., Philadelphia | ..... |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 32 00 |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | ..... | ..... |
| Victoria | ..... | 50 00 |

## FINISHED IRON AND STEEL

| Per lb. to Large Buyers. | Cents |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 5 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 5 75 |
| Chequered floor plate, 3-16 in. | 12 20 |
| Chequered floor plate, ¼ in. | 12 00 |
| Staybolt iron | 8 50 |
| Bessemer rails, heavy, at mill | ..... |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | *3 50 |
| F.O.B., Toronto Warehouse | |
| Steel bars | 5 50 |
| Small shapes | 5 75 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

## FREIGHT RATES

Pittsburgh to Following Points

| | Per 100 lbs. C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 38.1 | 50.5 |
| Halifax | 39.1 | 51.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

## METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $30 00 | $28 50 |
| Electro copper | 30 00 | 28 50 |
| Castings, copper | 29 00 | 28 00 |
| Tin | 125 00 | 115 00 |
| Spelter | 10 00 | 9 50 |
| Lead | 9 50 | 8 50 |
| Antimony | 15 00 | 16 00 |
| Aluminum | 50 00 | 50 00 |

Prices per 100 lbs.

## PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¼ to ½ | $ 9 00 | $ 9 00 |
| Heads | 9 65 | 9 25 |
| Tank plates, 3-16 in. | 9 50 | 9 10 |

## WROUGHT PIPE

Effective Feb. 5, 1918.

Standard Buttweld

| | Per 100 feet Boston | Montreal |
|---|---|---|
| ⅛ in. | $ 6 00 | $ 8 00 |
| ¼ in. | 5 16 | 7 29 |
| ⅜ in. | 5 16 | 7 29 |
| ½ in. | 6 55 | 8 12 |
| ¾ in. | 8 28 | 10 41 |
| 1 in. | 12 24 | 15 39 |
| 1¼ in. | 16 56 | 20 82 |
| 1½ in. | 19 80 | 24 89 |
| 2 in. | 26 64 | 33 49 |
| 2½ in. | 42 72 | 53 53 |
| 3 in. | 55 85 | 70 00 |
| 3½ in. | 70 84 | 87 86 |
| 4 in. | 83 93 | 104 10 |

Standard Lapweld

| | | |
|---|---|---|
| 2 in. | $ 29 60 | $ 36 08 |
| 2½ in. | 44 46 | 54 70 |
| 3 in. | 58 14 | 71 53 |
| 3½ in. | 72 68 | 90 62 |
| 4 in. | 86 11 | 107 37 |
| 4½ in. | 97 79 | 122 56 |
| 5 in. | 114 00 | 142 82 |
| 6 in. | 147 80 | 185 28 |
| 7 in. | 192 80 | 241 57 |
| 8 L in. | 202 50 | 253 75 |
| 8 in. | 233 30 | 292 32 |
| 9 in. | 279 50 | 350 18 |
| 10 L in. | 259 20 | 324 80 |
| 10 in. | 333 70 | 418 18 |

Prices—Ontario, Quebec and Maritime Provinces.

## WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

## OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 22 50 |
| Copper, heavy | 22 50 | 22 50 |
| Copper wire | 22 50 | 22 50 |
| No. 1 machine composition | 22 00 | 21 50 |
| New brass cuttings | 16 00 | 14 00 |
| Red brass turnings | 18 00 | 17 00 |
| Yellow brass turnings | 12 50 | 12 50 |
| Light brass | 10 00 | 9 50 |
| Medium brass | 12 00 | 12 00 |
| Heavy brass | 15 00 | 14 00 |
| Heavy melting steel | 24 00 | 21 00 |
| Steel turnings | 12 00 | 12 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 27 00 | 20 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 23 00 |
| No. 1 machine cast iron | 31 00 | 30 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 20 00 | 17 00 |
| Car wheels, iron | 26 00 | 30 00 |
| Steel axles | 38 00 | 35 00 |
| Mach. shop turn'gs | 9 00 | 8 50 |
| Cast borings | 12 00 | 12 00 |
| Stove plate | 19 00 | 19 00 |
| Scrap zinc | 6 50 | 6 50 |
| Heavy lead | 7 50 | 7 00 |
| Tea lead | 5 00 | 5 75 |
| Aluminum | 21 00 | 20 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, ⅜" and less | 10 |
| Carriage bolts, 7-16 and up | net |
| Coach and lag screws | 25 |
| Stove bolts | 55 |
| Plate washers | List plus 20 |
| Elevator bolts | 5 |
| Machine bolts, 7-16 and over | net |
| Machine bolts, ⅜ and less | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | 10 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | add 25 |
| Nuts, square blank | add $1 50 |
| Nuts, square, tapped | add 1 75 |
| Nuts, hex., blank | add 1 75 |
| Nuts, hex., tapped | add 2 00 |
| Copper rivets and burrs, list plus | 30 |
| Burrs only, list plus | 50 |
| Iron rivets and burrs | 25 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 37½ |
| Wood screws, O. & R., brass | 32½ |
| Wood screws, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

## MILLED PRODUCTS

| | Per Cent |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil. Head Cap Screws | net |
| Flat But. Hd. Cap Screws | plus net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. & Semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2 in. | plus 10 |
| Studs | net |
| Taper pins | 40 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | list plus 20 |
| Collar screws | list plus 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | 65 |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add 7 00 |

## BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $47 50 |
| Open-hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.

F.O.B. Pittsburgh.

## NAILS AND SPIKES

| | | |
|---|---|---|
| Wire nails | $5 25 | $5 20 |
| Cut nails | 5 70 | 5 65 |
| Miscellaneous wire nails | | 60% |
| Spikes, ⅜ in. and larger | | $7 50 |
| Spikes, ¼ and 5-16 in. | | 8 00 |

## ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 41 |
| Plumbers' oakum, per lb. | 8½ |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila rope | 0 33 |
| New Zealand hemp | 0 33 |
| Transmission rope, Manila | 0 45 |
| Cotton rope, ½ in. and up | 6½ |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | net |

MISCELLANEOUS

| | |
|---|---|
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| Red dry lead, 100-lb. kegs, per lb. | 15 50 |
| Glue, English | 0 35 |
| Tarred slater's paper, roll | 0 95 |
| Gasoline, per gal., bulk | 0 33 |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] of Paris, per bbl. | 2 50 |
| [illegible] B. & A. | list plus 20 |
| [illegible] | list plus 20 |
| [illegible] | 0 03½ |
| [illegible], rolls | 0 05 |
| [illegible] | 0 04½ |
| [illegible] D," per lb. | 0 03 |
| [illegible] | 0 03½ |
| [illegible] and granular | 0 12 |
| [illegible] | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

CARBON DRILLS AND REAMERS

| | Per Cent. |
|---|---|
| S.S. drills, wire sizes up to 52 | 40 |
| S.S. drills, wire sizes, No. 53 to 80 | 40 |
| Standard drills to 1½ in. | 40 |
| Standard drills, over 1½ in. | 40 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 |
| Bit stock | 40 |
| Ratchet drills | 15 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 40 |
| [illegible] | 40 |
| Taper pin reamers | net |
| Drills and countersinks | list plus 40 |
| Bridge reamers | 50 |
| Centre reamers | 10 |
| Chucking reamers | net |
| Hand reamers | 10 |
| High speed drills, list plus | 75 |
| High speed cutters, list plus | 40 |

COLD ROLLED SHAFTING

| | |
|---|---|
| At mill | list plus 40% |
| At warehouse | list plus 50% |

**Discounts off new list. Warehouse price at Montreal and Toronto**

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 8 00 | $ 8 00 |
| Sheets, black, No. 10 | 10 00 | 9 50 |
| Canada plates, dull, 52 sheets | 9 00 | 8 65 |
| Can. plates, all bright | 9 50 | 9 50 |
| Apollo brand, 10¾ oz. galvanized | ..... | ..... |
| Queen's Head, 28 B.W.G. | ..... | ..... |
| [illegible] B.W.G. | ..... | ..... |
| Gorbal's Best, No. 28 | ..... | ..... |
| Colborne Crown, No. 28 | ..... | ..... |
| Premier, No. 28 U.S. | ..... | 8 95 |
| Premier, 10¾ oz. | ..... | 9 25 |
| Zinc sheets | 20 00 | 20 00 |

PROOF COIL CHAIN

[illegible] in., $12.35; 5-16 in., $11.85; ⅜ in., $11.50; 7-16 in., $10.90; ½ in., $11.20; 9-16 in., $11.20; ⅝ in., $11.10; ¾ in., $11.00; ⅞ in., $10.90; 1 inch, $10.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B. ⅛ in., $15.50; 3-16 in., $11.70; ¼ in., $8.40; 5-16 in., $7.40; ⅜ in., $6.35; 7-16 in., $6.35; ½ in., $6.35; ⅝ in., $6.35; ¾ in., $6.35.

**Prices per 100 lbs.**

FILES AND RASPS.

| | Per cent |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 40 |
| Black Diamond | 40 |
| J. Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 37½ |
| Disston | 50 |
| Whitman & Barnes | 50 |

BOILER TUBES.

| Size | Seamless | Lapwelded |
|---|---|---|
| 1 in. | $36 00 | $..... |
| 1¼ in. | 40 00 | ..... |
| 1½ in. | 43 00 | 36 00 |
| 1¾ in. | 43 00 | 36 00 |
| 2 in. | 50 00 | 36 00 |
| 2¼ in. | 53 00 | 38 00 |
| 2½ in. | 55 00 | 42 00 |
| 3 in. | 64 00 | 50 00 |
| 3¼ in. | ..... | 58 00 |
| 3½ in. | 77 00 | 60 00 |
| 4 in. | 90 00 | 75 00 |

Prices per 100 ft., Montreal and Toronto.

OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | |
| Royalite, per gal., bulk | 18 |
| Palacine | 21 |
| Machine oil, per gal. | 26½ |
| Black oil, per gal. | 15 |
| Cylinder oil, Capital | 49½ |
| Cylinder oil, Acme | 39½ |
| Standard cutting compound, per lb. | 0 06 |
| Lard oil, per gal. | $2 60 |
| Union thread cutting oil antiseptic | 88 |
| Acme cutting oil, antiseptic | 37½ |
| Imperial quenching oil | 39½ |
| Petroleum fuel oil | 13½ |

BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30-5% |
| Standard | 40% |
| Cut leather lacing, No. 1 | 1 95 |
| Leather in sides | 1 75 |

TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 06 |
| Emery glue | 15 to 20 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 35 |

**Prices Per Lb.**

ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | .08½ |
| Grits, 80 and finer | .06 |

BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 38 |
| Brass sheets, 24 gauge and heavier, base | 0 43 |
| Brass tubing, seamless | 0 46 |
| Copper tubing, seamless | 0 48 |

WASTE.

| White. | | Cts. per lb. | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 18½ |
| Peerless | 21 | X Empire | 17¼ |
| Grand | 19¾ | Ideal | 17¼ |
| Superior | 19¾ | X press | 16 |
| X L C R | 18½ | | |

Colored.

| | | | |
|---|---|---|---|
| Lion | 15 | Popular | 12 |
| Standard | 13½ | Keen | 10½ |
| No. 1 | 13½ | | |

Wool Packing.

| | | | |
|---|---|---|---|
| Arrow | 25 | Anvil | 15 |
| Axle | 20 | Anchor | 11 |

Washed Wipers.

| | | | |
|---|---|---|---|
| Select White | 11 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

RUBBER BELTING.

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

ANODES.

| | |
|---|---|
| Nickel | .50 to .54 |
| Cobalt | 1.75 to 2.00 |
| Copper | .44 to .46 |
| Tin | .49 to .56 |
| Zinc | .23 to .25 |

**Prices Per Lb.**

COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | 42 50 | 43 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 46 00 | 44 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 48 00 | 48 00 |
| Copper sheet, planished, 16 oz. base | 57 00 | 45 00 |
| Braziers,' in sheets, 6x4 base | 45 00 | 44 00 |

LEAD SHEETS.

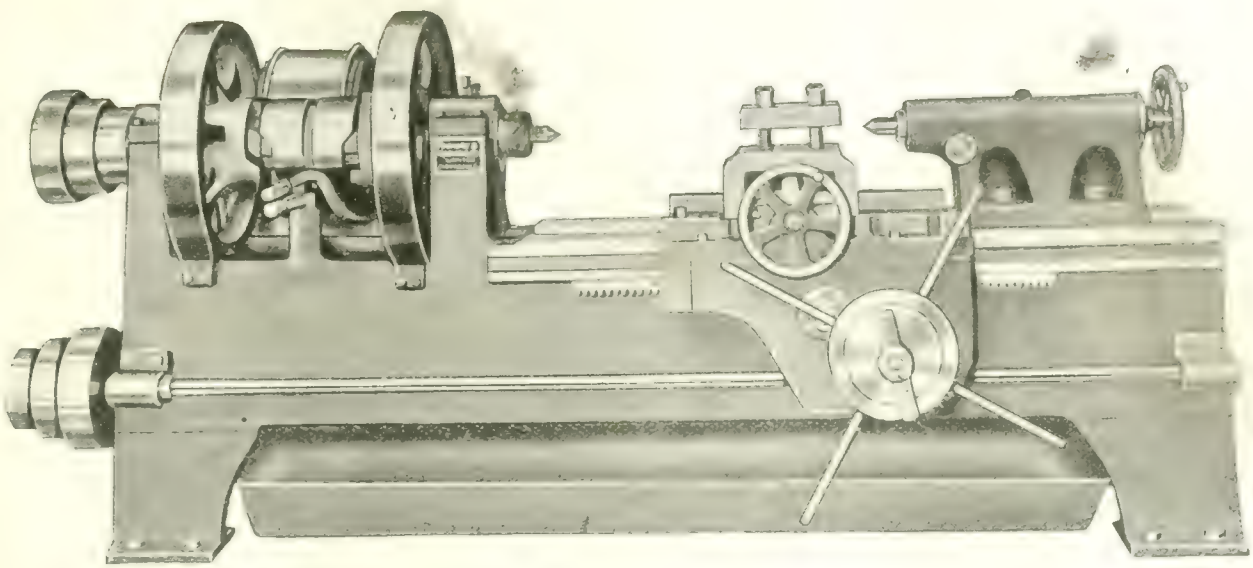
| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $13 25 | $13 25 |
| Sheets, 3½ lbs. sq. ft. | 13 25 | 13 25 |
| Sheets, 4 to 6 lbs. sq. ft. | 12 50 | 12 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

| | |
|---|---|
| Acid, boracic | $ .15 |
| Acid, hydrochloric | .05 |
| Acid, hydrofluoric | .14½ |
| Acid, nitric | .10 |
| Acid, sulphuric | .05 |
| Ammonia, aqua | .08 |
| Ammonium carbonate | .15 |
| Ammonium, chloride | .11 |
| Ammonium hydrosulphuret | .40 |
| Ammonium sulphate | .07 |
| Arsenic, white | .12 |
| Copper, carbonate, anhy | .35 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .70 |
| Iron perchloride | .20 |
| Lead acetate | .16 |
| Nickel ammonium sulphate | .12 |
| Nickel carbonate | .35 |
| Nickel sulphate | .15 |
| Potassium carbonate | .75 |
| Potassium sulphide (substitute) | .20 |
| Silver chloride (per oz.) | .65 |
| Silver nitrate (per oz.) | .55 |
| Sodium bisulphite | .10 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .41 |
| Sodium hydrate | .04 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | .14 |
| Tin chloride | .60 |
| Zinc chloride | .60 |
| Zinc sulphate | .09 |

**Prices per lb. unless otherwise stated.**



# *Speed Up Production*

## *with the*

# MONTREAL LATHE

for the economical production of 4.5", 6" and 155 MM. shells. If you are interested in obtaining maximum production at minimum labor expense, investigate the records of the MONTREAL lathe in plants of the largest producers of shells in Canada.

The MONTREAL lathe is wonderfully simple in operation and construction, yet every worth while improvement has been embodied in the design.

A powerful machine—designed to transmit all the power that the cutting tools will stand—with large broad ways, liberal wearing surfaces and unbreakable apron. The MONTREAL lathe comes to you equipped as you need it—with carriage for rough turning —with rigid single bar for boring, or with swivelling bar for inside profiling.

***Write Now for Prices and Delivery.***

## The A. R. Williams Machinery Co.

LIMITED

**64 Front Street West - . - TORONTO**

# Japan Turning to Canada to Secure Needed Equipment for Her Shipbuilding Plants

## S. Noda, President of Roku-Roku Shoten, Ltd., Tokyo, Spent Some Time Looking Over the Situation in Toronto. Situation in China Makes the Development of Japan a Difficult Matter.

JAPANESE [illegible] are turning to the Canadian industry, have turned [illegible] The reason for this is probably necessity as much as preference. The Japanese firms are finding it increasingly hard to secure shipments from the firms in the United States, with which they have been doing business for many years, on account of the regulations that are holding the output of American plants at the disposal of the United States Government for war purposes.

S. Noda, president of Roku-Roku Shoten, Ltd., machinery merchants of Tokyo, Japan, spent a few days in Toronto during the week. Speaking to a representative of CANADIAN MACHINERY, through which publication he first became familiar with the lines made in this country, Mr. Noda stated that there was a very great demand in his country at present for machine tools for the shipbuilding enterprises. "The bottoms that are being built are principally freighters of about ten thousand tons, and are on the order of the Japanese ship owners. The machines we want are lathes, mostly big ones, drills, grinders, planers, etc. We also need steel plates in greater quantities than we are now getting them, and pig iron is a scarce article with us."

### A Capable Merchant

Mr. Noda impresses one as bright, capable, and quite familiar with our methods of doing business. He speaks good English, is very anxious to learn all he can about the events that are taking place in Canada, and is well versed on the far eastern situation, especially regarding the relations between Japan and China.

"I have been buying machinery in the United States for a number of years. The Roku-Roku Shoten has been organized for over fifteen years, and handles nearly all lines necesary for shipbuilding and other industries. Of recent months we have found it very hard to get the goods we wanted from the United States, as the shipping regulations are very strict. I decided to see what we could do in Canada. We had been in touch with firms here through your paper, CANADIAN MACHINERY, as you had always sent us your export numbers. I am meeting many men here as possible, but my [illegible]e is limited, but we will have another representative in this country before very long to go into the business more thoroughly."

### The Limits are Placed

"Will Japan develop industrially to the point where she will not be an importing nation?" queried the reporter.

"Not for a long time to come," replied Mr. Noda. "You must understand the situation before you see the reason for my answer. Japan itself is not a large country, but the people there are very energetic. We feel that China is the place where we should be able to get the raw materials, and that is where the trouble comes in, and there is small chance of any improvement until there is some settled policy for the future of China. For instance China is rich in mineral wealth. We want to get iron ore there. We can also secure coal for the making of coke and limestone. Why could we not make pig iron and steel? Simply this reason stops us—each province of China seems to be separate and apart from the other. There is no central body to deal with there, and there is no assurance for protecting large investments that would be necessary before we could go in and get a sufficient output of raw material. The powers will have to come together on the future of China. While the feeling between China and Japan is better than it has been for a long time, there is always that element of uncertainty that stops and hinders any development that our people have in view, and in that way we are held back very much."

### Steel Prices are High

Answering a question about the price of ship plate in Japan, Mr. Noda said that it was now worth about $200 a ton. That is based on imports from the United States, where the figures are lower than here. "We find it hard to secure plate now, and I would like you to tell me," continued Mr. Noda with a laugh, "where I could get a whole lot of plate right away as well as a big shipment of pig iron. We are very short on these. Not long ago we made an agreement with the United States whereby we receive one ton of plate from them and in return send back one ton in shipping bottom. We are making quite a bit of plate but nothing to what we can use. Japan probably turns out one million tons of plate in a year. Of course we have the advantage in the way of the price paid for labor that is put into the building of ships."

"And what wages do you pay?" asked MACHINERY.

"They vary," replied Mr. Noda, "but as a general thing it would be safe to say that fifty cents a day was the average paid for labor. Some lines that require greater skill and training will get more, but others again where nothing but rough work is done will get less than that. Of course living does not cost anything like as much as it does here in Canada. The poorer people of Japan can rent a house from five dollars a month up. For the better houses we will pay about $15 and perhaps more. There's one thing I notice here. I think you people eat too many kinds of stuff. In a hotel there are a great many more dishes prepared than a person really needs. We live much more simply than you do, perhaps we eat just as much, but the variety is less. I think it would be safe to say that a man could live on a little more than 25 cents a day in Japan right now."

### Japan and the War

"Japan is greatly interested in the war," remarked the visitor from Japan. "The people there are anxious to have it over with, as it is impossible to go ahead with any plans for the future as long as the war keeps on. Japan is ready and anxious to do what she can and there is no question as to the feeling of the people toward the cause of the Allies. There was much said a little while ago about Japan sending troops into Siberia when the Russian army left the field. I do not think the Japanese would do that unless they were acting with the rest of the Alies. They would not go in there themselves, because they want to act with the other armies that are fighting with Britain now. But Japan is going ahead, and will do so more after the war than she has ever done before. There should be a chance for the manufacturers of Canada to do more business with our country than they have ever done before. We need machinery, machine tools and supplies, wood pulp, lumber of all kinds, pig iron, condensed milk, and I should think we could buy a lot of good horses, especially the heavy ones. You see the motor car is not used in Japan as it is here. I don't suppose there are over two thousand cars in the whole country. They are generally the property of the better class only. I shall come to Canada again," said Mr. Noda in conclusion, "and next time I shall spend more time here. It is a great country and I am much pleased with what I have seen of it."

---

**Wilfrid U. Hollingworth**, foreman at the Dominion Bridge, Montreal, died at the Lachine General Hospital on May 3. Mr. Hollingworth had been ailing for some time, and on the advice of his physician had resigned his position and was on the point of going west to take up farming. He was a native of Widnes, England, and came to this country eight years ago, taking a position with the above company.

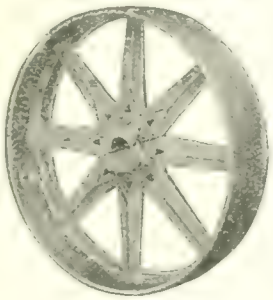
# THE A. R. WILLIAMS MACHINERY CO. LTD

64 FRONT ST., W. TORONTO, ONT.

SALES SUPPLY DEPARTMENT SERVICE

# WE HAVE THE GOODS IN STOCK

We have one of the largest stocks of Machinery Supplies in Canada, including Machine Shop Woodworking Factory, Power House Supplies, etc.



## "AMERICAN"

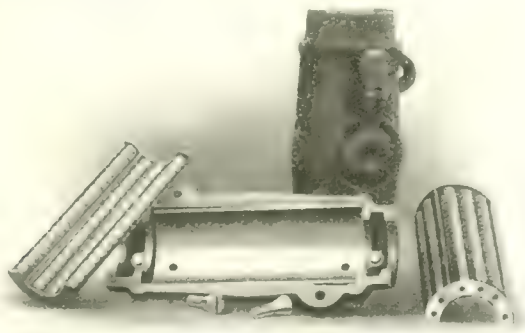
**Steel Split Pulleys** are made of Steel,—a material used the world over for structures demanding lightness combined with strength. They transmit maximum power with minimum belt slip. AMERICAN Pulleys are guaranteed to perform double belt duty under any conditions not demanding a special pulley.

## Gear Cutters, Milling Cutters, End Mills

We make it a rule to always have a complete stock of these cutters. Therefore, it is very seldom you are unable to get what you require immediately out of [illegible] stock.

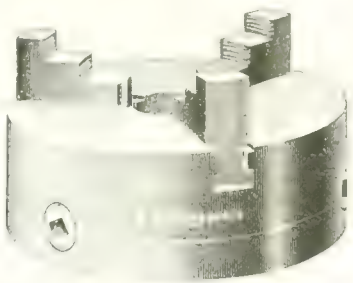
## "HYATT"

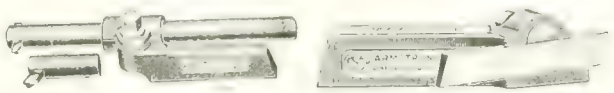
**"HYATT" Flexible Roller Bearings** save you from 60 to 75% of friction, save Oil and Labor. The Rollers operate on the shaft. There are no Collars nor Sleeves, nor Bushings—nothing to give trouble. "HYATT," the bearing of Highest Practical Efficiency. Write us for list of satisfied users of above bearings.



## LATHE CHUCKS

All the popular makes of both Drill and Lathe Chucks carried in stock in all sizes and styles. Also we can give you immediate delivery from stock on all sizes and styles of Twist Drills, Reamers, Taps, Screw Plates, etc., etc.

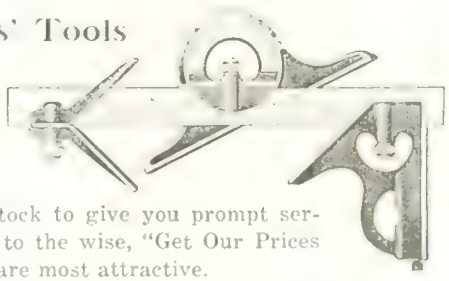




## "ARMSTRONG" Tool Holders

Heavy loss in time and material is inseparable from the use of forged lathe tools. Therefore, use "Armstrong" Tool Holders and avoid this loss. "Armstrong" Tool Holders are a complete Economical and Efficient Equipment of High Speed Tools for Turning, Boring, Threading, Knurling, Cutting Off, Planing, Slotting and Drilling metals. A most extensive stock of these Tool Holders kept in stock to give you prompt service.

## Mechanics' Tools



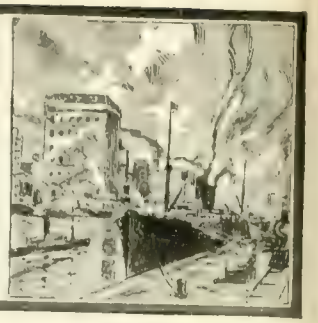
We have practically everything you will require in this line right in stock to give you prompt service. A word to the wise, "Get Our Prices First." They are most attractive.

**Complete line of TRANSMISSION EQUIPMENT, POWER HOUSE, MILL and FACTORY SUPPLIES always in stock.**

**THE A. R. WILLIAMS MACHINERY CO., LTD., TORONTO, ONTARIO**

# INDUSTRIAL NEWS

## NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES



## ENGINEERING

**Thorold, Ont.**—The Beaver Board Co. [illegible]

**Toronto, Ont.**—The Chapman Double Ball Bearing Co., Sorauren Avenue, will build an addition to its plant to cost [illegible]

**Halifax, N.S.**—The Halifax Vulcanizing Works proposes to build a vulcanizing plant on Grafton Street at a cost of [illegible]

**Montreal, Que.**—The Montreal Locomotive Works will build an addition to their foundry at Longue Pointe. The Dominion Bridge Co. have the steel contract.

**Blenheim, Ont.**—E. W. Knight, Talbot Street, has secured a site on which he will build a two-storey brick and concrete garage and auto repair shop, to cost $10,000.

**Grand Mere, P.Q.**—The Laurentide Power Co. have under consideration the installation of three additional units of 20,000 h.p. each, making the total capacity 180,000 h.p.

**Orillia, Ont.**—The E. Long Mfg. Co., manufacturers of sawmill machinery, tools, etc., Queen Street, will build a two-storey factory, to cost about $60,000. W. W. McBain is secretary-treasurer of the company.

**Toronto, Ont.**—The Northlight Motor Co., Wesley Building, will establish a plant in Toronto for the manufacture of marine engines, and is in the market for screw cutting lathe, large drill, planer, milling machine, 30-inch band saw, wood turning lathe, and universal wood trimmer.

**Quebec, Que.**—Quinlan & Robertson, who are building four wooden ships of 2,500 tons each, have commenced work on the fitting out of machine shops at the Louise Docks. J. A. German is in charge of the work. The machine shops will be used in connection with the installation of the engines and boilers in the above shops.

**Vancouver, B.C.**—The Taylor Engineering Co. of this city has the contract for the construction of a floating dry dock. The dock will have a capacity of 4,500 tons and will be capable of completely docking vessels up to 4,500 tons, but repairs may be carried out on ves- [illegible] either end. The cost will be $750,000.

**Halifax, N.S.**—The foundry of Hillis & Sons, Ltd., which was destroyed by explosion last December, is to be rebuilt on the Kemp Road. It will manufacture Richmond ranges and foundry products of all kinds. Contracts for a temporary foundry and machine shop have been awarded to the Eastern Investment Corporation, Halifax, and work will begin at once.

**Sydney, N.S.**—The Dominion Coal Co. contemplate several extensions and improvements to their electrical equipment during the summer months. A central station is to be erected at New Waterford, and from this point transmission lines will be run to the locations requiring current. It is expected that electricity will also replace steam for haulage purposes.

**Midland, Ont.**—The smelter at Midland, which has lain idle for several years, has been acquired by Midland, Cleveland and Duluth interests. Employees of the new company are already preparing the premises for the new machinery and appliances, which will be rushed forward with all possible despatch. The company will manufacture pig iron, and hope to be in full operation within two months.

**Toronto, Ont.**—The site recently purchased for a munitions plant, situated near the G.T.R. at East Toronto and covering an area of 3¾ acres, cost $34,000, according to the statement of the vendor, J. B. Harris, Danforth avenue. The building will be erected shortly and plans and specifications are now being prepared. The machinery alone will cost $360,000 ,and will be used in the manufacture of large shells.

**Preston, Ont.**—The Hydro Commission, in view of the shortage of electric power, has asked the Grand River Railway to put their steam plant into commission and thereby reduce their electric consumption by 400 h.p. The steam plant is in need of repairs, however, and the order is not being enforced for the present, though May 15 is the date mentioned as the one on which the reduction should be inaugurated.

**Vancouver, B.C.**—By the provisions of the ore bounties bill passed at the concluding session of the house in Victoria a decided boon is given to the iron industry in the coast province. The province is given power in the measure to give a bonus of three dollars per ton of pig iron which is made in British Columbia from B. C. ore. In speaking in the house on the bill William Sloan, minister of mines, stated that there was sufficient iron ore in sight in the province to insure production for twenty-five years.

**Brantford, Ont.**—Mayor Macbride has received assurances from Ottawa that the estimates for the Port Dover harbor improvements will be brought down in the supplementary lists. W. F. Cockshutt, M.P., has written that the promise of assistance made to the Grand River Valley deputation by Hon. Frank Carvell will be carried out, and that commencement of the work at the harbor may be expected this year. The exclusion of Port Dover from the estimates recently brought down caused a protest from this and other centres affected.

## ELECTRICAL

**Barrington, N.S.**—Town Council contemplate the erection of an electric light and power plant to cost $8,000.

**New Westminster, B.C.** City Council contemplate repairs costing $5,000 to electric light system at the Queen's Park.

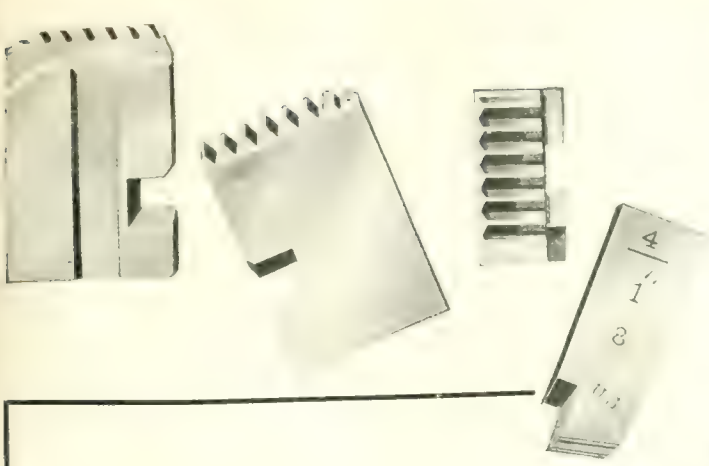
**Niagara Falls, Ont.**—Niagara District Independent Telephone Co., which has served farmers for many years, has decided to sell out to the Bell Co. The price fixed is $27,000, and it is expected the deal will be put through at the ne meeting.

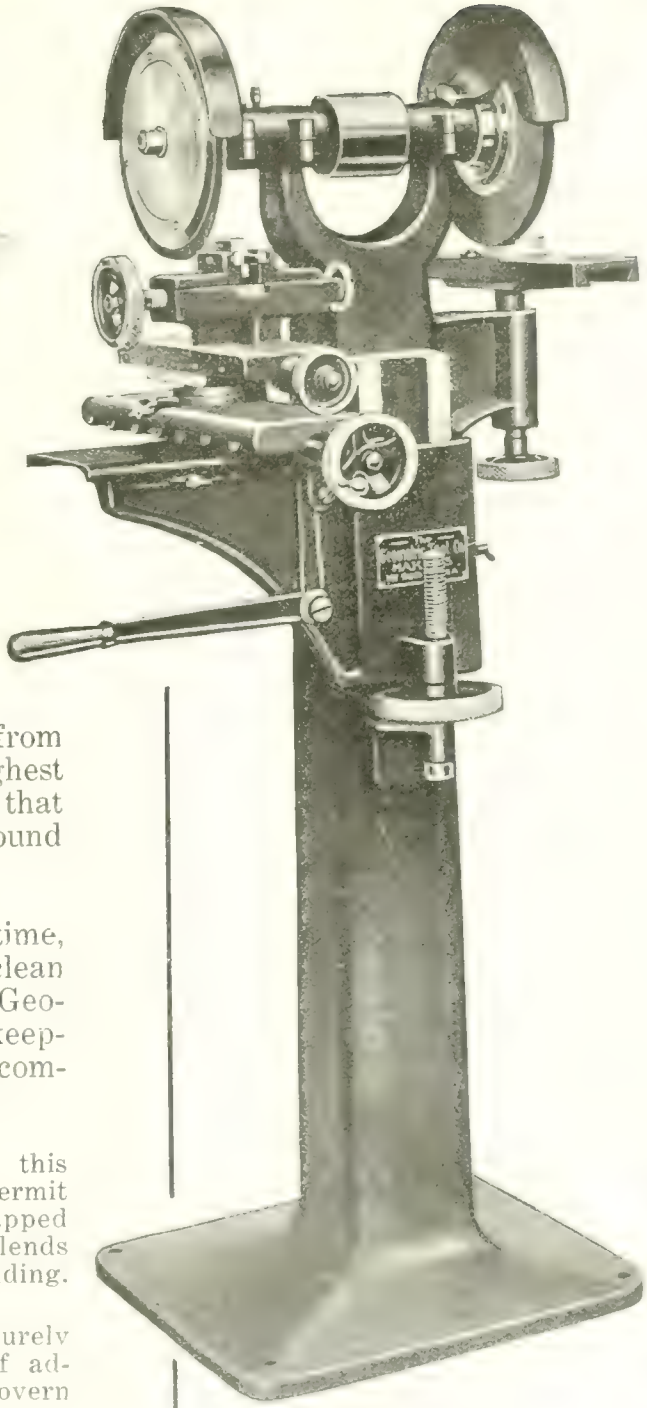
**Saskatoon, Sask.**—Telephone contractors estimate that approximately 2,000 miles of rural telephone lines will be built in Saskatchewan this season at an approximate cost of $250,000. The lines to be erected are chiefly extensions and completions of last year's work. Very little new work is being undertaken because the local government board is not authorizing any new telephone construction. The contractors estimate that if the local government board would authorize the expenditures there would be at least 5,000 additional miles of rural lines constructed in the province, at an approximate cost of $1,375,000 before August 20.

## MUNICIPAL

**Halifax, N.S.**—The Board of Control has requested the release of Major E. W. Doane, city engineer, from military service overseas.

**St. Thomas, Ont.**—Many of the big hydro power users will have to go back to steam shortly, in order to meet the demands of the power controller. Two of the latest to be affected are the Michigan Central Railway and the Pere Marquette. The St. Thomas waterworks system will





# Sharp Chasers Cut Clean Threads

Accurate, uniform threads result only from dies which are maintained in the highest state of cutting efficiency. This means that chasers must be kept sharp, and ground uniformly.

Even if just touched up from time to time, the chasers respond splendidly, with clean threads. And with this machine—the Geometric Chaser Grinder—the matter of keeping threading tools up to scratch is a comparatively simple matter.

Any make of chaser can be ground on this adaptable machine. The two wheels permit the easy grinding of both milled and tapped chasers. In addition, the plain wheel lends itself readily to various kinds of tool grinding.

Uniform grinding of a set of chasers is purely a mechanical matter through the use of adjustments which can be accurately set to govern the grinding of an entire set of chasers.

***The Catalog describing this machine is a mine of information on chaser grinding. Write for it.***

**THE GEOMETRIC TOOL COMPANY**
**NEW HAVEN CONNECTICUT**

***Canadian Agents:***

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B.

Chatham, Ont.—A [illegible] of the Hydro power users in Chatham is being [illegible] the Public Utilities Commission to ascertain just what power is being used and what might be wanted if there was an increase possible. A record is being made of the product of the various companies and other details connected with the plants. It is reported that similar reports are being compiled in other Western Ontario towns and cities and it is presumed the report will have some connection with the requests being made for more power, because of the order cutting off natural gas on July 1 next.

**Regina, Sask.**—The City Commissioners have been authorized to endeavor to arrange a thirty-day option on the $175,000 electric light unit which the council has been asked to purchase to ensure a sufficient supply of energy to meet the anticipated demands of the coming winter. The city has received offers of two American machines, one of which is ready for immediate delivery, consisting of a General Electric Co. turbine and a Westinghouse condenser, and the other, which will be ready for delivery about September, consisting of a Westinghouse turbine and a Wheeler condenser. The price of the two units is within $2,000 of the same figure. The officials reported that they would sooner have had a combination of one of the turbines with the other condenser, but the owner of the equipment would not consider this proposal.

## PERSONAL

**G. W. Ketter** has joined the staff of the Electric Furnace Construction Co., Philadelphia, having resigned his position with the British Forgings Co., Ltd., Toronto, Ont.

**Herbert A. Jackson** was recently elected president of the Chicago Pneumatic Tool Co., Chicago, to succeed W. O. Duntley, [illegible] He was born in Bethlehem, Conn., July 7, 1881.

**Edward F. Fauquier**, one of the most prominent of Canada's railway contractors, died at Ottawa on Sunday in his 63rd year. He was a son of the late Emilius Fauquier, of Woodstock, Ont.

**Capt. T. S. Scott**, No. 5 F.C.C.E., has been ordered to report at Halifax to aid in the reconstruction work in that city. Capt. Scott has been professor of civil engineering at Queen's University, Kingston, for several years.

**James M. Smith** now has charge of the shipbuilding plant of the Canadian Car & Foundry Co., Fort William, Ont., which expects to turn out 12 trawlers for the French Government before the end of the 1918 season.

Capt. John B. Forrest, [illegible] years old, master mariner for more than thirty years, died last Saturday at his [illegible] due to heart disease. A son of the late Capt. Robert Forrest, he was born at Sandwich, Ont.

**Mr. J. M. Riordan**, until recently sales engineer of the Grant Lees Gear Co., of Cleveland, and formerly representing the Fellows Gear Shaper Co., of Springfield, Vermont, in the Central States, is now connected with the sales organization of the Cleveland Milling Machine Co., 18511 Euclid avenue, Cleveland, Ohio.

**J. T. Edmond**, formerly with the West Coast Navigation Co., has been appointed ferry superintendent at North Vancouver, B.C. Mr. Edmond is 37 years of age, and served his apprenticeship as marine engineer with the firm of Hepple & Co., South Shields, England. For over a year he was marine engineer with the West Coast Navigation Company, and also served with Moore & Scott, San Francisco, and other prominent firms.

**E. C. Peck**, superintendent of the Cleveland Twist Drill Co., has been appointed a lieutenant-colonel in the Engineering Bureau of the U. S. Ordnance Department. Mr. Peck will have charge of the gauges used in the production of munitions and kindred materials for the above department. His duties will be the supervision of design of gauges and the setting of limits of variance which will be satisfactory to both manufacturer and the Ordnance Department itself.

**Joseph Bickerstaff**, manager of the Elm Cutting Oil Co., King St. E., Toronto, and his family of boys, have a military record to be proud of. Mr. Bickerstaff himself enlisted with the R. C. H. A. in the early part of the war, but was discharged on account of being too old. Of the boys, Everard M. Bickerstaff, the eldest son, was killed at St. Julien while serving in the 3rd Battalion. Joseph R. Bickerstaff, the second son, has just returned to Canada, after having been severely wounded at Vimy Ridge in April, 1917. The youngest son, Harold W., now assistant manager of the Elm Oil Co., was wounded and won the Military Medal on the Somme with the 19th Battalion for holding up a German detachment until the arrival of British reinforcements.

## TRADE GOSSIP

**Ottawa, Ont.**—The British Columbia members and delegation will meet the reconstruction committee of the cabinet here to present their case for the establishment of a British Columbia shell industry. Hon. A. K. Maclean is chairman of the committee.

**Tungsten Market Steady.**—There has been less movement of ore of late owing to lighter offerings of the more desirable grades. Demand for wolframite is fairly active at $24 and for scheelite at $74.50, New York. Off-grade tungsten ores are limited and absorbed as offered at the usual price differential.

**More Ships Launched in U. S. Yards.**—Ten steel ships of 57,695 tons and six wooden ships of 21,500 tons were launched by American yards in the week ending May 5, the Shipping Board announced recently. Twelve steel ships of 80,180 tons were delivered to the board complete in the same period.

**To Conserve Fuel.**—In order to assist in the conservation of fuel the Grand Trunk Railway are considering the installation of a powdered fuel system in their shops at Point St. Charles. The problem has been carefully gone into by the officials, but final decision has not yet been made.

**C. P. R. Changes.**—The Canadian Pacific announces the following promotions and changes in the New Brunswick district; Mr. J. H. Boyle is appointed superintendent, Brownville division, succeeding Mr. H. J. Humphrey, transferred. Mr. C. Gribbin is appointed master mechanic, succeeding Mr. C. Kyle, transferred.

**Extending Plant.**—The Swedish Crucible Steel Co., Windsor, are building a 100 ft. extension to their foundry, and will also build a machine shop 75 x 100 feet. In the foundry extension they will install three fourteen-ton moulding machines by which the company's production of large steel castings will be very considerably increased.

**Will Rebuild Plant.**—Fire broke out in the plant of Canada Beds, Ltd., at Chesley, Ont., on April 26. A newspaper report claimed it was of incendiary origin, but the firm is not inclined to accept this view. An official said to CANADIAN MACHINERY: "We will suffer a loss, but anticipate rebuilding. We are not at the present time prepared to state what equipment we will require but will be able to give you full particulars after our adjustment is made."

**C. P. R. Promotions.**—W. E. McGill is appointed assistant superintendent, Montreal terminals division, in place of J. B. Blair, transferred. H. P. Creighton is appointed B. & B. master, with headquarters at Schreiber, vice E. T. Draper, transferred. C. A. Wheeler is appointed division master mechanic, with headquarters at Sudbury, vice T. Hambley, promoted. T. Hambley is appointed master mechanic, with headquarters at North Bay, vice C. Gribbin, transferred. J. S. Allen is appointed general foreman, locomotive erecting shop, North Bay.

**Labor Troubles.**—Three hundred moulders left their work in sixteen Toronto shops on Friday night over wage differences. Their present wage is $4.50 a day and their requested increase is to $6 a day. It is stated in connection with this strike that it may extend to Hamilton. In British Columbia the wages now being paid for this class of work is $6.25 a day. Sheet metal workers are being paid 50 cents an hour and are asking 65 cents. They are being offered, it is stated, 52½ cents. Plumbers and steamfitters working on the water front are being organized now.

**Tool Companies Merge.**—The Independent Pneumatic Tool Co., Chicago, a New Jersey corporation, and the Aurora Automatic Machinery Co., incorporated in Delaware, have been consolidated under the name of the former and have been capitalized at $3,000,000. The general

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LABOR SAVING DEVICES

M E C

# Waiting Your Request

Is the M.E.C. illustrated catalog. It describes minutely the most dependable labor saving devices including these deservedly famed

M E C Air Cylinders, Air-Operated 2 and 3 Jaw Chucks, M.E.C. Master Hinge Collet Chucks and Collapsible Taps.

In your hands it will point the better way to compensate for any shortage of skilled labor with which you may be contending. Write to-day for your copy.

**MANUFACTURERS EQUIPMENT COMPANY**

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Canadian Agents: J. R. Stone Tool and Supply Co., Detroit, Mich. New York: J. R. Stone Tool and Supply Co., 30 Church Street

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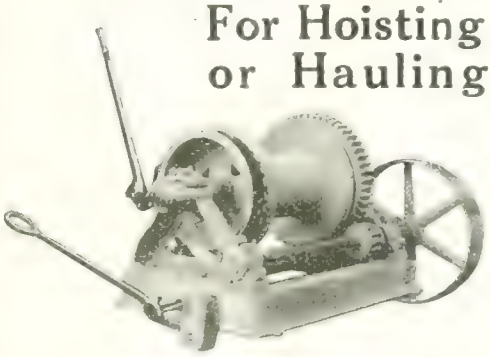
FOR FACTORY USE

For Hoisting or Hauling



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One Drum
Two Drums
Three Drums
or
Four Drums
as required.

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LIMITED
BELLEVILLE, - ONTARIO
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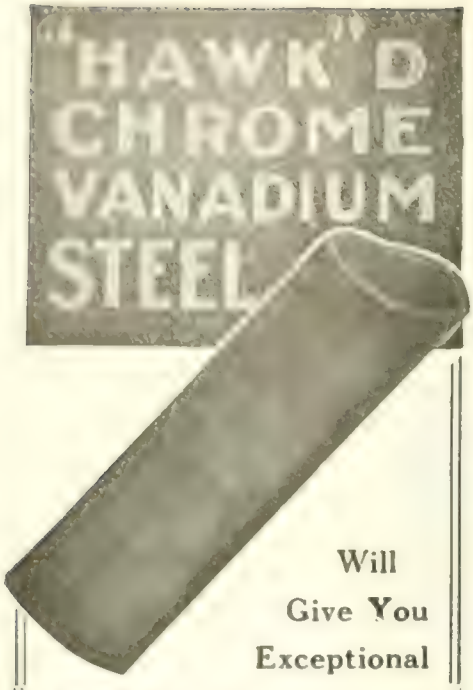


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**Shell Forging Production**

WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat-treated and ready for use.

It does not stick to the work.

There are many cases where each punch has turned out over 2,000 shells.

It means more shells, per machine per day.

STEEL OF EVERY DESCRIPTION.

**Hawkridge Brothers Company**

303 Congress St., BOSTON, MASS. U. S. A.

**THE IRON WORKS** LIMITED

Owen Sound Iron Works

Owen Sound, Ont.

Engineers

Boiler-makers

Founders

Machinists

Tank Work
Smoke Stacks,
Grey Iron and
Brass Castings,
Special
Machinery
Made to
Order


[illegible] of the company are: G. the Thor Building, 130 Scott Michigan Boulevard, Chicago. The pneumatic and electric tool plant is located at Aurora, Ill., and motor cycles and gasoline engines are manufactured at 361 West Superior Street, Chicago. John D. Hurley has been elected president.

**Lake Superior Corporation Production.**—The Lake Superior Corporation for nine months ended March 31, 1918, produced 211,452 tons of finished material, as compared with 170,076 tons for the same period in 1917. The unfilled orders on hand March 31st, 1918, approximated 392,795 tons. Steel ingot output in March was 48,000 tons. This exceeds the output of three preceding months. The company intends to bring production to around 50,000 tons a month, and to attain this is working on the construction of thirty coke ovens.

**Hamilton Industrial Prospects Good.**—Speaking of industrial prospects, C. W. Kirkpatrick, commissioner of industries, said the outlook was never brighter than at the present time, when he is carrying on negotiations with twelve different concerns which are considering Hamilton as a favorable point in which to locate branch factories. Mr. Kirkpatrick is very desirous of securing a small factory building with a floor space of not less than 12,000 square feet, for an American concern which wants to locate in this city. Such a building must be adapted for light machinery and foundry work.

**Patents Issued.**—The following is a list of Canadian patents recently issued through the agency of Messrs. Ridout & Maybee, 59 Yonge Street, Toronto, from whom further particulars may be obtained:—Joseph G. Rubino, talking machine cabinet; Andrew F. Small, fastening means for wall boards; Henri H. Vosburgh, turnbuckle; William Wilkie, machine for turning down the edge of cloth of wearing apparel in the process of manufacture; David Bridge & Co., Limited, friction clutch; Mead, McLean & Co., Limited, ventilators for vehicles and the like; Borden's Condensed Milk Co., dried milk and its manufacture; Harry E. Day, gearing; Thomas Gill, gear boxes for automobiles and other vehicles; Earl D. Ryckman, stump extractor.

**Shipments of Coal to Canada Restricted.**—Plans for the restriction of the movement of anthracite coal from the United States to Canada during the present year have been formulated by the United States Fuel Administration in co-operation with the Fuel Controller of Canada. A representative of the former attended a recent conference of representatives of coal operators, coal miners and railways in Canada, at which this problem was discussed. The conference reached an agreement as to the movement of anthracite coal into Canada, embracing the following: Anthracite coal supplies to points in Western Canada will be materially restricted during the present coal year. No American anthracite will be available for shipment to points west of Winnipeg.

# TENDERS

**Edmonton, Alta.**—Tenders will be received up to June 1st next for the supply of automobile number plates for the Province of Alberta during the year 1919. Specifications may be obtained on application to the Deputy Provincial Secretary, Edmonton, Alberta.

**Quebec, Que.**—Tenders for storage dam at river St. Anne (of Beaupre) will be received at the office of the Quebec Streams Commission, Room 125, Parliament Buildings, Quebec, until Tuesday, May 21, 1918. Plans and specifications can be seen at the said office or at the Quebec Streams Commission's office, Montreal.

**Ottawa, Ont.**—Tenders will be received until Friday, May 10, 1918, for the roofing and sheet metal work for Military Orthopedic Hospital, Christie street, Toronto, Ont. Plans and forms of contract can be seen and specifications and forms of tender obtained at the offices of the chief architect, Department of Public Works, Ottawa, and the clerk of works, Postal Station "F," Toronto, Ont.

**Dundas, Ont.**—Tenders will be received up till May 14, 1918, for reinforced concrete sedimentation basin and rapid sand filter as follows:—A. Bulk tender for basin and building of reinforced concrete and hollow tile; B. Filter equipment. Plans and specifications may be seen at the office of E. H. Darling, consulting engineer, 604 Spectator Building, Hamilton, Ont., or at the office of the Commission, Dundas, Ont.

**Ottawa, Ont.**—Tenders will be received until May 21, 1918, for the "Iron Stairwork" required in the reconstruction of the Parliament buildings. All tenders to be based on the supplying, execution, erection and completion; together with the furnishing of all tools, appliances, labor, etc., as required and described by the plans and specifications for "Iron Stairwork." Plans and specifications and any other information required can be obtained at the office of the general contractor, P. Lyall & Sons Construction Co., Ottawa.

**Ottawa, Ont.**—Tenders will be received until May 21, 1918, for the plate glass and leaded glazing required in the rolled steel casements of the exterior of the Parliament Buildings. All tenders to be based on the execution, completion and delivery on the site; together with the furnishing of all material, tools, appliances, labor, etc., for the work as required and described by the plans and specifications and in conformity with the samples submitted, for—(A) Glazing exterior casement frames; (B) Exterior leaded glazing. Separate tenders will be submitted for "A" and "B." Plans, specifications and any other information required can be obtained at the office of the general contractor, P. Lyall & Sons Construction Co., Ottawa.

# MARINE

**Vancouver.**—The Way Cayuse, a 2,500 ton wooden ship, was launched successfully at North Vancouver, the third of

its kind to take the water from the Lyall shipyards.

**Coke Export Licensed from U. S.**—A Washington dispatch states that Fuel Administrator Garfield has placed coke under license for export to foreign countries.

**Sarnia, Ont.**—The steamer Royalite, which arrived at Sarnia with a cargo of oil last Saturday, is being lightered before proceeding to Welland. She encountered heavy ice on her trip down and is leaking.

**Fort William.**—Captain Jordan, master of the steamer Franz, the first of the lake carriers to make Fort William harbor since the opening of navigation, was invited to the Kam. Club, where he was presented on behalf of the Fort William Board of Trade with the customary high silk hat, by W. F. Hogarth, chairman of the harbor committee of the board.

**Montreal, Que.**—The Canada Steamship Lines' vessel, Calgarian, 1,300 tons, has arrived light from Toronto and will proceed to the Montreal drydock for repairs prior to being placed into commission for other work. When ready for sea the Calgarian will in all probability leave for an Atlantic port to start upon her new duties.

**The Canadian Bridge Co.**, Walkerville, Ont., announces the appointment of John W. Seens as sales manager with offices in the New Birks Building, Montreal, effective May 1, 1918. Mr. Seens was for the past seven years manager of the Structural Steel Co. of Montreal. Joseph Labelle, formerly designing engineer of the Structural Steel Co., has been retained as sales manager in the Montreal office of the Canadian Bridge Co.

**Halifax, N.S.**—The Dominion Government steamer Stanley, reported in distress north-east of East Point, P.E.I., while en route to the Magdalen Islands from Louisburg, C.B., is still drifting helplessly in the ice. A wireless message from the steamer last Friday night to the Marine and Fisheries Department here reported that she was then only ten miles north-west of Cape St. Lawrence, C.B. The Stanley reported that she had effected temporary repairs to her rudder, but that the ice was so closely packed that she could make no headway.

**Demand for Tractors Was Quite Heavy.**—The Dominion Government has received orders for every one of the thousand tractors ordered from the Ford Company on behalf of Canadian farmers, and is taking no further applications. The Ontario Government, which took 200 of the Dominion's tractors, still has from 79 to 80 available. Farmers who want a tractor are advised to get in their orders since with the press of contracts with various State Governments the Ford Company will not be able to fill orders from private individuals for some time.

**Standardize Wages in Railway Shops.**—Conferences between a committee representative of all the railway shop trades of Canada and a committee representative of all the Canadian rail-


# Hydro-Electric Grave-Digging in Progress

FOR every Canadian interested in the principles of public ownership that pays there is a regular searchlight on the subject in THE FINANCIAL POST of May 4th. On page 10 appears an editorial and a leading article which give financial facts, and business-like principles so intimately connected with the ultimate success of the Hydro that not even the most decided critic of public ownership as expressed in the present management of Hydro-Electric affairs in Ontario can fail to find in them food for thought.

## Burial of Hydro Hopes

In the [illegible] account rendered from the pen by City Auditor H. T. Jamieson, of St. Catharines, there are warnings which cannot be neglected. They point to the [illegible] Hydro methods of financing and accounting at present [illegible] to the very spade and pick-axe strokes by which the Hydro is digging its own grave as fast as human [illegible] Whether you are a supporter of Sir Adam Beck or not [illegible] these articles. They are intensely important to all Ontario to-day, and to all Canada as far as principles of public [illegible] are concerned. Remember they appear in THE FINANCIAL POST of May 4th, and with them THE POST contains the most [illegible] of business news under such headings as these:

Canadian Trade Increased Bank Credits in March

Provincial Commission Forestal's Courts Re Niagara Franchise.

Mystery as to What Britain is Doing With Gold.

Reconstruction of Cabinet is Ottawa Gossip.

Looks like Three Hundred Million Bushels Export Wheat.

Iron Enough for Twenty-five Years' Supply in B.C. Ores.

Claims of British Columbia as to C.N.R. Voiced by Premier

Underlying Causes of Movement in New York Funds.

April was a Good Month in Toronto Realty Business.

German Banks Amalgamate in Preparation For After War.

Bond Market Has Been Pretty Well Cleared of Issues.

Edmonton Taking Steps to Meet Its Maturing Bonds.

Montreal Asks One Million From Quebec Province.

Fire Insurance Commission Takes Up Fire Prevention.

Jitneys to be Abolished in Winnipeg.

Lord Shaughnessy's Report on Canadian Pacific Railway

Organizing for Victories to Follow the War.

These [illegible] indicate some of the principal subjects of importance to Canadian business men and investors which you will find ably dealt with both as to news facts and comment in THE FINANCIAL POST of May 4th. Remember, THE POST is the business newspaper of Canada with not only a high standard staff of its own, but with the specialized attention and assistance of [illegible] newspaper editors also devoted to making [illegible] alert man of affairs. For Three Dollars a year you can have THE POST every week. Just fill up this coupon.

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[illegible] trades and local in Montreal last week with a view to standardizing wages throughout the country. The various shop trades recently determined on a closer organization to obviate the overlapping of effort perennially expended in various parts of the country with the end in view, and as a result they formed Division No. 4 of the American Federation of Labor, Railway Department. Then they appointed a committee of twelve from that division to negotiate with a joint committee from all the roads wherever changes are desired in the wage schedule now existing and in the present working conditions. Fifty thousand men are involved in the negotiations.

**Launchings from U. S. Shipyards This Year.** Exact figures on the progress of the merchant shipbuilding program in the United States this year were disclosed last Friday for the first time. They show that under direction of the Shipping Board there have been launched 236 steel and wooden vessels, with an aggregate tonnage of 1,440,622. There now are operating 157 shipyards with 753 ways in use. There are 398 steel ways, 332 wooden ways, either completed or under construction, four concrete ways, and 19 ways devoted to naval work. The launchings of steel ships include 18 vessels with a total tonnage of 136,250, constructed under Government contracts, and 183 with an aggregate tonnage of 1,195,887, obtained by requisition. The grand total of contract and requisitioned ships already launched is 1,332,127 tons. Already delivered are 138 steel vessels, with a total tonnage of 977,371. Wooden ships launched number 35, with an approximate tonnage of 108,500.

## BUILDINGS

**Toronto, Ont.**—City Architect Pearse has issued a building permit to M. Granatstein for a four-storey brick and reinforced concrete warehouse at 488 Wellington street west. The building will cost $50,000.

## CONTRACTS

**Vancouver, B.C.**—The Davies Construction Co. have the general contract for the erection of a $11,500 car shop for the C.P.R.

## RAILWAYS

**Toronto, Ont.**—The Hydro-Electric Power Commission has been granted permission by the Ontario Railway and Municipal Board to construct a temporary railway over certain roads in Stamford Township in order to provide an outlet for material taken out in the excavation of the new Chippewa power canal. The road will be taken up when the work is completed.

**Brantford, Ont.**—Notice has been received here by the Board of Trade that the Dominion Railway Board will meet in Brantford to consider the application of local manufacturers for free interswitching between the three railways—G. T. R., T., H. and B., and C. P. R. At present an order of the Dominion Board is effective that where a railway has a switch into a factory, the railway in question has priority in the matter of routing outgoing freight, and the application of this city is for the rescinding of the order

## WOODWORKING

**John Island, Que.**—The saw mill owned by the Multhrop Lumber Co. was recently destroyed by fire.

**Grandmere, Que.**—The Laurentide Co's saw mill was destroyed by fire recently, the loss being estimated at $20,000. The company will rebuild.

**Port Arthur, Ont.**—J. Stirrett & Sons is making preparations for the erection of a sawmill to cost, including machinery, etc., approximately $60,000.

### JUST LIKE YOUR WORK

(Continued from page 497)

settle by next day. I told him plain I'd cut the belts and take out his machinery if he failed. He wanted to give security. I told him we didn't want security. I was there to get the machinery or the money. I knew what he had in the way of assets and showed what we were prepared to do. Well, to make a long story short, we made an agreement for the time. Later he sold, but I went to repossess the place. As soon as our men were ready to go ahead the mill man appeared with a gun. He didn't have much to say, simply, 'The first man who lays a hand on this mill will be shot.' It was up to me, so I said 'I'll be the first man, now shoot.' It didn't do any good. The rest of the boys didn't like the looks of the gun and quit. Later he sold the mill and I garnisheed the payment. I met him in town shortly after. 'Well, you beat me to it in the end,' he said. We shook hands and at his suggestion and expense we went out and had dinner on top of it. We parted very good friends."

**The "Promoter" Type**

Mr. Cronk is not in love with the promoter. "I remember one chap, a German. He came in here and bought about $8,000 worth of machinery, paying a good sum down. He put that plant in a Saskatchewan town and organized a million dollar wood-turning business. Taking it into another province put a few kinks in the usual run of liens on the plant, and we had quite a lot of trouble getting that squared away. In that case I was up against the Saskatchewan Government and several corporations and loan agencies. It was a big squabble, but we got the machinery."

Mr. Cronk is well known in the machinery trade. As the picture on this page suggests, he's fond of flowers. The other shows him on the load near Monteith.

**J. G. Reid**, assistant superintendent of dredging of the Montreal Harbor has just completed his 24th year in the service of the Montreal Harbor Commissioners.

## THE PITTSBURG MARKET LETTER

(Continued from page 502.)

are taking more interest in the distribution of the so-called "commercial" steel, recognizing clearly that some of it is indirectly very helpful towards winning the war. At one time it was contemplated to take over formally the distribution of all commercial steel. This proposition has been tabled, with the understanding that the mills themselves distribute such steel as may be left, in places where it will do the most good. Without a formal order, the producers have been informed that they should set first in the distribution of commercial steel two classes: (1) Steel involving oil development and transportation; (2) Steel involved in agriculture. Other classes of consumption the steel producers are to serve according to their own judgment.

### The Market

In the circumstances the finished steel market has become a particularly narrow one. Transactions are of course altogether exceptional, when so little of the commercial steel on books is being shipped. There is no very great buying pressure upon the market, however, because consumers as a rule are much more interested in securing deliveries against orders already on books than in placing additional orders. In pig iron there is a moderate amount of business, in point of number of orders, but the tonnage is small, and most of the orders are for Government account.

### Production

Production has been increasing slightly, but only very slightly. Taking a few weeks together there is an increase, and production at the moment is probably nearer 90 per cent. of capacity than 85 per cent., which was approximately the average in March. The Carnegie Steel Company has put on two additional blast furnaces, giving it 51 in operation of a total of 59, its pig iron production being now about 90 per cent. of capacity. Other interests are operating at higher and lower rates than this.


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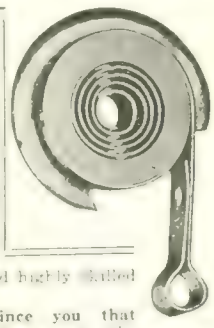

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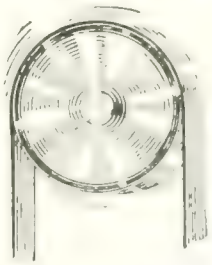

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Vol. XIX. TORONTO, MAY 16, 1918 No. 20


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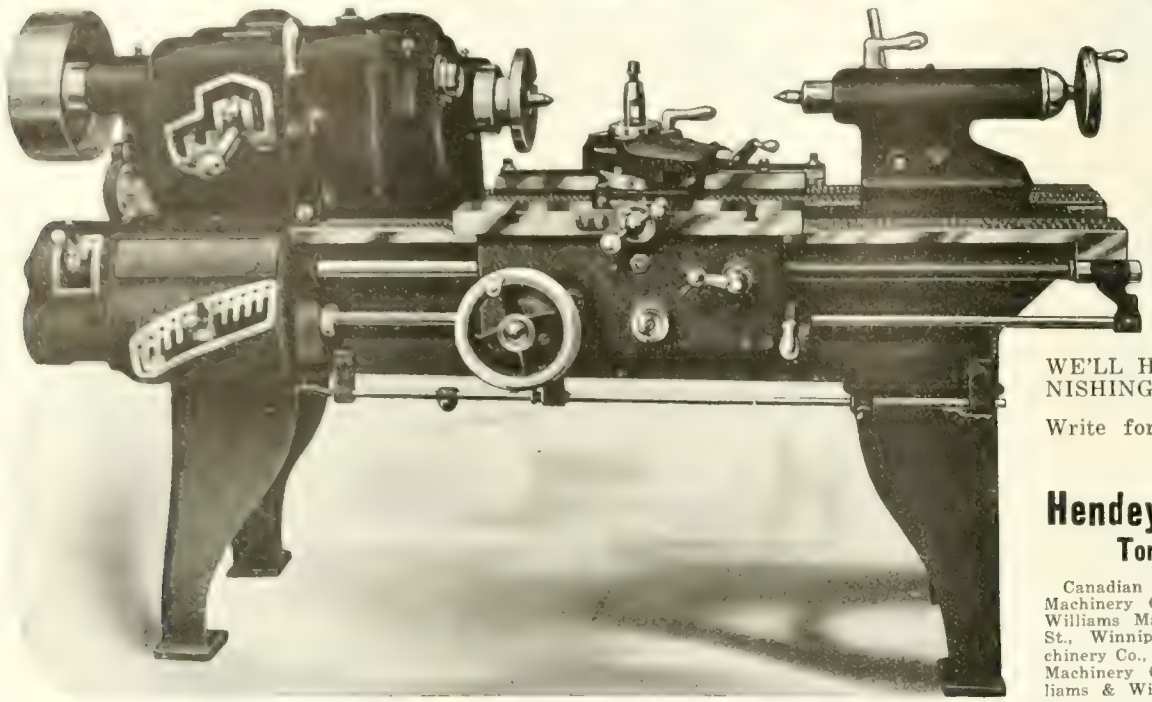

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CANADIAN MACHINERY
AND
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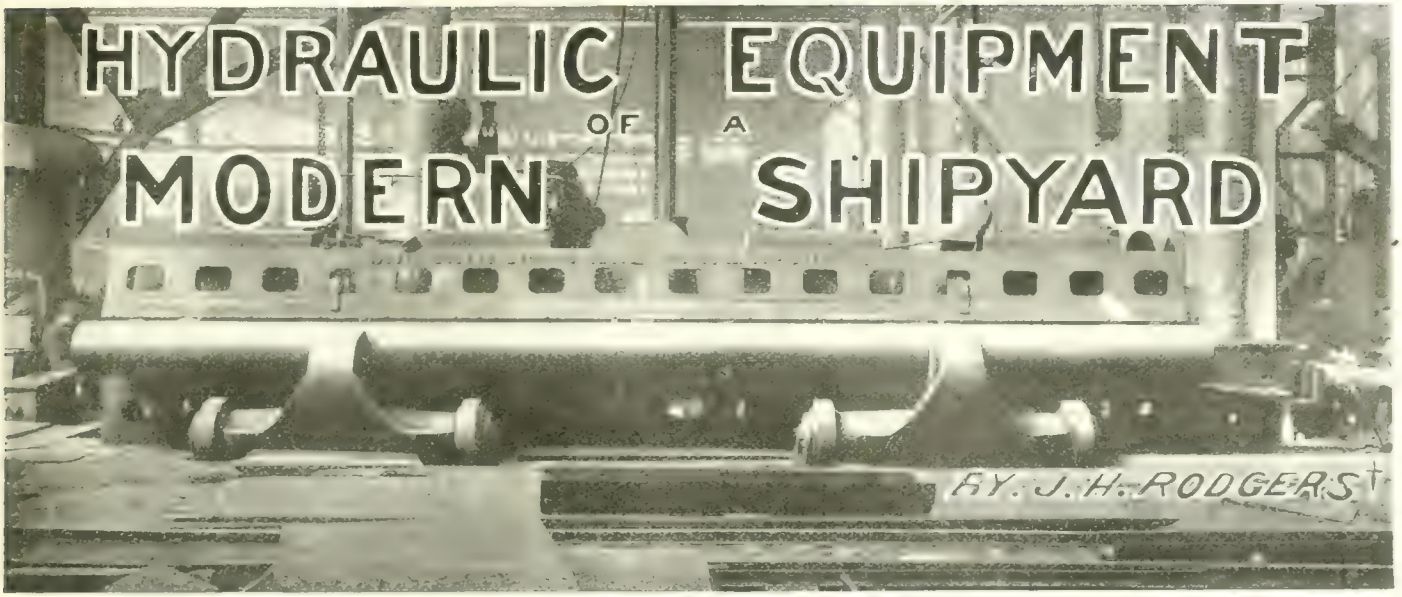
Volume XIX No. 20 May 16, 1918

# HYDRAULIC EQUIPMENT OF A MODERN SHIPYARD




*Through the courtesy of a prominent Canadian shipbuilding company we are enabled to present the accompanying article which illustrates modern practice in a fully equipped plant.*

MODERN steel ship construction would be practically impossible without the aid of hydraulic equipment. The nature of the enterprise involves the forming and bending of heavy steel plates for the hull and the framework that would be difficult to accomplish by any other method. The developments that have taken place in this country during the past two years, and more particularly in the last twelve months, have resulted in the establishment of many new shipyards, but owing to the great difficulty in obtaining ship plates, a great number of these yards are constructing wooden vessels. In view of later expansion when the necessary plates are available, it is of interest to study the class of hydraulic machinery installed by one of the large Canadian shipyards.

Weather conditions in Canada are not particularly favorable for the successful maintenance of such equipment, as it is generally located in large sheds or buildings which are difficult to heat during the winter months. Destruction of hydraulic appliances through the agency of frost must be guarded against, especially in northern climates, where the possibilities of freezing are much greater, owing to the frequent and often sudden changes of temperature and atmospheric conditions. This plant, although situated on the shores of the St. Lawrence River, has experienced little difficulty in this connection, due largely to the efficient piping installations and its method of delivery from the pumps in the engine room to the various departments.

From the accumulator, located in the engine room, the piping is carried through a spacious tunnel well below the ground level, the top of the tunnel being about six feet below the surface. This tunnel also contains all electrical conduits, water pipes, steam pipes, etc., which assist in maintaining a uniform temperature that prevents the possibility of frost. The total length of the tunnel is nearly 3,000 feet, and it extends from the power plant to the iron workers' shed, and thence alongside one of the quay walls. From the main tunnel the piping is distributed to the various buildings and to the different machines. This system of delivering the water from the pumps to the presses has been the chief help in avoiding trouble from frost. During the past winter, however, a slight accident was experienced on the horizontal bulldozer, shown in Fig. 1, when the flange of the return cylinder was broken off, through the freezing of the water and the subsequent expansion. This indicates the necessity of always draining the water from hydraulic equipment whenever it is out of service, and also the precaution that must be exercised to guard against low temperatures where such machinery is used.

### Portable Hydraulic Forming Press

One of the disadvantages of hydraulic equipment is that it is not very suitable for portable use owing to the special facilities that would be required for such purposes, so that in few instances will it be found that appliances are adapted for service other than in a permanent position in the shop, where the work can be conveniently brought to the machine for the necessary operations. However, occasions sometimes arise where it is almost impossible to accomplish certain operations unless the machine can be transferred to different locations on the work, where the same is held in a fixed position while one or more bends are being formed. This condition applies to the shaping of many pieces in connection with the angle irons that constitute certain portions of a ship's framework. By the use of a small portable press for this purpose it is much easier to work to the template, which can be more conveniently handled when it is not required to move the piece being formed.

For efficient work of this character it is necessary to have suitable equipment; on the discharge end of the furnace, where the work is heated, it is the general practice to have a considerable space fitted with heavy cast iron floor

†Associate Editor Canadian Machinery

FIG. 1. HORIZONTAL BULLDOZER

press, the top surface of which is made as level as possible. These plates are provided with a large number of cored holes into which are placed the steel pins that act as fulcrums for the bending operations, and also a heel for taking the thrust of the hydraulic ram.

In Fig. 2 is shown one of the few hydraulic units adapted for portable service. In the operation of this press it is necessary to utilize two lengths of hose, one for the supply and the other for the discharge. For moving from one location to another the appliance is provided with a pair of handles, the lower ends of which are connected to a pair of wheels in such a manner that the cylinder is raised from the floor when the handles are pressed downwards, thus facilitating the movement of the machine to another position. The ram of this particular press is 4 inches in diameter and the working pressure is 1,500 lbs. per sq. inch.

The chief difficulty experienced in the operation of portable hydraulic equipment is the inability to get flexible connections that will stand up to the continual strain of the high pressure required. The pressure itself is not the most serious factor, but if particular care is not exercised in moving the machine the liability of kinking the hose, first in one direction and then in the other, soon destroys its usefulness, as cracks frequently develop and prevent further use for effective work. The reinforced hose used in this plant is principally of English manufacture, as others have not given very good results. Even the best, however, will have a short life unless great precaution is taken to protect the hose from injury.

### Hydraulic Press With Plate Frame

A special design of press is shown in Fig. 3, where the frame is composed of steel plates, I beams and angle irons. The cast iron cylinders are supported between the overhanging arm with their axis in a vertical position, the main cylinder being 9 ins. in diameter and the return cylinder 4 ins. This press can be used for a large variety of light work, owing to the double arrangement of the working of cylinders. It is generally used for the making and trimming of small forgings. Presses built after this pattern are not as satisfactory as those constructed of cast iron, owing to the greater elasticity of the metal.

### Vertical Plate Rolls

Forming the plates for the cylindrical portions of marine boilers is one of the chief details in connection with the work of a shipbuilding plant. In many establishments, particularly those of the smaller type where the plates are of the lighter sizes, the three-roll horizontal system is extensively used. In this plant the heavy plates for the high pressure boilers are formed in the large vertical plate roll shown in Fig. 4, manufactured by Hugh Smith and Company of Glasgow. With the three-roll type the bend is made by the action of the rolls in motion, forcing the plate against the third or shaping roll. In the machine here illustrated the bend is accomplished by the application of pressure while the plate is held stationary, this action being repeated at regular intervals as the plate is revolved intermittently, by the movement of the large main roll.

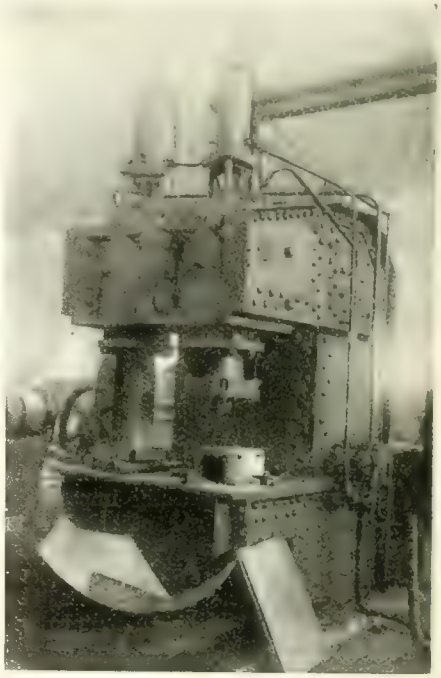


FIG. 3. 60-TON HYDRAULIC PRESS WITH PLATE FRAME.

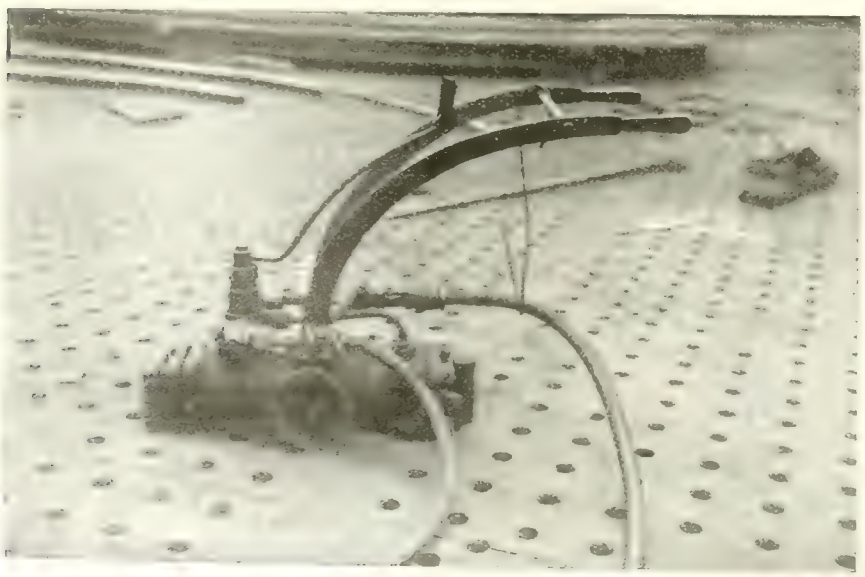


FIG. 2. SMALL PORTABLE HYDRAULIC UNIT.

The machine can be operated at will or automatically, as desired, and the movement can be obtained in either direction. When the plate is first placed in position in the machine, the small rolls A A A that are carried in the forked end of the piston connected to the ram of the small hydraulic cylinders contained in the main cross beam, are moved back to permit the insertion of the plate

between the small rolls and the main roll B. The three small rolls A are for the purpose of retaining the plate in constant contact with the main roll, and maintain it in a parallel position while it is being revolved for the following impression. The diameter of these small cylinders is about 3 ins., so that with an initial pressure of 1,500 lbs. per sq. inch the power exerted against each of the three rolls will be about 10,000 lbs. When in the desired position, the movement of the large roll—which is obtained through a system of gearing below the floor—is stopped, so that the bending pressure is applied when the plate is at rest.

The front face of the cross beam C is formed of two long narrow machined strips on either side of the central recess, into which the roll B enters when the cross-head C is forced outwards. This movement is obtained by the action of the toggle F at the top and a similar one (not shown) located below the level of the floor. One end of these toggles is secured to the movable cross-beam C, while the other end is pivoted to the fixed frame member G. The knuckles are connected to the links extending from either end of the operating ram, the cross-head of which is seen at E; the hydraulic cylinders D being located about midway of the height and supported on the central tie rods. The automatic ratchet mechanism is shown at H, and the main control handle at I. When the auxiliary handle is locked in the position shown, the machine will operate automatically during the period desired. When the end of the plate has been reached the reverse is set by hand and the machine operated automatically in the opposite direction. On the heavy plates several reversals are necessary before the required operation is completed. This machine has a capacity for plates about 10 ft. wide and 1½ in. thick.

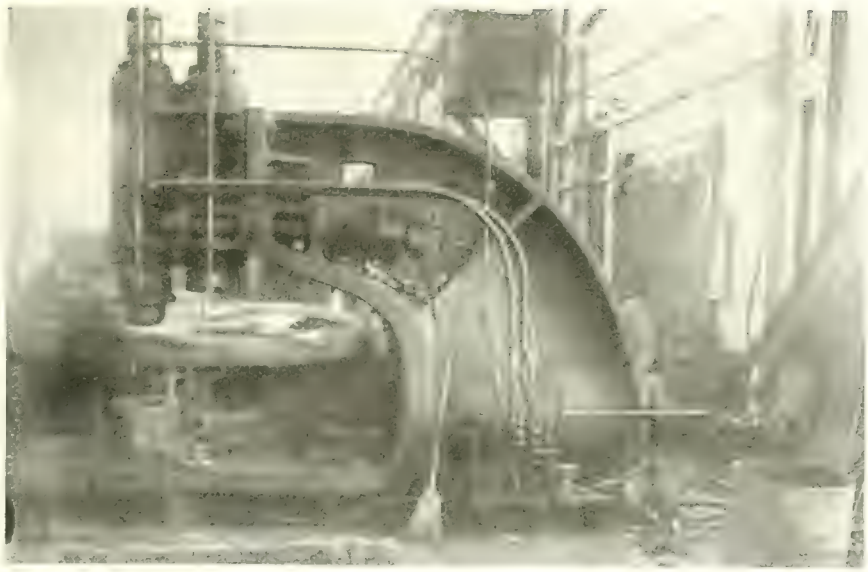


FIG. 5 FOUR-CYLINDER FLANGING PRESS

### Four-Cylinder Flanging Press

A very interesting design of hydraulic press is illustrated in Fig. 5. This is the single frame type and is provided with four rams; two in the upper portion of the overhanging arm, parallel and adjacent to one another; one in a horizontal position at the junction of the arm and the base; and the fourth in a vertical position in the base, in line with the outer of the top two. The arrangement of these four cylinders is such that almost any operation of a flanging, forming, or bending nature can be readily performed. When flanging, the forward of the upper two rams is used as a clamp, while the inner one is bending the flange. The horizontal ram is then used for finishing the piece to the desired shape of the forming block, the latter being bolted to the bed of the press. Each ram can be operated independently, the control levers being shown in the right foreground. For such operations as fire hole or man hole forming, special dies are constructed so that the impression is made at one setting of the dies. Large furnaces are located nearby for the heating of the materials.

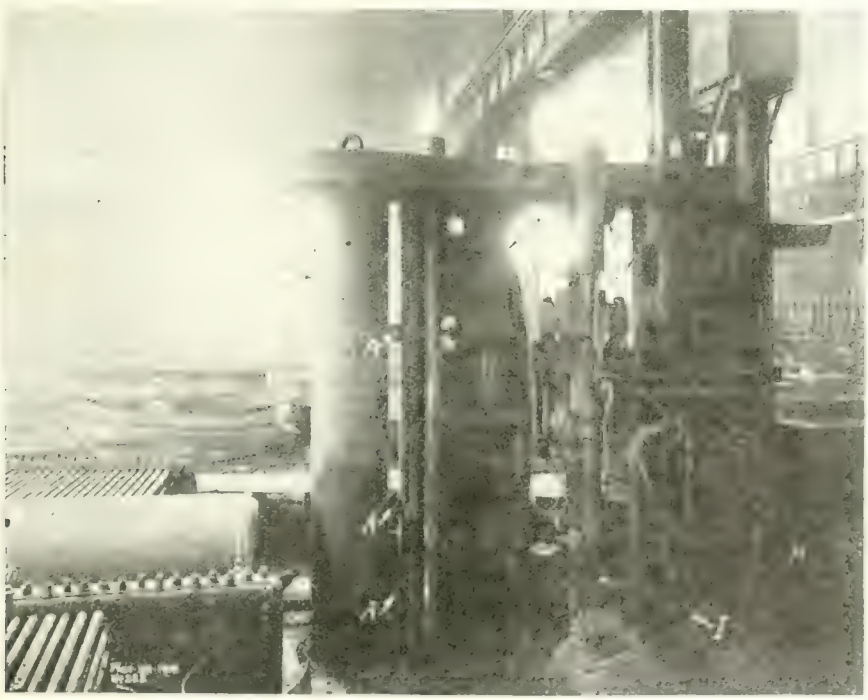


FIG. 4 VERTICAL BOILER PLATE ROLLS

### Large Hydraulic Gap Riveter

In the manufacture of boilers and the construction of steel vessels the uniting of the various parts is mostly accomplished by means of riveted joints, with subsequent caulking of the seams to make them perfectly steam or water tight. Hand riveting is fast becoming a lost art, as power appliances are now extensively used for this purpose. Pneumatic tools are probably recognized as being of greater service than those operated by hydraulic pressure; this, however, is due to the portable character of the air operated tools and the adaptability to conditions, where it would be impossible to use the hydraulic equipment, rather than the inefficiency of the latter, as in many respects the steady pressure of the hydraulic riveter will accomplish much better results than the rapid fire of the pneumatic tool.

For fabrication work the hydraulic riveter is generally given an important place in boiler shop and shipyard equipment, although necessity demands that the air riveter be utilized for erection purposes. Another feature that restricts the hydraulic machine to certain limits is the fact that the resistance of the operating pressure must be taken by the same frame that supports the hydraulic cylinder. It will therefore be readily seen that the effective use of the hydraulic riveter is confined within certain limits, whereas the air-operated tool can even be used to good advantage where it would be impossible to use the hand hammer.

In Fig. 6 is illustrated a large Southwark 12-foot gap riveter, used for the construction of marine boiler shells. The

the ram that carries the rivet set is sup-

**Keel Plate Bending Machine**

An interesting machine, both as regards its dimensions and its operation, is that of the keel plate bending machine shown in Fig. 8. The overall length of this machine is nearly 38 ft. and its total

The clamping of the stock is accomplished by hydraulic pressure from a 6 in. dia. cylinder located at the extreme right of the machine. The axis of this cylinder is set at an angle of 6 deg. with the horizontal to coincide with the taper

FIG. 6 [illegible] GAP HORIZONTAL RIVETER.

FIG. 7 300-TON HYDRAULIC JOGGLER.

with the set in the anvil. The cylinder has a diameter of 9 ins., which gives a compression pressure on the rivet of about 45 tons. A platform is provided for the convenience of the operator. An advantage that the hydraulic method of riveting has over the pneumatic system is that the applied pressure has a greater tendency to spread the rivet in the hole, a factor that adds to the stability of the work.

**Lambie's Hydraulic Joggler**

Joggling of bars and angle irons is a frequent operation in connection with steel ship construction. For this purpose it is necessary to provide powerful machines, owing to the sharp offset required. Fig. 7 shows a Lambie's hydraulic joggler adapted for this operation. This press is of special heavy design, the operating cylinder having a diameter of 24 ins., providing a pressure, when fully loaded, of 300 tons. The return cylinders, 6 ins., dia., are located on either side of the main cylinder, and are used for discharging the water from the central cylinder and elevating the ram after the operation has been performed. The press is provided with special dies for the rapid handling of the work; these dies are so constructed that they can be adjusted laterally for the different thicknesses of metal.

weight is approximately 90 tons. The main braking beam, over which the stock is bent, is in two sections and is supported—or suspended—from four massive arms extending up from the back of the machine. These are of the box type to reduce the weight and yet provide ample strength and rigidity for the heavy duty required. The forming roll, made of forged steel, has a diameter of 17 ins. and a length of 30 ft., the weight of the roll being about 12 tons. The roll is freely supported at a distance of about ¼ of its total length from each end in the bearings of the two swinging arms, the lower end of each arm being attached to the ram of a hydraulic cylinder, which is located below the floor level. The diameter of each cylinder is 18 ins., so that a total pressure of 180 tons can be exerted in the bending of the work, with the exception of that required to raise the roll and its supports. The roll is not fixed in its bearings, so that in the process of forming the work the shaft has a tendency to roll upon the material, thus eliminating the friction that would otherwise be present.

To guide the swinging arms in their proper path and also maintain them in a parallel position, two links are provided on either arm, the inner end being secured to lugs on the machine base.

of the wedge on the clamping beam. The upper edge of this beam is parallel with the under face of the brake beam, and the lower surface is divided into four equal steps or wedges, having a taper of about 1 in. per ft. The two main cylinders can be operated jointly or independently as desired, so that tapered work may be easily accomplished. This machine, while primarily designed and intended for the bending of keel plates, can be adapted to a variety of purposes in connection with steel ship construction.

**250-Ton Press for Large Work**

Of the many designs of hydraulic presses, none is more adaptable to such a wide range of operations than that shown in Fig. 9. This machine is especially suited to the forming of large plates into shapes that would be very difficult to obtain in any other manner. By the use of various blocks, either of wood or iron, any desired shape can be readily attained, the workmen in time becoming very expert in its manipulation. The base of the machine, with the operating cylinders, is located below the floor level, and extending upwards are the four main corner shafts for supporting the upper head. The four corner screws are threaded for over half their length for adjusting the position of the top head.

The screws are 8 ins. in diameter, and 2½ threads per in., the nuts being 6 ins. thick. These nuts take the entire thrust of the hydraulic pressure, minus the weight of the part supported by the ram together with that of the top head. The lower table is on a level with the shop floor so that it is comparatively easy to move the work to and from the machine. The operating cylinders are four in number, the diameter of the main cylinder being 21¾ ins.; the internal cylinder 14 ins., the push up cylinders 7½ ins., and the clamping or vising cylinders, 6 ins. The control levers are shown to the extreme left.

## MINING SOCIETY OF NOVA SCOTIA PRESIDENTIAL ADDRESS

At the recent annual meeting of the Mining Institute of Nova Scotia (May 1 and 2), the presidential address was delivered by D. H. McDougall, general manager of the Dominion Steel Corporation, Sydney, N.S., who said:

On the occasion of our last meeting I made reference to the part played in this war by coal, and the subsequent course of events has given the general public and ourselves a very lively appreciation of the value of our domestic fuel supplies. We have realized through actual trial and experience the bearing of fuel supply upon our national independence. A combination of labor shortage, inadequate transportation facilities and unprecedently severe weather conditions during the past winter caused a fuel crisis in the United States which, but for swift and drastic action on the part of the United States Government, would have brought about a national catastrophe, in which we also should have been involved.

We have realized that no nation can stand alone unless it possesses an adequate fuel supply within its own borders. Fortunately for Canada, the republic to the south of us is our ally and companion in arms, and Canada has received most generous consideration from the United States in this matter of fuel supply.

Recently in Ottawa a representative of the Fuel Administrator of the United States told the assembled coal miners, operators, and transportation men of Canada that Canada would receive the same treatment from Dr. Garfield as though it were part of the United States itself. We were told that in the distribution of the available coal supply of the United States the boundary line between the two nations would be absolutely ignored, and that so far as the distribution of this most vital munition of war was concerned North America would be looked upon as being one nation with one common aim.

### Fuel Supply and Transportation

We have learned the intimate connection between fuel supply and transportation facilities. In this country of vast distances they are in fact practically indistinguishable one from the other. The problem of the utilization of the great bituminous and lignite fields of the Canadian West—as was abundantly demonstrated during the recent Fuel Conference at Ottawa—is altogether one of transportation.

I may remind you that the coalfields of Nova Scotia remained undeveloped, and the industry, which we so largely represent, did not emerge from its small beginnings until the transportation problem was solved, and the St. Lawrence market was opened to Nova Scotian coal by the provision of modern coal freighting vessels and of modern loading and discharging plants.

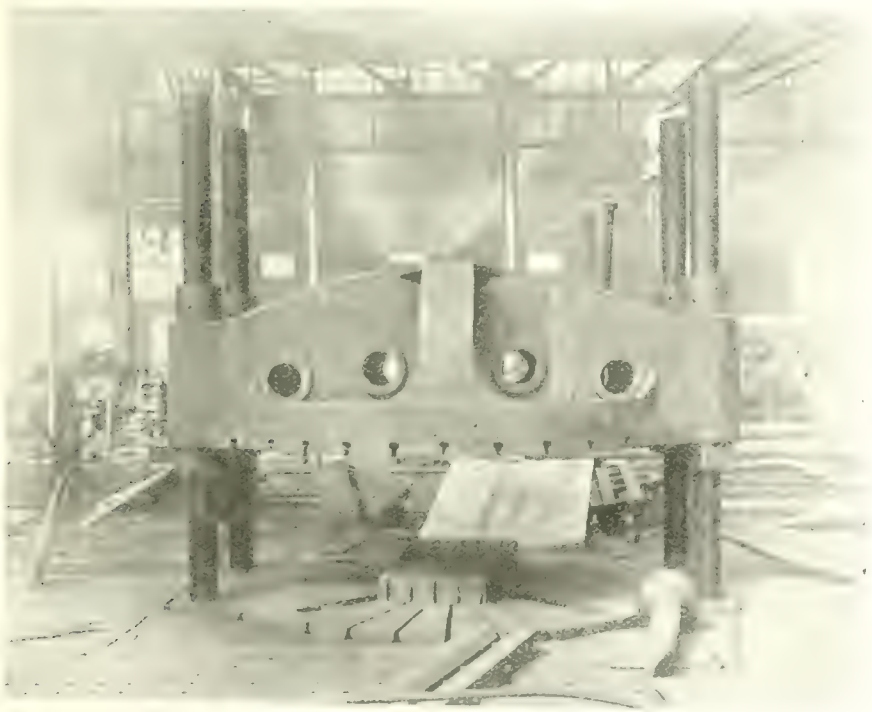


FIG. [illegible]-TON HYDRAULIC PRESS

At the present time the enormous increase in the percentage of coal consumed within the Province of Nova Scotia itself, accompanied by declining outputs, has obscured the present importance of transportation in our own particular case, but this problem will revive and will face us in greater intensity whenever we seek to regain the St. Lawrence market as an outlet for Nova Scotian coal.

We have further learned that the value of fuel and all questions of comparative excellence of fuels become considerations of a secondary character during times of fuel scarcity. We are learning to make the best of our own natural resources, and when fuel such as anthracite, possessing the desirable features of smokelessness and high calorific value, cannot be obtained, we must perforce turn our attention to the utilization of such fuels as peat, lignite, and even wood.

The Fuel Controller of Canada has announced that it is extremely unlikely that United States anthracite will be available next winter in the prairie territory west of Winnipeg, which means that bituminous coal and lignites will have to be used as substitutes.

It is not an unmixed evil for a people so virile and enterprising as our own people to be thrown back on their resources because it naturally leads to development and progress and probably the discovery of unsuspected excellences both in our natural resources and in our ability to make the best of them.

I may, in passing, point out that the shortage of anthracite is not a mere phase originating in present conditions. No country in the world, unless perhaps it is China, has been so favored in the possession of anthracite resources as the United States, but that the anthracite fields there are approaching a period of comparative exhaustion is evidenced by the fact that very thin seams of anthracite are to-day being worked, seams which in the past it would not have been deemed worth while to operate.

Another thing that we are learning is the intrinsic value of coal itself. Probably in regard to no basic raw material has there existed so widespread a misconception as in the case of coal. This misconception has not been confined to the general public, but it has extended to those whose daily business is the production and sale of coal.

The ultimate factors entering into the cost of coal have not been fully understood, and, without entering into detail, it may be briefly stated that coal has in the past—both in Canada and in the United States—been sold at prices below the actual cost of production, when such cost is considered over the whole life of any given coalfield. Further, it may be stated that the material value of coal itself has been underestimated, and perhaps no raw material has been so wastefully and unscientifically consumed in the past.

### Coal Supply and Demand

We are learning that the price of coal is not a deciding factor in days of fuel

[illegible] to produce.

[illegible] sharpest lesson in this connection. No small part of the barely averted catas[illegible] was due to the arbitrary fixing of coal prices in the summer of 1917. Any action in the fixing of prices which ignores the essential factor of production and does not simultaneously with the restriction of prices provide for the stimulation of [illegible] its own object. In the case of a raw material of such fundamental and vital importance as coal all government action should have as its first and guiding motive the increase of production.

Increase of coal production does not necessarily mean the opening of new mines, but rather the reverse. There has been throughout North America a general reduction in the working force at the collieries. In Nova Scotia this reduction of workmen has largely concentrated upon the actual miners and producers of coal as would naturally happen, because the producing class at a colliery—by a process of natural selection—includes the men most fitted by physique and mentality for military service. This withdrawal of the most efficient members of the working forces has not been peculiar to Nova Scotia, but is a noticeable feature throughout all the coalfields of North America.

Under these circumstances of labor shortage, of a selected character, the obvious remedy for the unbalanced conditions which it has brought about is the concentration of the remaining workmen in the collieries best equipped to give the greatest production of coal. The most noteworthy feature of the existing labor situation at the collieries is the inefficiency of operation brought about by the unbalancing of the forces referred to, and concentration is the remedy.

Not only is concentration desirable from the point of view of productive efficiency at the collieries, but it is also necessary to conserve the transportation factor. The fewer the points from which transportation is required and the greater the tonnage which can be moved from these points the less will be the call upon the motive power of the railways and upon shipping.

In view of the insistent calls of the army for more and still more men, it appears quite hopeless to look for any large increase of coal production arising from the provision of additional employees, and, as in the case of the fuel itself, we must make the best of the man power we have.

The coal operators are fully alive to the necessity of increasing production where it can be achieved by the use of mechanical devices, and the labor shortage has already brought forth mechanical devices which will play an increasingly important part in the future development of the coal industry. Unfortunately, this avenue of possible increase of coal production is restricted by the difficulty of obtaining delivery of machinery, so for the present the only way by which coal production can be stimulated is that every man employed in the industry—no matter what his position—shall work to the full extent of his ability.

Our chief incentive to hard work [illegible] and here you will pardon me if I repeat my statement of last year—that, "no single department of the machinery of modern warfare can move or act without coal." Those of us who help in one way or another in the production of coal are privileged in that we are able by our personal endeavors to help or hinder in the prosecution of the war. In view of the critical condition of military affairs at a time when we are approaching the end of the fourth year of the struggle, I believe I voice the feelings of us all when I say that we need no further spur.

## ACID-RESISTING IRON

FOR many years chemists and metallurgists have been seeking some form of metal which could be adapted for the requirements of the chemical industry for the purpose of resisting the corrosive action of acids, but it is only in comparatively recent years that there has become available acid-resisting iron suitable for large chemical plants.

It has long since been proven in the laboratory that a pure form of iron could be rendered resistant to either sulphuric or nitric acid by the addition of a suitable proportion of silicon, chromium or other elements, but according to S. J. Tungay who discussed the matter recently before the Society of Chemical Industry in London, Eng., the development and application of such metals upon an industrial and commercial basis was not approached until some twenty years ago.

### Foreign Efforts

In Paris, Jouvre successfully made small castings and in Germany "neutraleisen," so-called, was produced by more than one metallurgical house for producing castings to withstand nitric or sulphuric acids, but the firms which took it up did not meet with commercial success. In more recent years the development of the electric furnace had proved a valuable aid in the satisfactory commercial production of such alloys as ferro-silicon and ferro-chromium. Kowalke, in America, had made considerable research, and his tests showed that silicon present in a lesser quantity than 12 per cent. did not promote satisfactory resistance to corrosion, whilst, when it reached 19 per cent. or more, the acid resisting quality of the alloy again fell.

In addition to the serious difficulties presented by the considerable shrinkage of non-corrosive iron castings during cooling, which amounted to slightly over ¼ in. per foot in each direction, as compared with a shrinkage of about 3-32 in. per foot in the case of ordinary cast iron, the presence of graphite in any considerable quantity caused disaster. The iron must also be low in carbon and phosphorus, otherwise during the process of cooling these compounds tended to separate out and form eutectics. Some tests recently made at the Manchester School of Technology showed these eutectics to consist largely of phosphorus and silicon. These difficulties, however, had been largely overcome by suitable furnaces and by improved manipulation in mixing the metal, with the result that in present commercial practice it was found quite possible to produce a satisfactory acid resisting iron, but its application to the manufacture of large plant for the chemical industry had not until recently been completely successful.

The physical constants of acid-resisting iron compared with cast iron are as follows:

| | Cast iron. | Acid resist. iron |
|---|---|---|
| Density | 7.3 | 6.8 |
| Tensile strength (tons per sq. in.) | 9-10 | 6-7 |
| Melting point | 1150 deg. Cent. | 1200 deg. Cent. |
| Hardness | 24 | 35 |
| Heat conductivity | 10 | 8 |
| Electrical resistance | 8 | 10 |
| Contraction per foot in casting | 3-32 in. | 9-32 in. |
| Crushing 1 in. cubes | 40 tons | 34 tons |

Since the outbreak of war, acid-resisting iron has played no small part in the construction of plant for the production of propellants and high explosives. For the condensation of nitric acid, it was found to be a great boon, as plants of large capacity had to be erected rapidly at short notice, and it was found possible to instal many large nitric acid plants of this class of iron much more rapidly than would have been the case with pottery, as was more usual. In addition it was found that that acid-resisting iron possessed a much higher efficiency owing to its greater heat conductivity than earthenware. The heat transmitting power of acid resisting iron had been calculated at ten times that of stoneware or quartz, and thus the parts could be made much smaller. A condenser built of acid-resisting iron condensed a charge of nitric acid in sixteen hours, as against thirty-six hours with a similar condenser built of pottery. The metal was now being used for other purposes, including the concentration of sulphuric and other acids.

With all this success there were still difficulties to be overcome. All alloys of low silicon content, say, 10 per cent., were attacked very readily by the acids mentioned, and while acid-resisting iron which contained from 16 to 18 per cent. was satisfactory from the resistance to acid point of view, it was so very hard that it was impossible to machine it in any other way than by grinding with high-speed abrasives.

Apart from chemical plant, this iron had a wide application for anodes in connection with electro-metallurgical processes. On the outbreak of the war it was impossible to obtain magnetite anodes, since they were chiefly made in Germany, and a substitute was found in acid-resisting iron.

# An Efficient Night Force: Organization and Development

By M. H. Potter

*The following article deals with some of the troubles and difficulties likely to be encountered in the starting of a night shift. The personal equation is perhaps the greatest of these and excellent supervision is necessary for economical production.*

THE present demand for increased production has made an efficient night force a necessity with many shops. The purpose of this article is to help those who are confronted with this problem.

Three principal and closely-related factors present themselves for the consideration of the factory executive, when an extraordinary volume of product is desired, namely—facilities, labor, and time.

The first, facilities, is limited only by the ability to provide them and to use them, and here considerable flexibility of action can be taken advantage of to successfully meet new and unusual demands for production.

The second, labor, is of course limited to conditions, and by the ability of the user to supply material and facilities to keep it profitably employed, thus presenting a problem, in the handling of which more or less flexibility of action can be taken.

The third, time, has a fixed limit of twenty-four hours and can be utilized to this limit in some instances.

The degree in which each of these three items is a limiting factor in securing additional production and their relative importance to each other as restricting influences are subject to determination by analysis.

There is no profit to be gained in working additional hours per day if we greatly lower or cripple the efficiency of the workers by so doing. Likewise there is no advantage in employing workers and facilities out of balance with each other. Too many executives, especially those who are not directly in touch with the amount of work done, value the hours overtime and place a premium upon the man who maintains them.

### Proper Procedure

Methods successfully pursued to show which of these things to hit hardest to secure increased production, and to do it in a way that keeps all three balanced and in harmony, will be brought out to some extent in what follows, but the solution of this problem varies as the labor market, factory conditions, type of work and workers.

To secure the best results from the employment of a night force the surrounding conditions should receive primary attention, as the handicap of working, sleeping and eating at unusual hours is enough without having to face any other.

Power, heat and light supply, distribution and segregation should be studied, and in many instances can profitably be modified to meet and not to exceed the needs of the night force.

In some plants where power is steam-generated and electrically distributed, it is comparatively easy to make modifications, and it is often found profitable to purchase electrical power for night running rather than to run the steam plant full capacity night and day.

It pays to part line shafts, used by several departments, when only a few of the departments are operating nights, putting in small motors instead of large ones. The running of a long line shaft to take care of a few machines is frequently seen and is certainly an unnecessary waste of power.

Lighting, in particular, should be ample, as poor work and small quantity surely follow where insufficient light is provided, and, in addition to this, sufficient heat and ventilation should be supplied to keep the operators comfortable.

It must be kept in mind that where machines are running double the usual number of hours there is double the amount of chips and dirt produced and to be cared for.

Additions should be made to the stock-handling and accounting departments both in men and facilities in order that machined material will not be delayed in transit from one operation to another.

With the employment of a night crew, jig, tool and fixture equipment is a very live subject and must be given the necessary attention. Ample and immediate supplies of this equipment should be provided. Patterns should receive the same attention at such times of pressure as tools and metal patterns are frequently necessary and economical additions to equipment should not be overlooked.

### Machine Tool Depreciation

One of the dangers, incidental to night work, to be guarded against, and a point by the way which will have a direct influence on new business after the present munitions' rush diminishes, is the more rapid deterioration of machine tool equipment. It must be borne in mind that machines and tools are doing double duty and that wear and consequent misalignment and misadjustment are taking place at least twice as rapidly as usual; furthermore, at least some of the operators are temporary employees and more or less careless. Therefore miller tables, drill tables, bearings, etc., should be gone over frequently and checked and trued up when necessary so that accurate work is always possible. This precaution will remove at least one of the causes for trouble and poor workmanship customarily laid at the door of the night force.

The selection of executives and of the crew for night work has vital importance in relation to the profits derived from such work. Cases have been observed where the organization, discipline and records of a considerable night force were so lax that a few machines added to the equipment and the employment of a small portion of the best of the night men on the day shift entirely did away with the necessity of running a night force and resulted in a marked saving..

If a night force is to be employed the selection of the men comprising it should be carefully made. Good results have been attained by the selection for the principal night executives of the best men of the secondary line of day executives. If a steady, young, ambitious man with a good record behind him and good possibilities before him can be secured so much the better. For the leading night foreman and operators it is well to select some of the steadier and more reliable day men, those willing to make some sacrifices to obtain the extra compensation offered for night work.

### Lunch Room Facilities

Another feature which helps toward keeping the night workers satisfied is the serving of a lunch at cost at midnight. If possible smoking should be allowed during the night or preferably during a portion of the time.

The inspection crew should be composed of the same type of men as the leaders of the night force and final inspection left to the day inspection force.

For assembling operations it is questionable if night forces can profitably be employed, as the opportunities offered for the covering up of poor workmanship which may not be discovered until the product has passed through numerous operations and perhaps final assembly are too numerous.

Some of the incidental profits to be gained from the employment of a night force are the permanent simplification and improvement of design, appliances and methods which are sure to accompany and follow pressure work, as good suggestions are bound to come out at such times and everyone is more open to receive and act upon them than usual.

Executive talent previously more or less overshadowed is developed and proved. Space and labor requirements for a specific production receive a direct and strong illumination and old restricting ideas as to possibilities are passed by, thus permanently establishing and fixing a higher degree of efficiency. Such gains are a permanent source of revenue.

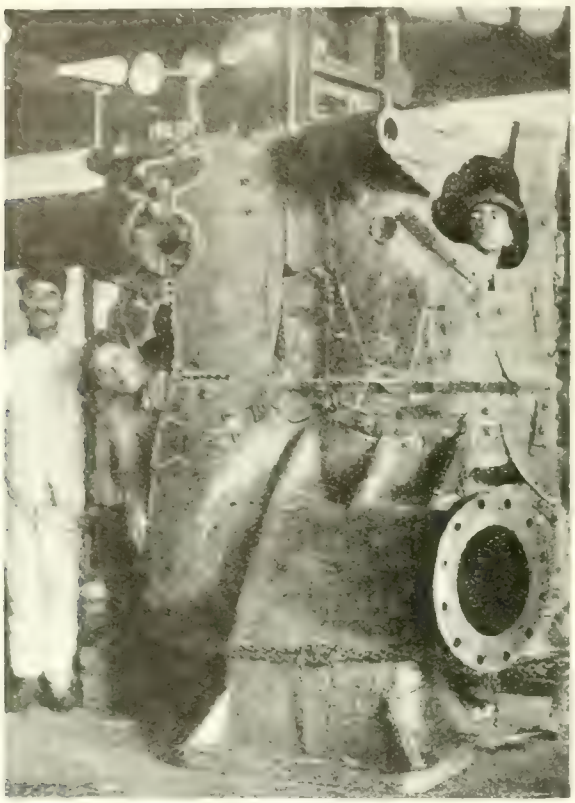
## GERMANS DAMAGED INTERNED VESSELS IN BRAZIL

When [illegible] Brazil [illegible] the number of German [illegible] was about to [illegible] With [illegible] Teutonic [illegible] the [illegible] had made considerable preparations for destruction, [illegible] the [illegible] suffering more or less serious damage, particularly to the propelling machinery, and in some cases [illegible] had to be made, while in others only portions of the cylinders had been destroyed. Commenting on the [illegible] of the work done by the German engineers as reported by correspondents, "Engineering" [illegible] case of two dam-

aged cylinders at least 8,000 holes must have been drilled transversely and vertically through the cylinders in order to effect complete destruction. Several of the vessels were taken over by the Brazilian Ministry of Marine and others by the Lloyd Braziliero Company. In the early part of 1917 the Brazilian Government invited Vickers, Limited, who had placed their experience at their disposal, to send an engineering technical officer to Brazil to survey the damage to the machinery and carry out the necessary steps for its repair. It was found that not only could the work be carried out in Brazil itself, but in the naval arsenal of that country. It was therefore decided by the Ministry of Marine to proceed immediately with the re-casting of the damaged cylinders and liners, and great credit is due to the engineering officers of the Brazilian navy and to the personnel of the arsenal, not only for executing the work, but for the expedition with which it was carried out.

The photographs we reproduce are of the high-pressure cylinders of a quadruple set of engines, the respective diameters being 26 3-10 in., 38⅜ in., 56⅜ in., and 81½ in. by 54 in. stroke. The cylinders illustrated had been broken into hundreds of small pieces, and in order to make new cylinders to suit the set it was necessary to collect as many pieces as possible and to erect them as illustrated, so that the dimensions of the cylinders could be measured accurately. When erected, photographs were taken, and we are indebted to the Brazilian Minister in London for permission to reproduce these photographs. Portions of cylinders were also re-cast and welded in position in the engineering workshops in Brazil.

It is an interesting fact that most of the broken parts of the machinery were, in the case of the greater number of vessels, carefully stored between decks, evidently in order to be used as scrap metal in Germany in the event of the return of the ships to the "Fatherland."



DAMAGED CYLINDER PIECED TOGETHER.

FIG. 2 ANOTHER VIEW OF THE CYLINDER.

## TRAINING ESSENTIAL TO FUEL CONSERVATION

Intelligent application of the principles of fuel conservation must be practised by every user of fuel throughout the coming twelve months to avoid a repetition of the past winter's plight. Wilful waste under existing conditions must not only be considered as a forerunner of woeful want but at the present time should be recognized almost as a criminal offence. "Keep the home fires burning," must not be taken too literally, but should apply rather to the fires of enthusiasm than to those of the hearth. The growing significance of this continental, if not world-wide, problem was forcibly presented at a recent meeting of the Canadian Railway Club, Montreal, when a paper on the subject of "The Fuel Situation in War Time" was ably presented by Mr. T. Britt, general fuel agent of the Canadian Pacific Railway; the substance of this paper appeared in the April issue of *Power House*. The largest gathering of the season was present, and the subsequent discussion indicated the extreme interest displayed in this momentous question.

Aside from the general adoption of methods and appliances to facilitate the saving of fuel the all-essential factor in the early or ultimate solution of this problem appears to be a better understanding of that ever-changing but equally unknown quantity—the human element. In suggesting that an educational campaign should be conducted among locomotive and stationary firemen, Mr. Britt pointed out the vital importance of personal instruction. He said:

"To my mind this should not be done by printed instructions but by actual illustration by competent firemen. While it is all very well to write a fireman and tell him what he should do,

it is far more educational for a competent instructor to show how it should and could be done."

Mechanical devices such as automatic stokers, the superheater, the brick arch, automatic fire door, feed water heater, together with the general design of engine mechanisms have all played an important part in the fuel saving movement, but the highest efficiency of any of these can only be attained when judiciously operated by the engineer or fireman responsible. Commenting on the poor quality of the fuel supplied during the past winter and the difficulties accruing therefrom, W. H. Sample, master mechanic of the G. T. R., said:

"So far as the conservation of fuel with us is concerned, I feel we do not do enough. We have undertaken to do some things but there are a great many more things that we intend to do. We have put on two additional travelling firemen with a view of instructing the firemen. That not only helps to save coal but it also assists in getting the trains over the road. We had to hire a great many new men, which is as great as factor in the fuel consumption as anything we have."

In agreeing that the question of fuel conservation was probably the biggest of present day problems, and pointing out the advantages that had resulted from the installation of mechanical devices for this purpose, W. H. Winterwood of the C. P. R. stated:

"A great deal of coal could be saved if measures were taken to prevent it falling from tenders along the right of way. In this connection I wish to say that Sir George Bury, vice-president of the Canadian Pacific Railway, has been vitally interested in the matter of fuel economy for years, and an order issued by him in the past was that locomotive tenders were not to be overloaded, and that the proper amount of fuel to be carried on the tenders be ascertained and that amount not exceeded. This has resulted in a great saving of fuel. He is also responsible for a modification and improvement in the design of our locomotive tenders. This change in design consists of a coal space with a very steep slope at the back which is brought much closer to the shovelling sheet than on any other tenders. The sides of the hopper are somewhat higher, but the coal in the hopper comes down by gravity to the shovelling sheet, eliminating the necessity of a mechanical coal passer and which insures all coal in the hopper being available. This has resulted in a great saving."

It was pointed out that it was not sufficient to equip an engine house or locomotive with fuel-saving devices, but in order to obtain the greatest efficiency from such installations it was imperative that the users should understand them thoroughly. In this connection, E. S. McMillan said:

"The Grand Trunk has spent a large amount of money on mechanical devices to save fuel and also to assist the firemen; as to teaching the firemen, we do this all we can, but it is very difficult on account of the large number of new men employed. I think the men co-operating with the engine crew in train handling should be properly trained in their work, for if not they can waste more fuel by unnecessary work than the engine crew can save. This condition will discourage the firemen very quickly."

In commenting on the vagaries of the human element and the direct bearing this often had on industrial problems, T. C. Hudson, master mechanic of the Canadian Northern, remarked:

"I feel that we should give more attention to young and inexperienced firemen, for that is where we meet most of our trouble to-day. Although we may have ideal conditions—such as locomotives equipped with superheaters, pneumatic firedoors, injectors proper size, tubes cleaned, and front end of locomotives properly adjusted, yet unless you have a fireman who can and will handle the scoop properly, coal will be wasted. It is true that we have a lot to contend with on the railroads in breaking in new men for road work owing to the fact that many skilled engineers have volunteered for overseas service. I am strongly in favor of travelling firemen who can accompany new and inexperienced men and demonstrate to them the proper method of firing a locomotive. You may equip a locomotive with all the fuel-saving devices possible (and the railways of this country have spent considerable on fuel-saving devices) but in the end we must come back to the human element if we are to get the best results. Printed instructions on fuel economy are beneficial from which an energetic fireman may learn much which will help him in his work, but these should be emphasized, and this can only be done thoroughly by demonstrating with the scoop on the footplate of the engine. We must admit that some of the coal supplied this year is of an inferior quality. However it is all we can get to handle the tonnage, therefore the fireman becomes a large single factor in any campaign to secure immediate results. Owing to the shortage of supply it will be found cheaper to educate the fireman than pay for the coal."

The better training of locomotive firemen was dealt with at some length by E. W. Sawyer of the I. C. school, and the thoroughness of this company's methods of education was demonstrated in his statement; he said in part:

"We have had an expert riding engines on one of the larger roads in and out of Montreal for some time in an effort to work out a system which would better results from the coal now being used on the locomotives on the road referred to, and it seems that it is not so much a matter of economy at this time as it is to evolve a system of handling this fuel and to keep the engines hot, especially when the fires get dirty and the grates clog with ash and other debris which so frequently occurs where coal is furnished high in non-combustible material."

Departing from the general groove of the discussion, A. M. Barry, of the St. Lawrence Welding ompany, brought up the subject of the firing and operation of marine boilers and their relation to the general problem of fuel preservation. To quote Mr. Barry in this connection:

"We have heard from the railways on the responsibilities of this fuel question and we have also heard from the power house man. What about the steamboat man? The steamboat man brings us back to the question of the human element. The steamboat man generally is a "wop" and is the cheapest kind of man that can be got. He knows nothing about fuel economy. His type is strong in the arm and thick in the head; his business is to shovel coal. You can see these marine boilers all over the country, in dredges, boats and elsewhere, with leaky and dirty tubes, tubes blocked and boilers dirty—two or three injectors on some to keep the water in them. The railroad man here to-night is being blamed for this fuel shortage but it seems to me that the steamboat man is equally responsible. When the fireman gets to the end of a trip he goes on a drunk, and if he does not turn up again it does not matter as they can get along without him. I do not mean the deep sea men, but the men on the inland waters—lake boats, dredges, and so forth. The railroad companies and those owning power plants may have reason to use greater economy in fuel but it seems to me they are not as great transgressors as the steamboat men. Why not get after them as well with education?"

From the above it would appear that the experience of the past winter will act as a stimulant to the adoption of every mechanical means available for the future saving of coal, especially in those districts where long haulage from the source is necessary. In addition to this increased attention will be given to the education of those men that are directly responsible for the actual burning of the fuel, so that the same may be accomplished in the most efficient and economic manner.

## AMERICAN NAVAL PROGRESS

ACCORDING to the 1917 annual report of the American Navy Department, there are upwards of 800 vessels being built for the navy, ranging from battleships to small petrol craft. It is also stated that a considerable number of 3-in. anti-aircraft mountings have been completed and supplied to ships in commission. Gratifying progress generally is recorded. The rate of production of armour-piercing projectiles has greatly increased and the quality of the projectiles now being delivered is better than it has been in the past. The almost unlimited capacity of the country for projectile making was indicated when sixty-none firms bid on one proposal and at prices lower than any previous tenders.

# FROM THE MEN WHO PRODUCE

Methods, Machining Devices, Systems and Suggestions From Shop And Drafting Room

## BABBITTING AND SCRAPING HINTS FOR THE POWER HOUSE ENGINEER

By M. H. P.

TO make a bearing ready for pouring, secure the mandrel in position and make tight around the ends of the journal, either with putty or with moistened clay. When putty cannot be obtained, clay worked between the hands until free from lumps and plastic makes a very good substitute. In making tight around the end of the box, particularly where there is considerable space between the casting and the mandrel, take care not to press the putty or clay into the lining space. Should there be ¼ inch or more space some wooden heads should be cut out to fit the mandrel and clamped against the box casting. If it is a repair job and there is neither time or opportunity to fit heads, then rub some putty into a small cord and wind around the mandrel close against the end of the box. The cord will serve as heads, and some more putty daubed on the coils will make everything tight.

### Covering Mandrels With Paper

Bearings may be cast direct upon the shaft which is to run in them, but it is better to have a mandrel for that purpose. If the journal must be used, place a sheet of strong, smooth paper around the journal so that the babbitt does not come in direct contact with the metal. This is also excellent practice in all cases where mandrels are used for babbitting single boxes. Where many are poured in succession the mandrel becomes heated and does not chill the hot babbitt, hence the paper becomes unnecessary.

When poured directly upon the journal, babbitt pinches the shaft along the line of division between box and cap, and scraping is necessary to make the journal fit the box after the lining has been poured. The thickness of paper around the journal, combined with the shrink of the soft metal, relieves the journal so that on rough work little or no scraping will be found necessary, the arrangement of the liners giving all the adjustment necessary. On fine work, however, scraping will be necessary. In fact, all fast running and close fitting bearings should be scraped to fit the journal which is to run in it.

Sometimes the soft lining is peened to make it tight in the casting. When babbitt or other lining metal is poured into a cold casting the lining becomes chilled before the iron casting becomes heated, therefore, when the soft lining finally cools it shrinks away from the casting and becomes a loose, rattling nuisance which must be peened to make it tight in the journal bearing casting. Heating the box before pouring in the soft metal lining is a cure for looseness, as the iron casting then shrinks with the soft metal lining on cooling and holds fast when cold.

There is another way of fastening a lining tightly into a cold casting, and that is by using one of the antimony alloys as a lining. Antimony, when alloyed with lead and with some other soft metals, loses the power of shrinking during the freezing process, and like water expands and fills the casting so tightly that there is no rattle or looseness. Therefore, when forced to line a cold bearing, use an antimony alloy. It is for this purpose that the antimony alloy is used for casting printing type. The expansion of the alloy during the instant of solidifying or freezing causes the metal to expand into every corner of the mold. The same is true with the antimony alloy in the journal bearing.

### Forming Oil Channels

Oil channels may be formed in the lining by winding small cord around the mandrel. The cord should be of the hard spun variety and preferably should be rubbed smooth with putty before being wound upon the mandrel. The cord

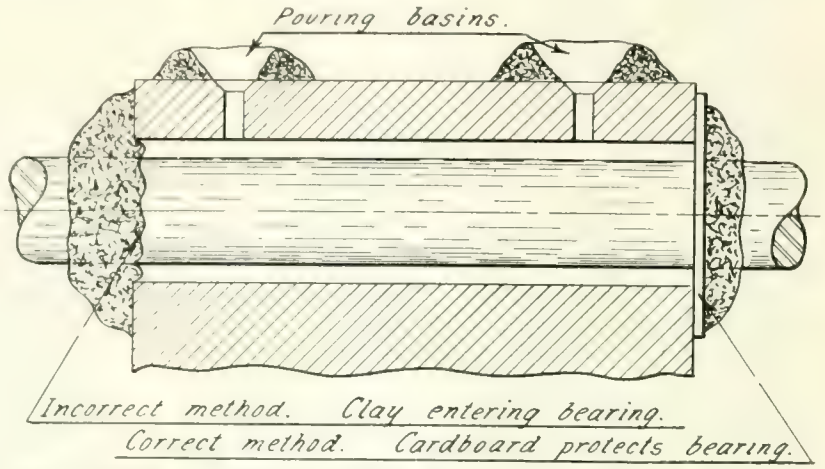



FIG. 1. RIGHT AND WRONG METHODS OF STOPPING OFF ENDS OF BEARING.

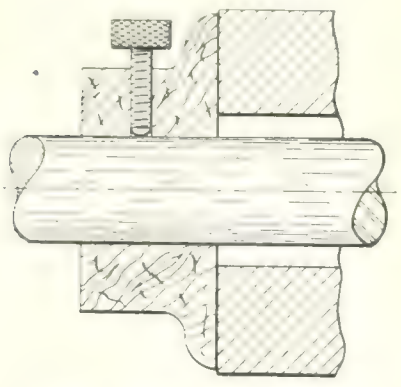



FIG. 2. THE USE OF WOODEN HEADS.

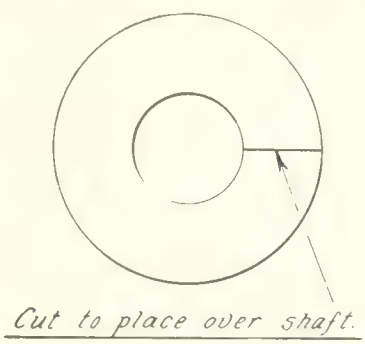



FIG. 3

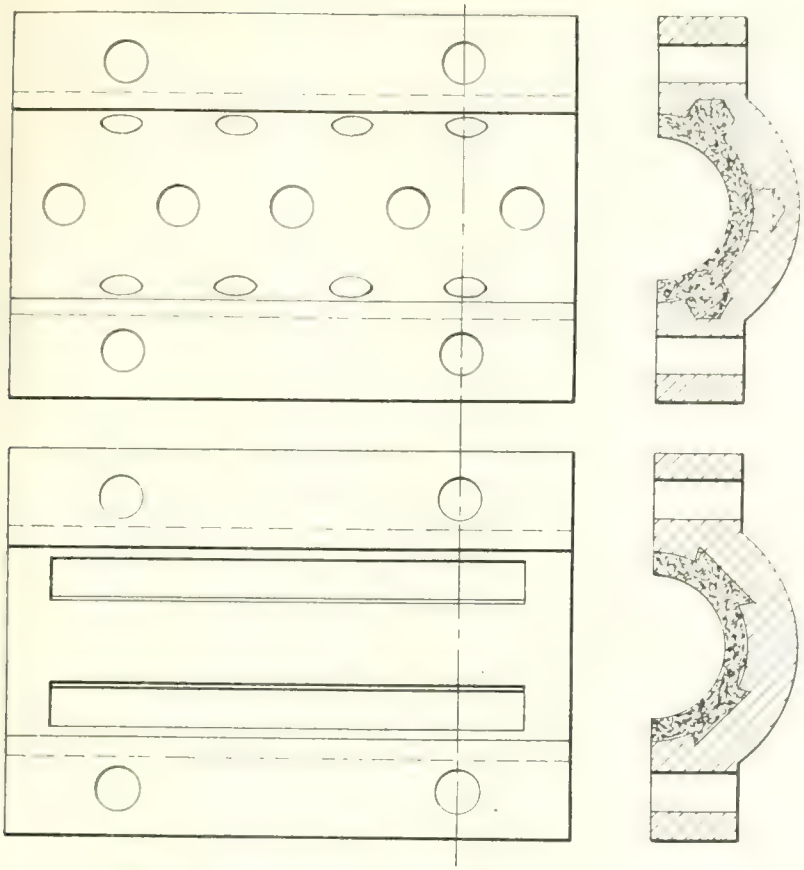


FIG. 1 METHODS OF KEYING BABBITT IN BEARINGS

must be wound in the direction that the shaft is to run. It does not work well when a passage must carry oil against the rotation of a shaft. When cap and box are to be poured together, cut two notches in each liner, one notch at one end, then clamp the cap in place, taking care that the liners are against the shaft before tightening down the cap bolts.

Bore one holes in the cap for pouring in the lining, besides the oil holes, then proceed to fit a white pine plug in the latter hole, fitting the plug tightly against the mandrel and let it project through the hole in the cap. After pouring, the cap may be easily removed by driving a cold chisel between cap and box, breaking off the metal which connects the cap and box linings through the four notches mentioned. These notches should not be more than ¼ inch on a side, and the section of soft metal lining being small is easily broken by driving in the cold-chisel. The four bits of ruptured metal should be carefully chipped or filed off smooth with the surfaces from which they project. Then drive out the plug in the oil hole and the cap is ready for scraping to fit the shaft.

### Heating Babbitt Metal

Before pouring a bearing, it is very important that the babbitt metal be heated to the proper temperature. This may be roughly determined by inserting a piece of wood—white pine or similar soft wood—into the hot babbitt and noting the effect upon the wood. It is best to whittle the stick to a smooth, flat surface, similar to the paddle used for stirring paint. The surface of the molten metal should be kept covered with a layer of charcoal to prevent oxidization of the alloy. Thrust the whittled stick through the layer of dust on top of the hot metal and note results to the stick. If the metal is too hot it can be felt to be boiling around the stick, which will be charred more or less, or not affected at all, according to the temperature of the molten metal.

It is certain that the metal is too hot when the stick trembles in the hand and smoke rises from the submerged end of the stick. When there is scarcely any trembling to be felt in the stick while it is immersed in the hot babbitt, then the alloy is ready to pour. If the stick is not colored at all and metal almost adheres to the stick, then the metal is not hot enough and it will not flow properly if poured at that temperature.

When babbitt metal is at the right temperature the stick will be faintly charred after being immersed three or four seconds in the molten metal. Two or three tests will blacken the stick even when the metal is not quite hot enough to pour, therefore it is best to whittle a new surface on the test-stick after each immersion.

### Pouring Soft Metal Bearings

Do not heat soft metal too hot, zinc is easily driven out of an alloy by too high temperature when melting, lead soon turns into dross upon exposure to the oxygen of the air when melted, and the higher the temperature of the melted metal the faster it will be rusted out by exposure to the air. It is for the purpose of preventing this loss of some of the metals that the surface of the molten alloy is kept covered with charcoal. But when the alloy is overheated, then oxidization proceeds much more rapidly and much metal is lost.

Do not skim the surface of the metal until it is clean of all dirt. When the ladle is tipped up, the bit of iron forms a floating dam which effectually prevents the covering of dirt from flowing out of the ladle, while the molten metal has free passage under.

When babbitt metal is melted in a pot, the alloy may be dipped out with ladles as required for pouring, and before dipping the ladle into the pot, push the covering to one side with the ladle, then pass the ladle below the surface of the alloy, taking care that the ladle is entirely submerged. Then lift the ladle out quickly and an excess of metal will be forced up by and above the ladle. As this excess of metal flows away, it forces back the charcoal covering on top of the alloy, and the ladleful of metal comes out of the pot clean, with no signs of dirt.

The metal must be poured very quickly when thus dipped up clean, for the reason that oxidization is going on all the time. Hasten the pouring operation once the

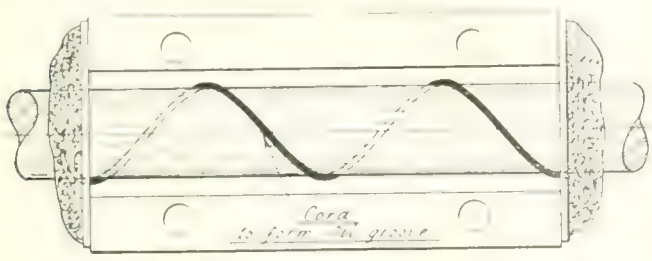



FIG. THE USE OF A CORD TO FORM OIL GROOVES

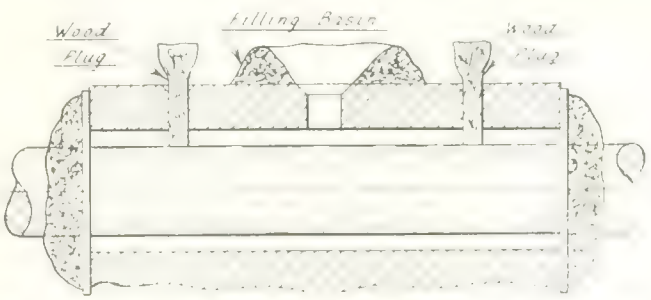
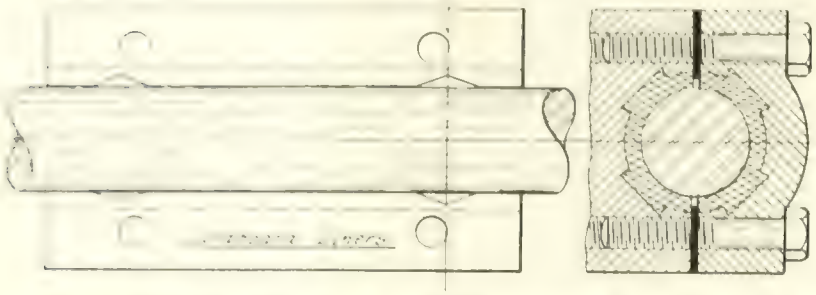



FIG. THE USE OF WOODEN PLUGS TO FORM OIL HOLES

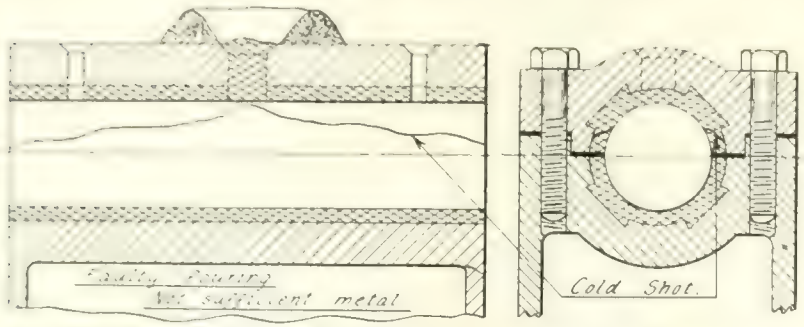
### Pouring Thin Solid Boxes

[illegible] must

spots. The remedy is to remove the metal at those points until the shaft touches at four or five places instead of at two or three. Then remove the four or five and secure a bearing at eight or ten. Continue this work until the shaft has a bearing in many spots. In this



[illegible] THE USE OF CARDBOARD LINERS IN POURING A SPLIT BEARING.




[illegible] THE RESULT OF FAULTY POURING. NOT SUFFICIENT METAL IN LADLE TO COMPLETE THE BEARING AT ONE POUR.

should be just high enough to slightly char a soft wood stick. But when thin solid boxes must be poured, and there is a long narrow or thin space to be filled with soft metal, then it is sometimes necessary to pour the metal hotter than described. In such cases the metals to come in contact with the soft metal should always be heated as much as possible before pouring in the lining. When a ladleful of metal fails to fill a box, do not try to fill the box by pouring hot metal on top of the cold. Take down and chip out the partially filled bearing, set it up again, and pour from a supply sufficient to fill the bearing.

### Scraping Bearings

In order to make a first class babbitting job the scraping operation is necessary. Even for rough work, should it be possible to make a good bearing without scraping, a better one can be made if the operation of fitting the bearing to the journal be carefully followed out. unless the journals are properly fitted to their bearings it requires a great deal of preliminary running so that the bearing will not heat. When a shaft hits a bearing only in two spots, at opposite sides and ends of a bearing, it cannot be expected that the shaft will run cool and steady in that bearing.

[illegible] a bearing and given a turn or two, and black spots appear in two or three parts of the babbitt with no marking elsewhere, then it is sure evidence that the shaft touches the bearing only at those two or three way innumerable points of bearings could be obtained between the shaft and the babbitt, and it could be assumed that they touched each other at all points and that the contact between them was practically perfect.

When fitting a bearing to a shaft as above, the blackened spots are removed by scraping, hence the name of the operation becomes that of scraping a bearing. A good job of fitting as above described may be done by the use of a common carpenter's chisel. By the use of this tool the blackened spots may be removed. A little plumbago or red lead mixed with oil and rubbed on the shaft each time will leave new spots to scrape off and the operation may be continued indefinitely.

## PACKING CASE ECONOMIES

By M. L.

A French inventor having remarked the damage that packing cases frequently suffer on opening, even when the well-known nail-puller is used, has devised a method by which the drawing of nails is greatly facilitated. He provides a washer of soft materials—such as scrap leather, hard paper or fibre—which is put on the nail before driving and which prevents the head from sinking to the level of the surface of the board. When the box has to be opened it is easy, with a pair of pincers or the usual opener, to grasp the head securely and draw the nail promptly without splitting the board.

There are various ways of opening a case. One way is to drive a wedge under the board to raise it, but this method is liable to split the wood. A better way is to hold a piece of 1 inch by ¼ inch bar iron against the lower edge of the board and strike upwards with a hammer so that the edge of the iron meets the edge of the board along its whole width; the blow is thus distributed and the board is not split. To dismount a box entirely, if big enough, a bit of one-inch board may be laid close up to a corner and struck smartly with a hammer to loosen and to draw the nails. To detach the bottom, a piece of the cover may be applied endways with a mallet to loosen the boards. A little judicious thought may save much waste in the opening and altering of packing cases.

## REMOVING PAINT

One of two methods of removing paint is usually adopted, either "burning off" with a blow lamp, by the flame of which the paint is softened in front of the tool which scrapes it off, or "pickling," by which the oils are destroyed and the pigment left ready for removal, and in which some strong caustic alkali is used, being adopted. Usually on metal the paint is best removed by pickling and scouring, but in every case the most suitable process should be used, a large amount of judgment being usually required in deciding which is best.—M.M.

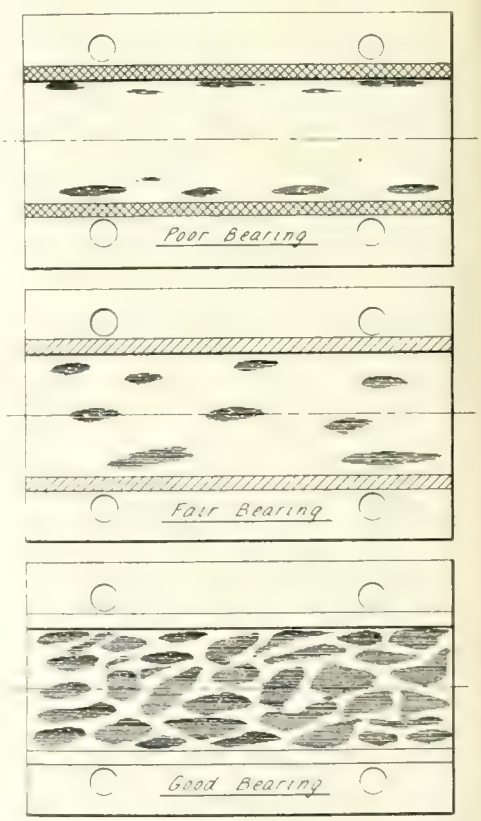



FIG. 9.—APPEARANCE OF BEARINGS AT DIFFERENT PERIODS DURING THE OPERATION OF SCRAPING.

# Underlying Principles of Forging Machine Die Design *

By E. R. Frost **

*Much information has been gained through experience by those who are familiar with forging machine die design but little of it has been made available or classified. Failures are usually found to be the result of neglect of certain of laws governing successful practice.*

IN preparing a paper on rules or methods for designing forging machine dies, the writer was confronted with the difficulty that but little information contained in such a paper would be new to your members, as experience has taught you most of the pitfalls in forging machine die design.

It is possible, however, that some of you may not have so classified the information gained that it could be clearly expressed in rules, and, as such, passed to your assistants. It is our experience that at least seventy-five per cent. of the failures in forging machine die design can be attributed to the disregard of one or more of the fundamental laws pertaining. The desirability of having this information expressed in the form of laws makes the excuse for this paper.

The only apparent way to make a paper on such a subject clear is by illustration, hence this information is presented in graphic form, with the hope that it will be of value to your men in the shop, and will serve to reduce the expense for dies, the failure of which might be anticipated.

Throughout these remarks the policy is followed of not taking into consideration unusual methods; trick heats; welding operations; or, in fact, any laboratory methods which, while possible under certain conditions, are unpractical in average shop practice. Consequently, while certain statements may appear to be too limited, they will, in the main, be found as applying to average conditions.

It is possible to classify the majority of forging machine die problems under three rules or headings, which are as follows:

**Maximum Unsupported Length of Stock**

RULE No. 1. The limit of length of unsupported stock that can be gathered or upset in one blow without injurious buckling is not more than three times the diameter of the bar.

As an example, by reference to Fig. 1, if the diameter of the bar "A" to be upset is 1 inch, then the length of unsupported stock "B" which may be successfully gathered cannot be more than 3 inches. This rule applies on all diameters of stock. As three diameters, however, is practically the limit, it is best to keep the actual working limit within two and one-half diameters; and where it can be done, even a limit of two diameters is better, as then less attention need be paid to the squareness of the end of the bar. On such upsets, as the heading tool advances, as indicated in Fig. 2, the stock will swell uniformly in all directions from the axis of the blank, and it can be carried to practically any thickness, such as shown in Fig. 3, without any serious tendency to upset unevenly. It is immaterial whether the stock overhangs the face of the gripping dies, as in Fig. 1, or whether part of the stock is gathered in the gripping dies and part in the heading tool, as in Fig. 4; whether it is all upset in the gripping dies, as in Fig. 5, or all in the heading tool, as in Fig. 6—the fact must be kept in mind that such conditions represent cases where the stock is unsupported, and hence Rule No. 1 applying to three diameters or less of unsupported stock will apply.

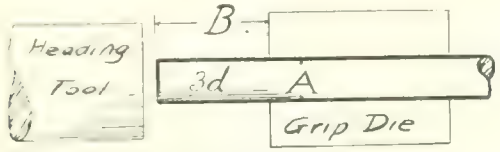



FIGURE 1.

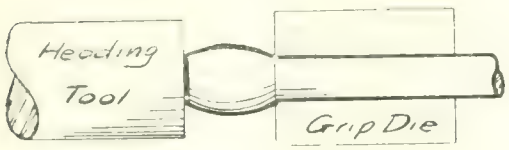



FIGURE 2.

FIGURE 3.

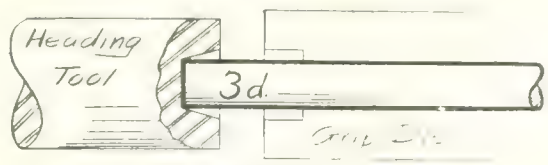



FIGURE 4.

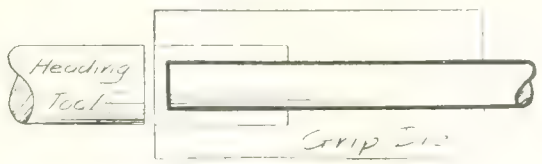



FIGURE 5.

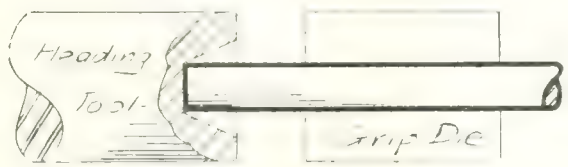



FIGURE 6.

Many simple forgings come under this ruling, such as the level pinion forging shown in Fig. 7; the grease cup spring shackle bolt, Fig. 8, or the ring forging Fig. 9. In each case, the distance from the heated stock to the inner surfaces of the gripping die impression or the heading tool, is such that the stock is in reality unsupported.

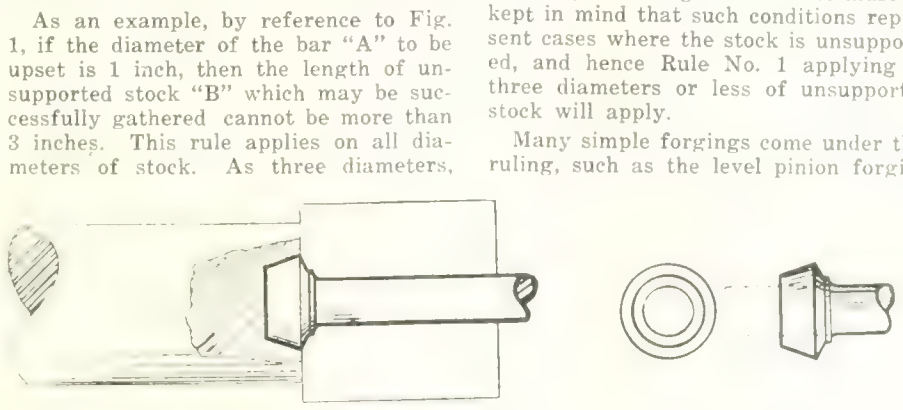


FIGURE 7.

* Read before the Fourth Annual Convention of the American Drop Forge Association at Cleveland, Ohio.

** General Manager National Machinery Company.

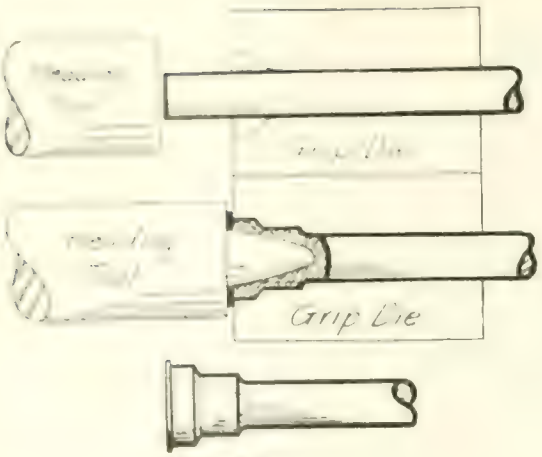



FIGURE 8.

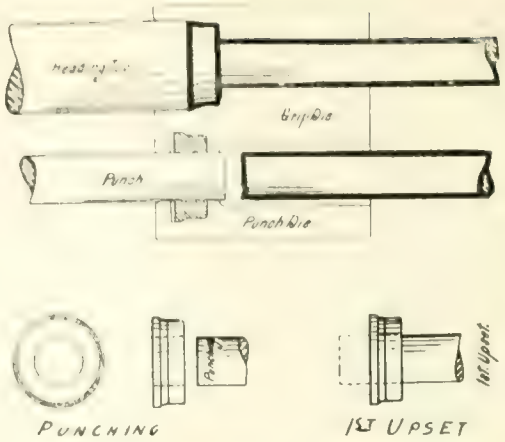



FIGURE 9.

In order to insure the dependability of Rule No. 1 no effort is made to upset a length of stock longer than three diameters, in place of upsetting uniformly, as shown in Figs. 2 and 3, the stock will buckle at a point near the middle, and result in more of the upset forming on one side of the centre of the bar than on the other. As an example, in Fig. 10, assuming that the diameter of the bar "C" is 1 inch, and the length of unsupported stock "D" is 4 inches, then when the heading tool advances, the stock will start to buckle, as shown in Fig. 11, and after it has once started, will, of course, continue, as illustrated in Fig. 12. It is merely an application of the general principle that under pressure given lengths of any material will either crush or bend.

It is impossible to correct this condition by varying the point in the die where the upsetting takes place, as it will be readily seen from sketches 13, 14 or 15 that the stock will buckle, regardless of whether it is upset in the gripping dies, in the heading tool, or part in the gripping dies and part in the heading tool.

**Effect of Upset Diameter on Upsetting**

RULE No. 2. Lengths of stock more than three times the diameter of the bar can be successfully upset in one blow, provided the diameter of the upset made is not more than one and one-half times the diameter of the bar.

This rule, while fairly well recognized, requires a clear understanding in order to develop its practical possibilities.

By reference to Fig. 16, assuming that the diameter of the bar "E" is 1 inch, and the length of stock "F" to be upset is 6 inches, and that the diameter of the hole "G" in the die is not more than 1½ inch, then when the upsetting begins, as in Fig. 17, the stock will at once buckle, but on account of the limited diameter of the hole "G" the stock soon comes in contact with the sides of the die. This prevents further buckling in this direction, hence any additional upsetting must take place at some other point. The stock will frequently be found to buckle at several points, as in Fig. 17; but as the heading tool advances, the stock will gradually fill the impression in the die, as shown in Figs. 18 and 19, resulting in an upset as in Fig. 20—the only objection being a fin around the end of the upset.

If an attempt is made to produce a forging in a die in which the diameter of the hole in the die, as at "H" in Fig. 21, is greater than one and one-half times the diameter of the bar, then when the upsetting begins the buckling effect at some point—and generally near the middle of the unsupported stock, such as at "I" in Fig. 22—is sufficient so that when the heading tool continues its advance, the stock on the opposite side from the buckled portion, such as at "J." Fig. 23, will fold "in," and, of course, leave a defect in the upset.

As in the case of Rule No. 1, while it is possible to make forgings in which the diameter of the opening in the die is as much as one and one-half times the diameter of the bar, nevertheless, this is very close to the limit, and in practice it is much better to keep the diameter of the upset not more than 1.3 times the diameter of the bar.

The practical application of this law is in the ability to gather large amounts of stock by repeating the principle, as indicated in Fig. 24. In the first, or top impression, the diameter "K" of the recess in the die is not more than one and one-half times the diameter of the bar "L." In the second impression the diameter of the recess "M" is not more than one and one-half times the diameter of the previous upset "N." In the last impression, the length of the upset "O" is well

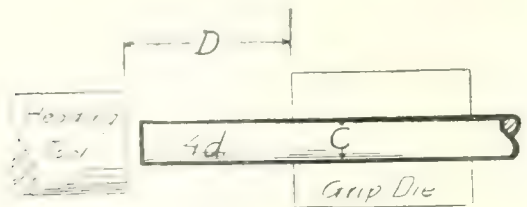



FIGURE 10.

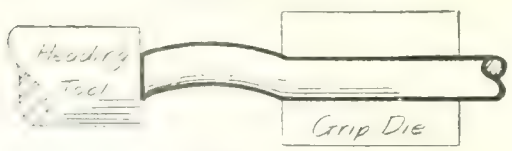



FIGURE 11.

FIGURE 12.

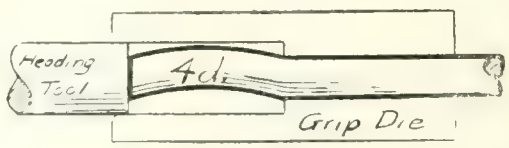



FIGURE 13.

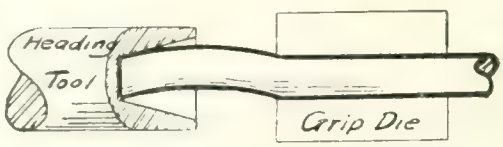



FIGURE 14.

FIGURE 15.

within the limit of Rule No. 1 regarding unsupported stock, so that no limit need be put on the diameter "P" of the last die impression.

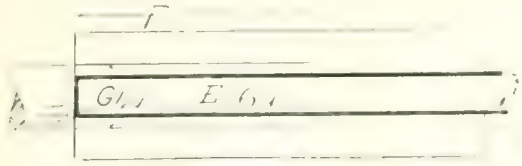



FIGURE 16.

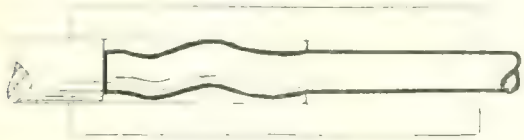


FIGURE 17

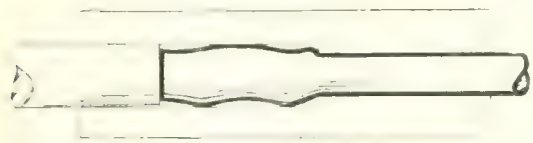


FIGURE 18

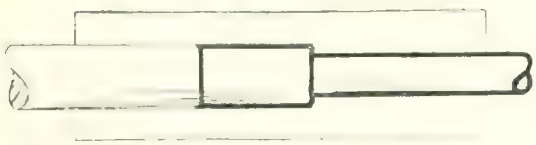


FIGURE 19.

the impression in the die is made not more than 1.3 times the diameter of the bar, as in Fig. 27, then the upset formed will be free from fins on the end of

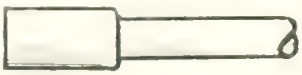


FIGURE 20.

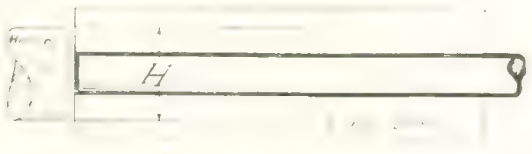



FIGURE 21.

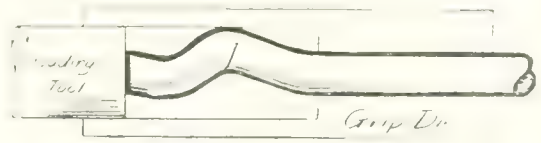



FIGURE 22.

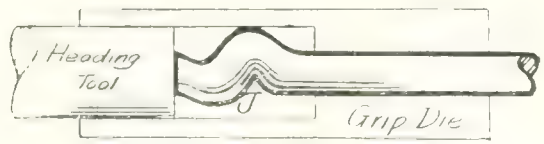



FIGURE 23.

dle of the unsupported portion, and as a result, somewhat more than one-half the stock to be upset, as at "Q," Fig. 31, must be inside of the impression in the die. It can equally well be in a taper or straight hole in the heading ram, as in Figs. 32 and 33; but it is useless to attempt to make part of the impression in the gripping die, and part in the heading tool, as in Fig. 34, because when the upsetting begins, as in Fig. 35, the stock will buckle, leaving a defective forging as shown in Fig. 36. To attempt to sup-

This principle is clearly shown in Fig. 25, in which, in both the first and second operations, the diameters of the impressions have been kept within this limt.

The same principle applies to the first two operations in the upsets shown in Fig. 26. In such upsets, where the length of stock in the first operation is excessive, it is generally necessary to the upset, even if no special care is taken in heating. This is on account of the fact that where the length of the stock is not more than three diameters, the upsetting takes place quite uniformly throughout its length, and any buckling being limited, the friction of the stock along the side of the die does not become a factor.

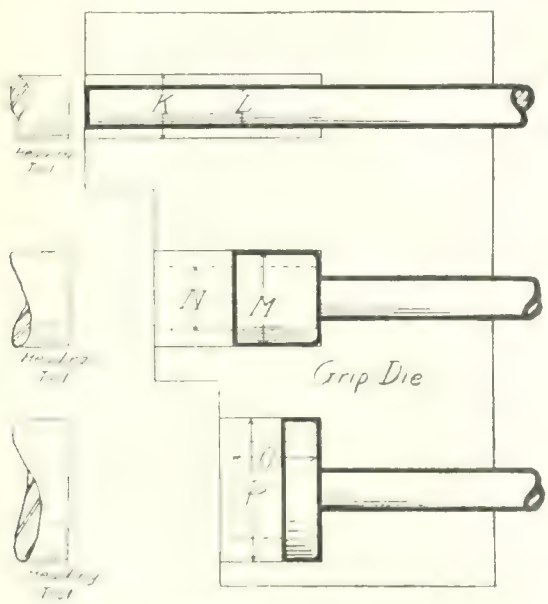



FIGURE 24

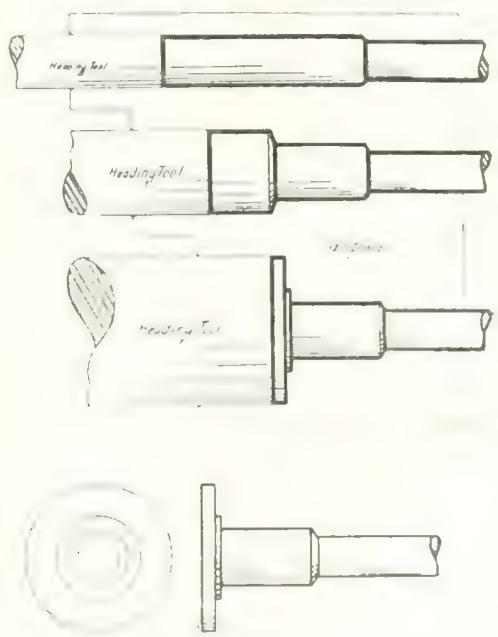



FIGURE 25.

keep the end of the bar at a lower temperature.

Where it is desirable to carefully hold the size of some upset in which the stock requirement is not materially over three diameters in length, if the diameter of

Forgings shown in Figs. 28, 29 and 30 come in this class.

In handling all upsets requiring more than three diameters of stock, the fact must always be kept in mind that the stock will first start to buckle at the mid-

port the end of the bar in the heading tool, as in Fig. 34, does, of course, help, but the final result will be a defective forging as indicated in Fig. 38, on account of the lack of support near the middle of the upset, as suggested in Fig.

sion in the die support the bar, and keep it from buckling; but the greater area of the square hole enables a larger amount of stock to be gathered than would be possible were the hole round.

the die impression, also prevent the bar from buckling and allow a large amount of stock to be gathered. If the length of the stock as it leaves the second operation has been shortened sufficiently to

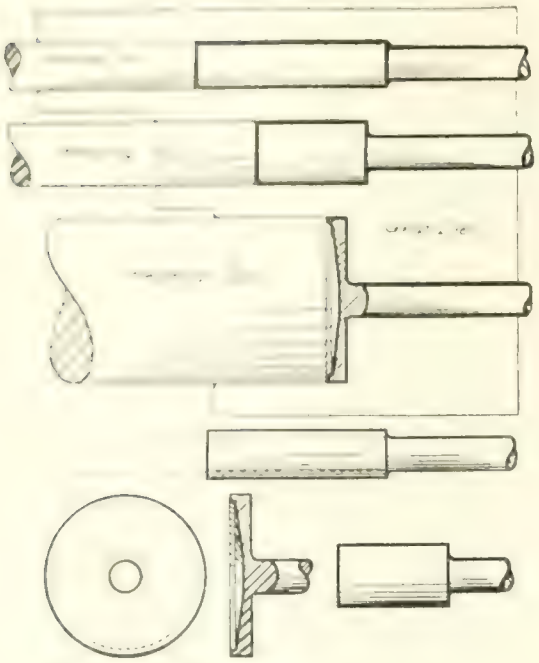


FIGURE 26.

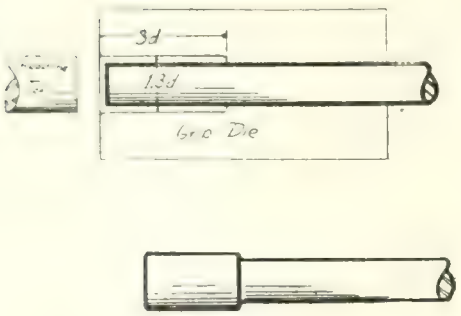



FIGURE 27.

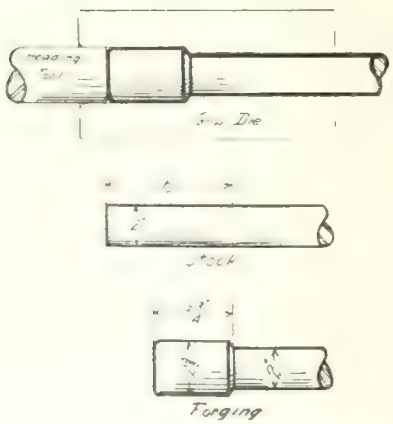
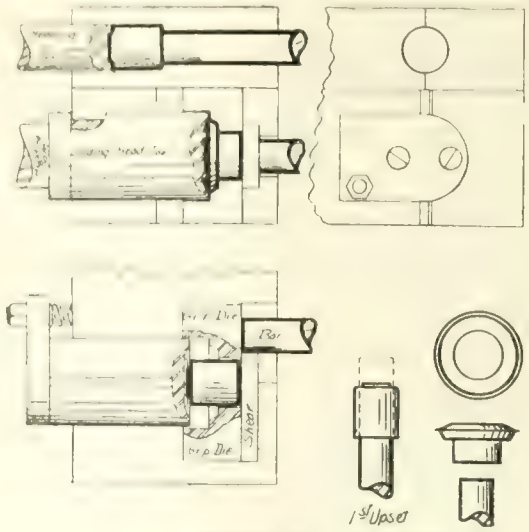



FIGURE 28.

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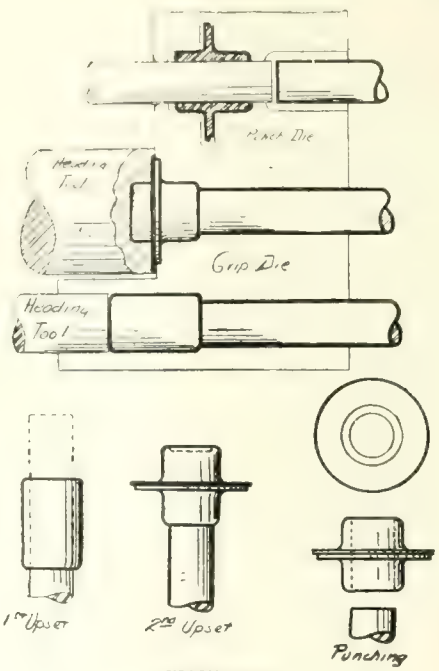



FIGURE 30.

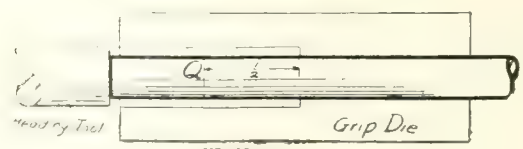



FIGURE 31.

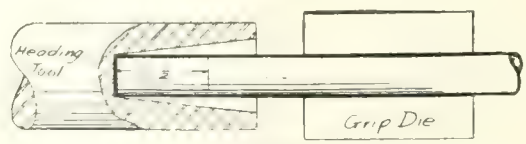



FIGURE 32.

an extra amount of stock is obtained in the first upset by making the first impression square, in place of round. The short diameter of the square hole, as at "R," is made within one and one-half times the diameter of the bar. Consequently, the corners of the square impression will be filled in the first upset. The next impression is made round, and the diameter of this impression, as at "S" can be one and one-half times the long diameter, or in other words, the diameter across the corners of the previous square upset. The square corners, by coming in contact first with the sides of

come within the requirements of rule No. 1, then it can be formed in the last operation into any desired shape without regard to the diameter of the die impression. The practical application of such a method is shown in Figs. 40 and 41.

## IMPROVED DRAWING-BOARD COVER

By M. M.

In a great majority of drafting rooms the ordinary buff drawing paper is used to cover drawing boards. It is not long before the paper is soiled and marked up with pencil marks and ink-spots. There is also another disadvantage—in damp weather the paper becomes loose on the board, making it disagreeable to work on.

A drawing-board cover treated in this way will never loosen up in damp weather, and it is hard to write on, therefore the cover will always look tidy and clean. In case some ink spots or other stains get on it, they can be washed off without any trouble.

FIGURE 33.

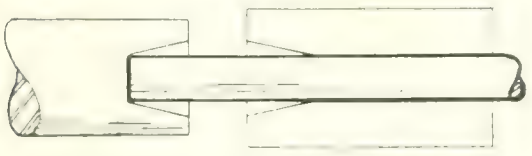


FIGURE 34.

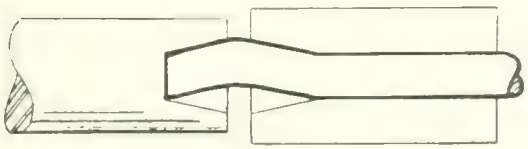


FIGURE 35.

FIGURE 36.

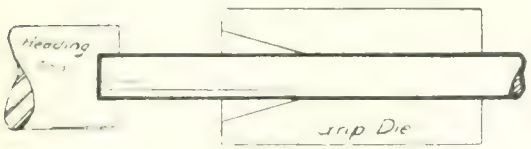



FIGURE 37.

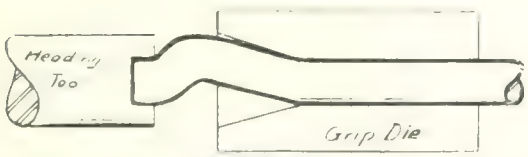



FIGURE 38.

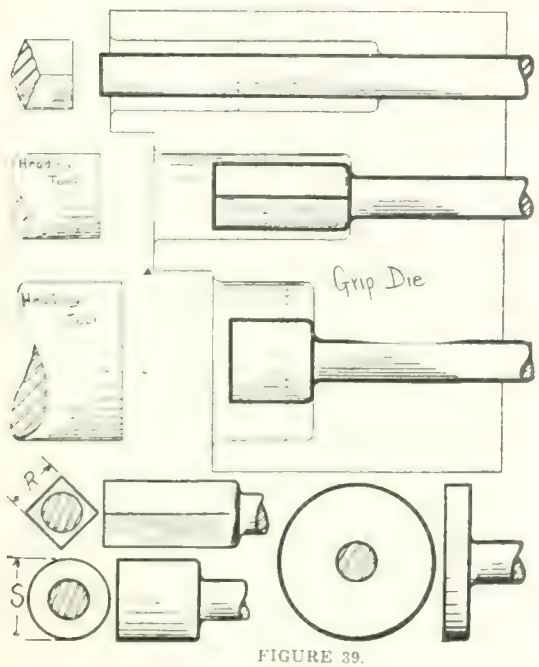
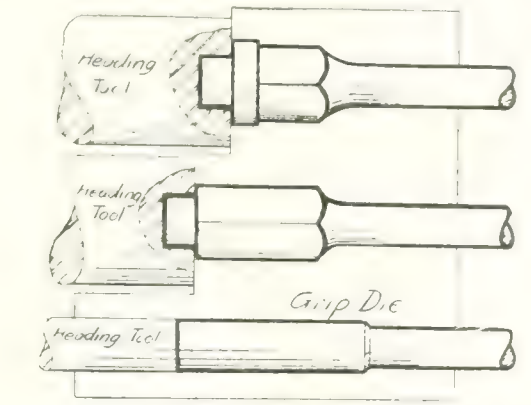



FIGURE 39.



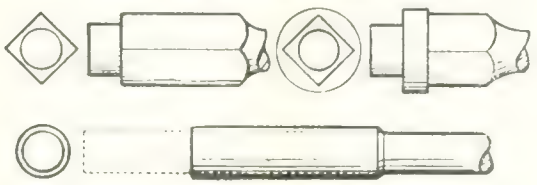



FIGURE 40.

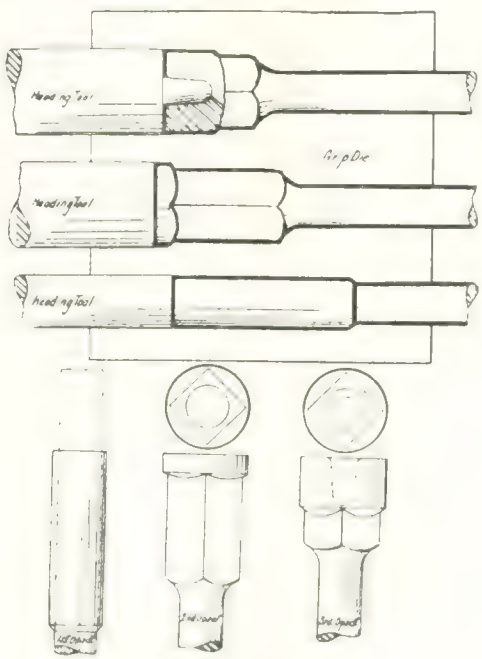



FIGURE 41.

A good way to do away with all this is as follows: Cut the paper the required size and rub over it with a damp cloth. The water on the paper will make it expand; then tack the paper to the board; the tacks should be about 2 inches apart. In a little while the paper will tighten up and dry, when a coat of shellac should be spread over it.

It takes a little longer to put on a cover like this, but it is worth while, considering how much longer it lasts than the other kind. The only reason for ever taking the cover off is on account of so many tack holes, but for these it would last indefinitely.

**Toronto, Ont.**—Among the appropriations tabled in the Legislature recently was $686,000 for the T. & N. O. Railway.

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## THE MUNITIONS "PROFITEERS"

LARGELY as the result of the efforts of the members of the tin-pan section of the public press the people have been given the impression that all shell makers are "profiteers" and all who have to do with shell contracts are "grafters." Some recent incidents at Ottawa have done much to relieve this impression although there was not any great effort shown to give them that publicity required to remove public misapprehension. On the floor of the House of Commons Sir Sam Hughes, referring to the "profiteering" in munitions manufacture, said:

record is as follows: Twenty-five per cent. of those who entered into the manufacture of munitions completely failed and lost their money, and I have yet to find any person express the slightest bit of sympathy for any of these poor beggars who put up their own money—not the Government's money as was done in Great Britain and the United States, but their own money—and then failed in the manufacture of munitions. Fifty per cent. came out a little more than even, and about twenty-five per cent., owing in some instances to good work and in others to slight encouragement from the Munitions Board and elsewhere, succeeeded in making money.

Twenty-five per cent. of the munitions contractors lost money; fifty per cent. came out even and twenty-five per cent. made money. How little has the public understood of this. The cases of some few concerns which by their exceptional positions made big profits—much of which went back to the Government in taxes—have been held up to represent a general condition, and those patriotic men and companies, after putting up their capital and experience for the national good have received no thanks, but, on the other hand, have been made the targets for those who revel in the cheap political effect of the plaudits of a misunderstanding public.

The zest with which recent references to percentage arrangements by the Imperial Munitions Board have been developed into charges—by innuendo—against Sir Joseph Flavelle and the seeming reluctance with which explanations in refutation have been made is only another indication of the Bolsheviki tendencies which are being fostered and which seriously menace that all-important but little understood national institution known as business.

## CANADIAN MACHINERY PROSPECTS

LATE advices from machinery sources in the United States indicate the probability of capacity being taxed to the utmost well into 1920. The continued needs of the nation for war purposes are compelling builders of large tools to undertake extensions in preparation for increase in business.

In view of the labor and output situation, the call for over eighty millions of 75 and 155 mm. shells during 1919 would indicate the necessity for Canadian machine tool builders being prepared to maintain the engineering industry at full efficiency with their own resources.

Much of this shell work will doubtless come to Canadian shops, and with tool-building loaded up in the States, our own builders should find increased opportunity.

## SHIPPING NEEDS OF THE FUTURE

CANADIAN exports to the amount of many thousands of tons are, according to Commissioner Ross of the Trade and Commerce Department at Melbourne, held up in this country owing to lack of shipping facilities to Australia. Ships are required elsewhere owing to the exigencies of war. For the present Canadian manufacturers must be prepared to face such conditions—the military campaign is the first consideration—but what of the future?

A nation which hopes to supply other nations with her products, particularly manufactured products, should be prepared to make delivery—and delivery means ships. Canada as an agricultural country may for the present, and in the future while there is an insistent demand for food stuffs, be in the position of being able to make buyer nations take delivery at the seaboard with their own ships. This will not be the case with manufactured goods, particularly as those nations which take our food exports will not only refuse to carry other products, but they will expect to bring manufactured products to us. This on the economic basis of settling for purchases and for the business reason that successful transportation demands cargo in both directions.

All indications are that if Canada wishes to play a part in the Pacific trade after the war, and to extensively export manufactured products, especially where there is national competition, she will require her own vessels to deliver the goods. This should be considered as a factor in relation to any shipbuilding program which on the face of it may not promise to be a financial success. It is under such circumstances that national industry looks to the Government for assistance.

## U.S. AUTHORITIES TO GATHER INFORMATION IN CANADA

CANADIAN factories will be visited in the near future by a sub-committee of the Senate Committee of Military Affairs from Washington as a result of the present state of the munitions industry in the United States.

Authoritative advices state that the present output of war munitions across the line is only 75 per cent. of what it should be. "This is due," says the United States Employment Service, "to the lack of mechanics and toolmakers."

The necessity for greater production is so urgent that this organization has made an appeal to all manufacturers of non-essentials to reduce their production so that the labor supply available for war uses may be increased. Reserve lists of workers in non-essential industries who are willing to take up war work will be utilized by the Employment Service in its effort to get help.

These facts lend weight to the belief that munitions orders for American account will continue steadily for some time. This is equally as gratifying as the statement in the opening paragraph. It appears that the sub-committee referred to was named as a result of the delay in supplying large guns for the American Expeditionary Force, and its present tour of steel plants and ordnance factories is expected to include representative Canadian factories so that a comparison of methods can be made.

The manner in which Canadian factories measured up to their demands before the war was a year old justifies confidence that the comparison will not be to our disadvantage.

# GOOD TRAINING AT START MEANS MUCH

**W. J. Rennie Says His Experience Under Careful Montreal Mechanics Has Meant Much To Him In His Mechanical Career**

"THE very best thing that can happen to a young mechanic is to learn his trade with a man who is the master of it." That's the conviction—not simply the opinion—of W. J. Rennie, superintendent of the Toronto Type Foundry on Coleman Ave., at eastern limits of Toronto. "As I look back over my life, I can thank such men as J. and R. C. Weir, of Montreal. It was in their marine shop that I went as a boy of 15 to learn the machinist's trade. Apprenticeship at that time lasted for six years, but when an apprentice finished his six years in the old Weir shop he was a mechanic — or it wasn't the fault of the firm."

W. J. RENNIE.

Mr. Rennie is particularly well known to the machinery trade in Montreal, from which place he came to Toronto when the Type Foundry went into the making of munitions about three years ago. He was with the Canadian Linotype Co., for many years as superintendent, for a period of some 19 years.

### A Friendly Feeling

"It's a good many years," stated Mr. Rennie, "since I first left Montreal, but there's one little incident that I never shall forget. It brought a lump in my throat at the time. The day I was leaving the Weir shop as a full fledged machinist, James Weir came outside the shop, and taking me by the hand, wished me success. Then he pointed to the sign on the shop that carried their name and said, 'As long as that's above the door there's always a job here for you.' I never went back to get that job, but just the same it was a great start for me to get on my first trip out."

### Not Much Equipment

"I remember well the first place in Bridgeport that I applied for work. We didn't carry such an outfit as many of the men do now. The first thing the superintendent asked me was where was my outfit. That was in 1890. I told him I had it with me. So I did, my overalls, hammer, calipers and a two-foot rule. The job he set me at was cutting a key way in a very large wheel. I finished it in short time because I knew exactly how to do it. The superintendent came over and looked the job over, put the rule on it and nodded. I remember quite well he turned and said, 'Say, where did you learn your trade?' I told him, and believe me I was thankful right there and then for the training I had received at the old Weir shop. The superintendent was mightily pleased with that first job."

### Went Into Special Work

Shortly after this, Mr. Rennie went into more special works, entering the plant of the Armstrong Die Works, also working in New York and Springfield. "That was one time in my life when I used to have lots of money," laughed Mr. Rennie. Firms were paying well then for special tool work, and a friend of mine worked with me—things were good then. Four years after I returned to Montreal and after being in the Linotype factory for six months I was made foreman, staying there for ten years, after which I became superintendent. I was there for 19 years altogether." About that time the Canadian-American Linotype sold to the Mergenthaler Co., Mr. Rennie then going as superintendent with the Robert Mitchell Brass Works. He afterwards became a partner in the firm of Decatur, Bull & Co., makers of tools. A disastrous fire wiped them out, and Mr. Rennie came to Toronto to put in and operate the shell plant of the Toronto Type Foundry, where a large number of 4.5 orders were successfully machined.

### Developed New Ideas

While the work of turning out shells was going on, Mr. Rennie turned to the task of improving the methods adopted. His thread-cutting machine, knurling machine and nosing die were brought to completion in quick order. Moreover they were adopted in many of the other shell plants. Just recently Mr. Rennie has developed a grinder that will soon be put on the market. Technical men who have looked over it state it is a workable, simple machine, possessing many new points that will make for accuracy and greater production. "For almost 30 years I have known that grinders were wrong," stated Mr. Rennie, "and each new one that came out seemed to carry some of the old faults with it. In short they were too complicated and too hard for anyone but a skilled man to adjust. I will be ready to tell you more about the grinder later on."

### Regarding the Apprentices

In answer to a question regarding apprentices, Mr. Rennie replied that he liked to secure them about 16 years

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# THEY SENT FOR SCHWAB

SOME men go a-tinkerin' on and get there fairly fat, and blunder till they get out straight about this thing and that, and in that way they seem to pass and get through with the crowd, 'cause no one ever calls their bluff, and calls it good and loud.

It beats the band how they get past and no one biffs their lids, you'd think it was a slide for them with grease upon the skids.

But these things change when things go wrong, when sand gets in the cogs, and when the road gets piled up deep with bricks and stumps and logs, and when the works turn up on edge and things get out of sorts, and when the engine fades and dies or wheezes bad and snorts.

Why just the other day a case came up in Yankee land, where folks had reckoned they was goin' right fit to beat the band.

When war got started over there they went in on a rush, with fifteen different kinds of steam and forty sorts of gush—the steam was blowin' from the valves, the stokers stripped by heck, until the hunks of dew and sweat was campin' on their neck.

Until one day they counted up and found with all their fuss, their whole caboose was turnin' out a funny lookin' muss.

'Twas then they found their middlin' men was fallin' down for fair, and they needed men whose heads was decked with somethin' more than hair. So then they looked around a spell and sputtered 'bout the job, until one jay piped up and said "let's send for Charlie Schwab."

It's just the same thing all the time no matter where you turn, from pickin' stones or heavin' coal or tinkerin' with a churn.

Things seem to run on fairly well when pressure's not too strong, or when the cash is plentiful and the purse is good and long, but when them things they cease to be, when wheels they cease to hum, and when the whole durn shootin' match seems goin' right on the bum, it's then they want a real live man to tackle that there job, so they do what Uncle Sam'l did when he called in Charlie Schwab.

A. R. K.

# MARKET DEVELOPMENTS

## Will Canadian Steel Prices Be Fixed?

### Business Very Brisk, With War Work Having Preference Over All Else—Prices Very Firm With Few Changes in High-Speed Goods—Copper Prices Seem Likely to Remain at Present Levels After June 1

DEALERS in steel in Canada are looking for some form of price control, apparently anticipating action from Ottawa. As a general rule prices in Canada are well above the United States prices, in some cases working to the decided disadvantage of Canadian manufacturers.

The business of supplying plants on munitions orders with material does not show any sign of dropping off. The great quest at present is to secure machine shop capacity to turn out the special war purpose machinery that is being so insistently called for. New plants for war business are being put in at Montreal and Toronto, while others are tooling again to change from 6-inch to the 9.2 orders, these plants having previously been engaged on this class of work.

A satisfactory volume of business is coming to Canada from American sources, but the publicity which certain Canadian papers continue to give to this class of work makes it harder for the Canadian War Board at Washington to work to advantage.

Production is satisfactory at American mills and great success is attending the effort to catch up with war demands. The demand for scrap metal is insistent both in United States and Canada. As a general thing yards in this district are almost bare.

The drafting of men from the coal areas of Sydney is being watched with some interest. It is estimated that production there will fall at least 25,000 tons a month.

The trading in non-ferrous metals continues to be about the same, no new features appearing. Canadian dealers claim that on entering the United States fixed market they have to pay well over the fixed price in order to secure supplies. Small lots of Chinese tin come through at intervals, but it is very scarce, irregular and high in price.

Canadian dealers do not anticipate changed copper prices on June 1, when the present schedule expires. They point out that it is easy to secure supplies. The agitation for a higher price is being carried on by the mine group.

## AMERICAN REGULATIONS ARE REFLECTED IN MONTREAL NOW

Special to CANADIAN MACHINERY.

MONTREAL, Que., May 14.—The situation throughout the district has taken on a nervous tendency owing to the acute nature of the supply of steel and other materials. As Canada is dependent on the mills in the States for her requirements in this respect, the American conditions are more or less reflected in the market here. Owing to the announcement that practically 100 per cent. of the mill output in the States will be utilized for government purposes, the domestic needs of both countries will require to be curtailed to the very utmost. The increase in shell orders is the feature of the week. One Montreal plant that has formerly been making shell machinery is enlarging its place for the manufacture of a large naval shell. A branch of the metal industry that is apparently expanding is that of electric and oxy-acetylene welding, two local firms during the past week having more than doubled their previous capacity. Developments in marine activity are largely responsible for these extensions. The break in the Lachine lock has not been entirely repaired, but navigation was interfered with very little as they were able to move the larger vessels through as soon as one pair of gates was placed in position.

#### Pig Iron

The situation in pig iron is relatively a war market, as all available material is practically reverted to the manufacture of war essentials. Furnaces have been working to capacity, but have often been forced to curtail the output owing to the lack of obtaining a sufficient supply of coke and other raw materials. This has become less pronounced, due to the fact that delivery has been more regular during the recent weeks. Dealers here report that little or no iron is available for ordinary purposes. Quotations are withheld or are quoted as a nominal figure.

#### Steel

If it were possible to show additional tension throughout the steel industry, the same has recently been the case over the rumor that changes might be looked for in the price of certain commodities, and that in all probability these changes would be in an upward direction. The demand for steel is still heavy. Little improvement has been shown in the delivery of material, and every ton of steel used in the manufacturing field at the present time is virtually utilized for war purposes. Dealers here report great difficulty in obtaining shipments from points in the States, and intimate that this may become still further emphasized in the early future. The regulations regarding the disposal of material are becoming additionally strict, and specifications must accompany every order for steel. The great trouble appears to be the distinction that should be made as to just what constitutes essentials, as many activities apparently engaged in the making of unnecessary articles are often required to manufacture some material urgently required for plants that are more directly engaged in war work. The heavy requirements for shipbuilding purposes have made an excessive demand for tubes, and mills are unable to supply the requirements in this particular. Many shipbuilders are unable to operate at full capacity owing to the inability to

obtain an adequate supply of plates. Dealers here would not be surprised to see a stronger position in steel before the middle of the summer. The demand for high speed steel is still quite heavy, and in some cases the supply has been reduced owing to the loss in transit of shipments coming over from England.

### Metals

With the exception of tin the metal situation has developed little of special interest. Shipments are more regular and consumers are better satisfied, but uncertainty still prevails in many respects. Copper is steady with the trade anticipating a revision of prices in the near future. Tin is exceedingly strong owing to the great difficulty in obtaining shipments from the Old Country. Spelter has taken on a better undertone with prices slightly advanced. Lead is steady and unchanged. Antimony is unchanged on a steady demand. Aluminum is in good demand but prices are firm.

Copper.—While considerable interest is still displayed in the prospective advance in the government price of copper the demand from the producers that a better price be fixed for the coming period does not seem to have as many supporters as formerly, and it is not unlikely that any revision in the price will be governed by the supply and the demand. Production at the present time is practically confined to the supplying of the requirements of essential war needs, and should the supply for this purpose be considered ample it may be possible that little alteration will be made in the existing price. However, if production could be increased by a slight advance it is thought that the War Industries Board might consent to the advance. Local dealers are still asking 29 and 30 cents per pound.

Tin.—The proposition of tin is so strong that no transactions but what are absolutely essential are entered into at the present time. The uncertainty of obtaining shipments is more pronounced than ever, and the unsettled condition that prevails in Dutch circles tends to make the market increasingly nervous and acute. Supplies to this country are very irregular, and the consumers are unable to obtain tin even for their most urgent requirements. The market in London is abnormally high, and tin is quoted at £380, an advance in a week of about £20. The situation, however, has a relieving tone, and the early future promises an easier market. Dealers here report a market that is slightly less nervous, but the scarcity of metal tends to maintain the high price; the quotation is still nominal at $1.25 per pound.

### Machine Tools and Supplies

Activity in the machine tool industry has been stimulated by the further placing of shell orders in Canada. Many Canadian firms are now engaged in the making of munitions, and every week additional contracts are being let for the making of shell of various calibre. This development has occasioned considerable interest in machine circles, and much business has resulted, but owing to the fact that many of these firms were working on the British shells, the demand for machinery has not been as great as the amount of the business might indicate, as these firms are adapting much of their former equipment to the making of the new shells. One firm here that has been making machinery for shell purposes has recently received a contract for the making of an 8-inch naval shell, and have taken over additional space and are rapidly fitting the shop with the necessary equipment. The demand for general machine tools is not excessive, but the requirements for all kinds of supplies has shown a noticeable increase during the past week or so. Shipbuilders are good buyers of pneumatic tools and sales of these are very satisfactory.

### Scrap

Transactions in old materials are restricted to immediate requirements owing to the unsettled condition that appears to prevail in this market. The regulations that are imposed on the trading in scrap metals make it very difficult for dealers to base their operations on a profitable footing, so that few are willing to stock or buy more than will satisfy the immediate needs of a customer.

## POINTS IN WEEK'S MARKETING NOTES

**United States Government is likely to go ahead with plant costing $100,000,000 for large projectile manufacture. The arsenal will probably be in the Pittsbury district.**

**Big industrial centres report a shortage of skilled mechanics.**

**Discard steel is being used largely in war purposes, for barb wire posts, etc.**

**United States steel makers are keeping pledge to speed up and devote entire output to war work.**

**Users of pig iron are being requested to state definitely the purposes for which they want orders before they are filled.**

**April production of pig iron in United States was at the rate of 40,400,000 tons a year. This is the highest rate for eleven months.**

**Scrap material is short in United States and Canada, interfering to some extent with the output of steel ingots.**

**Insurance rates have been cut on Atlantic sailings by the U. S. War Risk Insurance Bureau.**

**U. S. officials may inspect Canadian war plants to find solution for delay in turning out ordnance work in U. S. plants.**

**It is estimated that the taking of men of military age from the Sydney mines will cause a drop of 25,000 tons in the output.**

**Mechanics and tool makers are scarce, and as a result U. S. munitions output is only 75 per cent. of what it should be.**

**There is a feeling in steel trade circles that a movement is likely to be made soon in regard to fixing prices in Canada.**

**Canadian buyers of non-ferrous metals claim that upon entering the United States market they frequently have to pay over the fixed price to secure deliveries.**

## LOOKING FOR SOME FORM OF CONTROL

**Steel Dealers Seem to Anticipate Action Will be Taken at Ottawa**

TORONTO, May 16.—War business is still the dominant feature in the market situation this week—new plants, new orders, new tools and supplies. Contracts that are now being secured by some of the largest firms seem to be couched in such a way that they run well into the future, which is somewhat of a contrast to some of those that have been handled in Canada on a month-to-month basis. Big expectations exist in regard to the continuance of munitions business. And in proportion to the increase in this line it will be noticed that domestic lines are cut into more and more. The war rule is put alongside every order that the dealers secure. If the prospective business does not measure up to that standard it receives short shrift. This holds good in United States as well as in Canada.

There is a pronounced tendency among jobbers in Canada who are handling American material exclusively to look for better things after the 1st of July. Just now the warehouse men are dealing pretty much on the stock they have in hand, being unable to replenish it for importing purposes. The warehouse stocks, CANADIAN MACHINERY understands, are none too large, but operations can be kept up for some time on the policy of reciprocity between the dealers concerned.

A peculiar situation comes to the surface every now and then in regard to the United States fixed prices. One Toronto dealer tells of paying 11c a pound above the fixed price for aluminum. The Government is in a position to go in and commandeer the whole supply for its work, but the buyer in Canada does not find himself in any such position.

Scrap dealers say they have very little stock on hand, some going to the point of claiming empty yards. Against this there is the belief that scrap is being

material.

Steel is Firm

plates, although there are always certain fluctuations from the prices set as standards. There is a feeling in the [illegible] of prices. The jobbers think this may come soon, but they agree that it will begin at the mills. There is a marked [illegible] of any product now to go back at once to the [illegible] course is likely to be adopted. Business is being more and more brought within the war scope. Compared with the lines [illegible] nearly all entirely cut off or restricted to the point of stoppage. Even agricultural implements are not given equality with war business in many [illegible]

Some warehouse lines have had a big run. For instance, heavy rounds and [illegible] to Toronto just now. Requirements for the making of dies and punches and other lines where the high speed product is not used has cleaned out these sizes.

Orders that are sanctioned by the Canadian Government and passed on to Washington are coming through in fairly good time, and it looks as though United States were keeping the promise made some time ago to look after the war needs of this country.

### Scrap Metals

One or two rather unimportant price changes have been made this week. Zinc scrap has been bringing $6.50, but is now quoted at $5.50. "There is more prime Western spelter on the market now than I have seen for a long time," stated one Toronto dealer to-day, "and, of course, that has a tendency to flatten out the price of the scrap metal." Scrap zinc, like any other second-hand material, loses in smelting, it being calculated that in the case of zinc scrap some 15 per cent. will come out as dross in the process of recovery.

Although scrap yards are empty, or practically so, prices are not showing an upward tendency. There is some talk of quantities of scrap being held in some quarters, with the idea that a higher price will be paid by the mills owing to the scarcity of pig iron. There is nothing to prove that such is the case, but it is a rumor that prevailed this week.

A decided scarcity of scrap is noticed on the American side, the only plants that have not complained being those with a Bessemer capacity equal to open-hearth capacity. Even such a concern as the Carnegie Steel Co., which has a large Bessemer capacity, is short of scrap metal.

### Demand Big for Tools

Several Toronto firms are finding difficulty in getting machine shops to turn out work that is in excess of their own ability. One of the heads of a plant doing a big munitions business brought out a point that is well worth considering. He put it this way: "The Government, or some central body, should go farther in connection with the controlling of machine shop work and the prevention of overlapping. There are Canadian firms now that are sacrificing their usual lines, on which they will have to depend at the conclusion of the war, because they want to go ahead on war work. By all means get the war work out, but keep up the regular lines as well. Here is an instance. We are going to Montreal to get a shop there to work on a particular machine that is largely used in munitions shops. A Montreal firm is turning out a machine very much the same, and is coming away up here to Galt to get its work done. The result is that there are two plants—the one in Montreal and the one in Galt—doing work for a house in Toronto and one in Montreal. There is a whole lot of wasted energy in it."

Big lathes and boring machines are in [illegible] brisk demand for equipment.

Dealers handling high speed goods report an advance of 10 per cent. on the rather complicated lists that are now used for the purpose of computing values in these lines. For instance, an article that cost $2 85 on the original list, you now add $1.05, then add $1.15, and at the conclusion add 52c. The latest increase applies to cutters only, and includes both the carbon and high speed variety. Tooling up plants for new contracts has caused a big run on high speed.

There seems to be just a little uncertainty in regard to some of the outside business coming to Canada in regard to sizes, frequent small changes, just enough to keep up a little doubt, causing some delay in the completion of the plants being installed to do the work.

### Non-Ferrous Metals

**Copper.**—Dealers here do not look for any change in the price when the new Government ruling takes place at Washington on June 1. It is contended that the present ruling price is sufficient. The agitation for a higher set figure apparently has its origin at the mines, the owners claiming that their returns are not keeping up against the increase in the cost of production. Canadian buyers find no trouble in securing all the copper they need, and this condition seems to be general. This ability to secure needed supplies is counted on to assist in keeping the prices at present levels.

**Aluminum.**—The supply is not great, and dealers can hardly count on securing their needs at the supposedly fixed price. One Toronto buyer, for instance, bought in the American market a few days ago. He paid 11c over the United States price. It is claimed there are cases where the holders will not sell out at the Government schedule.

**Tin.**—Small lots of Chinese tin come through to the local market, but they are uncertain and very high in price. Straits tin used to be counted on for Canadian trade, but that is all under order to the British Government. The price in open market is more in the nature of a bargain between buyer and seller rather than an observance of a fixed price. To-day's figures are from $1.25 to $1.30 per pound.

## TRADE INQUIRIES

THE following inquiries have been received by the Department of Trade and Commerce, Ottawa. Further particulars may be obtained from the Inquiries Branch of the department.

323. Catalogues.—A Port Elizabeth firm of wholesale general merchants requests catalogues and price lists on all lines suitable for the wholesale trade and in a special way on hardware of all kinds, lanterns, cutlery, tools, shovels, enamelware, household utensils, stoves, furniture—knocked down—foodstuffs, wire—baling, fencing, and netting — iron and steel in bars and rods, bolts and nuts, nails, woodenware, stepladders, handcarts, and samples of paper—wrapping and grease-proof—also bags.

324. Catalogues.—A Durban firm of importers requests catalogues on any line suitable for the wholesale general trade, in a special way on hardware of all kinds, tools, axes, shovels, pickaxes, household utensils, iron and steel goods of all kinds.

# SHOULD BE GREAT RECEPTION FOR CANADIAN-MADE GOODS IN EUROPE

Special to CANADIAN MACHINERY.

BRANTFORD, May 14.—George Scott, advertising manager for the Cockshutt Plow Company, recently returned from a business trip in England and France. He had the somewhat interesting experience of being in London when it was visited by the Kaiser's aerial strafers. At the time the most remarkable thing about the occurrence was the lack of excitement on the part of the inhabitants. Either the people had become accustomed to such raids or have become so thoroughly drilled that, to an outsider, the visitation appeared quite as a matter of routine. The unconcern seemed infectious. Not until the raid is over does one wonder at the prevailing indifference.

"What impressed me more than anything," said Mr. Scott, "was the high opinion held in England and France with reference to Canada and things Canadian. In my opinion our prophets are not far wrong when they predict an unusually fine reception for Canadian products in Europe after the war. In view of this it is of course up to Canadians to measure up to the opportunity by showing the same efficiency in the production of the wares of peace as in the implements of war."

# WILL INVESTIGATE CAUSE OF DELAYS

### U. S. Officials May Study Plans That Have Been Followed in Canada

Special to CANADIAN MACHINERY.

WASHINGTON, May 14.—The shipping programme for the United States for the fiscal year of 1919 will call for an estimate of $2,223,835,000. Estimates for this amount have been made to Congress by the United States Shipping Board.

For the cost of construction of ships the Shipping Board has asked for an appropriation of $1,386,100,000 and for the requisitioning of plants and materials $652.000.000. Other estimates are as follows:—For acquisition or establishment of plants for shipbuilding, $5.000,000; lands and buildings, $50.000,000; operation of all ships, $500,000,000; for acquisition of plants for construction of plants for concrete ships, $35,000,000; for recruiting and instructing officers for the American vessels, $10,250,000; for development of port facilities, $25,000.000, and for constructing or completing ships in shipyards for foreign countries, $55,000,000.

#### Rates Have Been Cut

Insurance rates have been cut by the War Risk Insurance Bureau. Because of the diminished danger to Transatlantic shipping a substantial reduction has been made upon the order of Secretary McAdoo on the insurance of hulls and cargoes. The Transatlantic rate has been lowered from 3 per cent. to 2 per cent. A corresponding decrease in the rate of insurance has been made in coastwise shipping. Rates on hulls and cargoes between ports in the United States and the Dominion of Canada have been reduced from ¼ of 1 per cent. to 1/5 of 1 per cent.

#### Investigate Methods

Methods employed by Canadian manufacturers of ordnance will probably be the subject of investigation of a Congressional committee within a short time. Because of the delay in supplying large guns of the American Expeditionary Forces the Senate Committee for Military Affairs has named a sub-committee to investigate the methods pursued in the manufacture of heavy ordnance in the United States. The sub-committee is making a tour of the large steel plants and ordnance factories, and it is probable that Canadian factories will be visited in order that a comparison may be made between the methods used in the Dominion and Canada and the United States.

#### Not Up to Mark

The present output of war munitions in the United States is only 75 per cent. of what it should be, owing to the lack of mechanics and toolmakers, a statement from the United States Employment Service declares. An investigation has just been made under the direction of this organization, and it shows the necessity of taking men from the non-essential industries and placing them in the war trades. An appeal has been made to all manufacturers of non-essentials in the United States asking them to reduce their production in order that the war trades may have a greater labor supply. It is declared that 10,000 mechanics are urgently needed in the war trades. The greatest need for these mechanics is in the Eastern States. Non-essential manufacturers are asked to enrol a reserve list of workers who are willing to take up war work. This reserve list will be made the source of the necessary labor supply.

#### Waste Nothing

Rigid conservation and economy and the use of coal only for essential uses will prevent a coal famine in the United States next winter, according to T. A. Morrow, in charge of distribution for the Federal Fuel Administration. After a conference with fuel producers from the various coal fields, Mr. Morrow stated that efforts have been made to systematize the coal distribution during the summer months so that winter will find sufficient coal for all ordinary purposes. The supply of coal for Canada, however, is presenting a difficult problem, because it involves the very vital question of ships. Because a large number of Great Lakes ships have been put in the Transatlantic trade there is possibility of ship shortage on the Great Lakes. Many ships are also needed at this time to transfer as large quantities of iron ore as possible over the lakes. It is hoped, however, that some arrangement may be made for the use of ships, so that the Canadian coal supplies coming normally from the United States will be transported to Canada during the early summer months. Canadian coal users have been asked to place their orders early and with great care in order that their needed supplies may not be over-estimated.

#### Into War Channels

Despite the fact that the large steel producers of the United States have agreed to turn over their entire output to the Government if its needs demand such action, there is still a limited amount of steel going to commercial users. Estimates made by the War Trade Board here show that the great Government drain on the steel supplies of this country will probably be alleviated within thirty days, and then the normal amount of steel may go to commercial users. Nevertheless the use of steel is being gradually restricted as the war programme of the United States expands. During the past week automobile manufacturers have been called to Washington and asked to prepare a voluntary agreement for the curtailment of the manufacture of pleasure cars. It is estimated here that the Government demands for steel will be about 3,000,000 tons a month. This will be below the normal production, but the margin will be so narrow that there will be restricted supply for commercial users and curtailment of non-essential industries must necessarily follow.

Arrangements are now being made with the producers of pig iron to secure from them a voluntary agreement whereby all of their product will be diverted to war uses.

# COPPER OUTPUT INCREASES IN B.C.

### Big Plans Being Made for the Developments Planned There

The Canada Copper Company, in its annual report, states that at Copper Mountain, B.C., the construction of the new mill has now been entered upon, and that ore reserves of 10,000,000 tons are assured and 2,000,000 tons probable additional were verified by additional underground work. This company has a contract with the Canadian Pacific Railway Company for the construction of a branch line, about fifteen miles in length, from Princeton to Copper Mountain, which will cost about $1,000,000.

# CAPTAIN MICHAEL CHAPMAN KILLED IN ACTION ON THE WESTERN FRONT

On April 25 the death in action of Captain Michael Chapman was announced. He was well known to the machinery and electrical trade in Canada, having been for some years a member of the firm of Chapman & Walker, Ltd., electrical engineers and dealers in machine tools and supplies. This business continued from 1909 until the outbreak of the war in 1914, when Mr. Chapman enlisted, taking his officer's course and getting a commission first as lieutenant, being advanced to the rank of captain afterwards. Deceased came to Canada from England, where he was formerly with Crompton & Co., at Chelmsford, Essex. On coming to this country he was for a time with the Canada Foundry Co., going into business with Mr. Walker at a later date. He was married, and is survived by a widow and two children, the family being in England at the present time.

The late Captain Chapman had been previously wounded in the war, and won the Military Cross for bravery in action during some of the heavy fighting in February. He was with the Grenadier Guards, a regiment to which he was attached shortly after entering the service. Not long ago he wrote to a close friend, part of his letter being as follows: "If I am killed I want you not to fret or mourn for me. It is a fine death for a great cause." Of him the Colonel of the regiment wrote: "The example he set everyone was glorious. He died more than upholding the honor of our great regiment."

## IMMENSE ORDERS STILL POURING IN

U. S. Steel Corporation to Erect Immense Arsenal for Government Work

Special to CANADIAN MACHINERY

NEW YORK, May 13.—Official confirmation has now been given finally to the statements of War and statements of the Board of Directors of the United States Steel Corporation to the effect that CANADIAN MACHINERY that the United States Steel Corporation has undertaken to construct, [illegible] of the Government a mammoth plant to manufacture cannon and projectiles of large size and in great quantities. The official statements do not give the amount to be expended for the Government arsenal, but trade estimates vary from [illegible] Probably one-fourth of this amount will be expended for equipment. It is clearly evident that machinery manufacturers will have orders that will take up their entire capacity for 1919 and 1920. Some of the manufacturers of large tools are already building extensions to be in position to meet the pressing needs of the Government for the manufacture of ordnance, shells, ships, railroad equipment, aircraft and other war munitions. It will be recalled that the great arsenal will probably be built in the Pittsburg district—the official statement says in the Central West.

### One Plant Now

The Steel Corporation is already operating the gun forging plant adjoining the American Bridge Co. at Gary, Ind. Field guns of 155 mm. and howitzers of 9.5 inches calibre are being forged, rough bored and turned at Gary, and the finishing is being done at various Government arsenals. Gun pits of 40 to 50 feet in depth are being provided, and four presses, capable of exerting pressures of 1,000 to 3,000 tons, are being installed.

The latest programme of the Ordnance Bureau of the War Department calls for the expenditure of nearly $1,000,000,000 for projectiles to be delivered in 1919 and early part of 1920. Orders for 50,000,000 75 mm. shells, including shrapnel, anti-aircraft and high explosives, are included in the plans calling for an expenditure of $500,000,000. The programme also calls for 30,000,000 155 mm. shells and a smaller number of 8, 9, and 12-inch projectiles. It is estimated that 6,000,000 to 8,000,000 tons of steel will be required for the manufacture of artillery and projectiles next year. This year's requirements amount to 5,000,000 tons, including 2,500,000 tons for export to the Allies.

### Large Orders Out

In the last week several large contracts for shells have been placed with manufacturers in the Central West, which have been followed by purchases of machine tools and other shop equipment. Among the manufacturers who have received Government contracts for projectiles, hand grenades, aerial shells and depth bombs are the Dodge Manufacturing Co., Mishawaka, Ind.; the L. Wolff Manufacturing Co., and Winslow Bros., Chicago, while the Mosler Safe Co., Hamilton, Ohio, has bought tools in Cincinnati for making gun carriages.

### Labor Shortage Felt

Machine tool builders recently have been hampered by slow deliveries of castings from foundries and by inability to get tool steel promptly from mills, but the main difficulty contended against has been and is the shortage of skilled labor. In New England not a few machines are idle because of the lack of operatives. At Detroit 20,000 to 40,000 skilled mechanics are needed, and a representative of the Navy Department has been conferring with manufacturers regarding an effort to be made to prevent the further drafting of skilled mechanics for the army and navy.

Shipbuilders continue to buy cranes and other machinery to expedite the construction of merchant boats and many new small yards are being started at various points along the Atlantic coast and on the lakes. Among the buyers of machinery in the last week are the New York Shipbuilding Corporation, the Submarine Boat Corporation, and the Todd Shipyards Corporation. The Virginia Shipbuilding Corporation has awarded contracts for a shipbuilding plant on the Potomac River, to cost $5,000,000.

## CONCERNED OVER EFFECT OF TAKING MEN FROM EASTERN COAL AREAS

Special to CANADIAN MACHINERY.

SYDNEY, N.S., May 14.—The coal production of the Nova Scotia collieries for the first four months of the year is between 250,000 and 300,000 tons below the output of the corresponding period of 1917. It appears probable that the production for the half-year ending June 30th will be about 400,000 tons below the first half of 1917.

The effect of the withdrawal of men from the mines between the ages of 19 and 22 cannot exactly be forecast, but in the Sydney district alone it will cause a drop in production of not less than 25,000 tons per month, and it may be very considerably more.

During the first quarter of 1918 the bituminous coal output of the United States is reported to have fallen 2,000,000 tons below the production of the first quarter of 1917 and 3,000,000 tons below the first quarter of 1916. It was stated by Dr. Garfield last winter that the bituminous yield of the United States during 1917 had been 50,000,000 tons below the requirements of the country. The consumption of coal during 1918 will be at a much greater rate than it was during 1917 in proportion to the relatively greater war effort of the United States under the stress of present necessity. War effort may be said to be limited and measured by the production of bituminous coal. With a falling production in the United States, a falling production in Eastern Canada, and a higher rate of consumption in both territories, what may we expect next winter, judging by the experiences of the last? Some increase in production is expected in the Canadian West, but if the increase reaches the most optimistic figures it cannot amount to more than three or four million tons above 1917, and what is that compared with the drop in the United States production?

### Want it Settled

A Royal Commission has been appointed to look into and if possible adjust the differences which have arisen between the Nova Scotia Steel & Coal Co. and its steel workers, and the scope of this Commission's duties have been extended to include the grievances of the Scotia mine workers and the matters at issue between the Dominion Iron & Steel Co. and a portion of that company's workmen. There have been a number of stoppages of work at the mines and steel plant of the Scotia company, but they have been more annoying than serious. The general question of wages at the Scotia company's mines has been complicated by the interjection of a number of small local issues which do not justify any stoppage of work, and which should have been capable of adjustment with much less fuss than has actually been the case. It is hoped that the work of the Royal Commission may have a quietening effect on the irresponsible elements among the unionists. This element is not large, nor important, but it is very vociferous.

## SET NEW RECORD FOR RIVETING

**British Workman Beats Record That Was Set Up in United States**

The record made recently by Charles Schock, who at Baltimore, drove in 2,720 rivets in nine hours, has been beaten in London. The workmen of Frazer and Frazer, engineers and boilermakers, asked the management to give them an opportunity of beating Schock's record, and the effort was made May 7 by a selected squad of riveters under Robert Farrant, aged thirty-one. He is one of a family of eighteen, and his father, aged sixty-seven, is a riveter in the same yard.

The yard set out to do 2,850 rivets in nine hours so as to beat Schock's figures, but Farrant passed that total in six hours. Going on he hammered in 4,267 rivets in nine hours, an average of slightly less than 45 an hour, or one rivet every 7½ seconds. This is claimed to be a world's record.

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago. | 37 50 |
| Standard low phos., Philadelphia. | ..... |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 32 00 |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | ..... | ..... |
| Victoria | ..... | 50 00 |

## FINISHED IRON AND STEEL

| Per lb. to Large Buyers. | Cents |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 5 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 5 75 |
| Chequered floor plate, 3-16 in. | 12 20 |
| Chequered floor plate, ¼ in. | 12 00 |
| Staybolt iron | 8 50 |
| Bessemer rails, heavy, at mill | .... |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | *3 50 |

F.O.B., Toronto Warehouse

| | |
|---|---|
| Steel bars | 5 50 |
| Small shapes | 5 75 |

F.O.B. Chicago Warehouse

| | |
|---|---|
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

## FREIGHT RATES

Pittsburgh to Following Points

| | Per 100 lbs. C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 38.1 | 50.5 |
| Halifax | 39.1 | 51.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

## METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $30 00 | $28 50 |
| Electro copper | 30 00 | 28 50 |
| Castings, copper | 29 00 | 28 00 |
| Tin | 125 00 | 125 00 |
| Spelter | 10 00 | 9 50 |
| Lead | 9 50 | 8 50 |
| Antimony | 15 00 | 16 00 |
| Aluminum | 50 00 | 50 00 |

Prices per 100 lbs.

## PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¼ to ½ | $ 9 00 | $ 9 00 |
| Heads | 9 65 | 9 25 |
| Tank plates, 3-16 in. | 9 50 | 9 10 |

## WROUGHT PIPE

Effective Feb. 5, 1918.

| | Black | Galvanized |
|---|---|---|
| **Standard Buttweld** | Per 100 feet | |
| ⅛ in. | $ 6 00 | $ 8 00 |
| ¼ in. | 5 16 | 7 29 |
| ⅜ in. | 5 16 | 7 29 |
| ½ in. | 6 55 | 8 12 |
| ¾ in. | 8 28 | 10 41 |
| 1 in. | 12 24 | 15 39 |
| 1¼ in. | 16 56 | 20 82 |
| 1½ in. | 19 80 | 24 89 |
| 2 in. | 26 64 | 33 49 |
| 2½ in. | 42 72 | 53 53 |
| 3 in. | 55 85 | 70 00 |
| 3½ in. | 70 84 | 87 86 |
| 4 in. | 83 93 | 104 10 |
| **Standard Lapweld** | | |
| 2 in. | $ 29 60 | $ 36 08 |
| 2½ in. | 44 46 | 54 70 |
| 3 in. | 58 14 | 71 53 |
| 3½ in. | 72 68 | 90 62 |
| 4 in. | 86 11 | 107 37 |
| 4½ in. | 97 79 | 122 56 |
| 5 in. | 114 00 | 142 82 |
| 6 in. | 147 80 | 185 28 |
| 7 in. | 192 80 | 241 57 |
| 8 L in. | 202 50 | 253 75 |
| 8 in. | 233 30 | 292 32 |
| 9 in. | 279 50 | 350 18 |
| 10 L in. | 259 20 | 324 80 |
| 10 in. | 333 70 | 418 18 |

Prices—Ontario, Quebec and Maritime Provinces.

## WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

## OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 22 50 |
| Copper, heavy | 22 50 | 22 50 |
| Copper wire | 22 50 | 22 50 |
| No. 1 machine composition | 22 00 | 21 50 |
| New brass cuttings | 16 00 | 14 00 |
| Red brass turnings | 18 00 | 17 00 |
| Yellow brass turnings | 12 50 | 12 50 |
| Light brass | 10 00 | 9 50 |
| Medium brass | 12 00 | 12 00 |
| Heavy brass | 15 00 | 14 00 |
| Heavy melting steel | 24 00 | 21 00 |
| Steel turnings | 12 00 | 12 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 27 00 | 20 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 23 00 |
| No. 1 machine cast iron | 31 00 | 30 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 20 00 | 17 00 |
| Car wheels, iron | 26 00 | 30 00 |
| Steel axles | 38 00 | 35 00 |
| Mach. shop turn'gs | 9 00 | 8 50 |
| Cast borings | 12 00 | 12 00 |
| Stove plate | 19 00 | 19 00 |
| Scrap zinc | 6 50 | 6 50 |
| Heavy lead | 7 50 | 7 00 |
| Tea lead | 5 00 | 5 75 |
| Aluminum | 21 00 | 20 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent |
|---|---|
| Carriage bolts, ⅜" and less | 10 |
| Carriage bolts, 7-16 and up | net |
| Coach and lag screws | 25 |
| Stove bolts | 55 |
| Plate washers | List plus 20 |
| Elevator bolts | 5 |
| Machine bolts, 7-16 and over | net |
| Machine bolts, ⅜ and less | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | 10 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | add 25 |
| Nuts, square blank | add $1 50 |
| Nuts, square, tapped | add 1 75 |
| Nuts, hex., blank | add 1 75 |
| Nuts, hex., tapped | add 2 00 |
| Copper rivets and burrs, list plus | 30 |
| Burrs only, list plus | 50 |
| Iron rivets and burrs | 25 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 37½ |
| Wood screws, O. & R., brass | 32½ |
| Wood screws, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

## MILLED PRODUCTS

| | Per Cent |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil. Head Cap Screws | net |
| Flat But. Hd. Cap Screws | plus net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. & Semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2 in. | plus 10 |
| Studs | net |
| Taper pins | 40 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | list plus 20 |
| Collar screws | list plus 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | 65 |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add 7 00 |

## BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $47 50 |
| Open-hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.

F.O.B. Pittsburgh.

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails | $5 25 $5 20 |
| Cut nails | 5 70 5 65 |
| Miscellaneous wire nails | 60% |
| Spikes, ⅜ in. and larger | $7 50 |
| Spikes, ¼ and 5-16 in. | 8 00 |

## ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 41 |
| Plumbers' oakum, per lb | ..... |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila rope | 0 33 |
| New Zealand hemp | 0 33 |
| Transmission rope, Manila | 0 45 |
| Cotton rope, ½ in. and up | 62½ |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | net |

MISCELLANEOUS

| | |
|---|---|
| Linseed oil, raw, single bbls. | 1 |
| Linseed oil, boiled, single bbls. | 1 |
| | 2 50 |
| Sandpaper, B. & A. | list plus 20 |
| Emery cloth | list plus 20 |
| Sulphur, rolls | 0 05 |
| | 0 04½ |
| Rosin "D," per lb. | 0 03 |
| | 0 03½ |
| Borax crystal and granular | 0 12 |
| | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

CARBON DRILLS AND REAMERS

| | Per Cent. |
|---|---|
| S.S. drills, wire sizes up to 52 | 40 |
| S.S. drills, wire sizes, No. 53 to 80 | 40 |
| Standard drills to 1½ in. | 40 |
| Standard drills, over 1½ in. | 40 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 |
| Bit stock | 40 |
| | 15 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 40 |
| | 40 |
| Taper pin reamers | net |
| Drills and countersinks...list plus | 40 |
| | 50 |
| Centre reamers | 10 |
| Chucking reamers | net |
| | 10 |
| | 75 |
| | 60 |

COLD ROLLED SHAFTING

| | |
|---|---|
| | list plus 30 |
| | list plus 50 |

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings: class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | | |
| Sheets, black, No. 10 | 10 00 | 9 50 |
| Canada plates, dull, 52 sheets | 9 00 | 8 65 |
| Can. plates, all bright | 9 50 | 9 50 |
| Apollo brand, 10¾ oz. | | |
| | | |
| Fleur-de-Lis, 28 B.W.G. | | |
| Gorbal's Best, No. 28 | | |
| | | |
| Premier, No. 28 U.S. | | 8 95 |
| Premier, 10¾ oz. | | 9 25 |
| Zinc sheets | 20 00 | 20 00 |

PROOF COIL CHAIN

B

¼ in., $12.35; 5-16 in., $11.85; ⅜ in., $11.50; 7-16 in., $10.90; ½ in., $11.20; 9-16 in., $11.20; ⅝ in., $11.10; ¾ in., $11.00; ⅞ in., $10.90; 1 inch, $10.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $15.50; 3-16 in., $11.70; ¼ in., $8.40; 5-16 in., $7.40; ⅜ in., $6.35; 7-16 in., $6.35; ½ in., $6.35; ⅝ in., $6.35; ¾ in., $6.35.

Prices per 100 lbs.

FILES AND RASPS.

| | Per cent |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P H and Imperial | 50 |
| Nicholson | 40 |
| Black Diamond | 40 |
| J. Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 37½ |
| Disston | 50 |
| Whitman & Barnes | 50 |

BOILER TUBES.

| Size | Seamless | Lapwelded |
|---|---|---|
| 1 in. | $36 00 | $..... |
| 1¼ in. | 40 00 | ..... |
| 1½ in. | 43 00 | 36 00 |
| 1¾ in. | 43 00 | 36 00 |
| 2 in. | 50 00 | 36 00 |
| 2¼ in. | 53 00 | 38 00 |
| 2½ in. | 55 00 | 42 00 |
| 3 in. | 64 00 | 50 00 |
| 3¼ in. | ..... | 58 00 |
| 3½ in. | 77 00 | 60 00 |
| 4 in. | 90 00 | 75 00 |

Prices per 100 ft., Montreal and Toronto.

OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | |
| Royalite, per gal., bulk | 18 |
| Palacine | 21 |
| Machine oil, per gal. | 26½ |
| Black oil, per gal. | 15 |
| Cylinder oil, Capital | 49½ |
| Cylinder oil, Acme | 39½ |
| Standard cutting compound, per lb. | 0 06 |
| Lard oil, per gal. | 87 60 |
| Union thread cutting oil antiseptic | 88 |
| Acme cutting oil, antiseptic | 37½ |
| Imperial quenching oil | 39½ |
| Petroleum fuel oil | 13½ |

BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30-5% |
| Standard | 40% |
| Cut leather lacing, No. 1 | 1 95 |
| Leather in sides | 1 75 |

TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 06 |
| Emery glue | 15 to 20 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 35 |

Prices Per Lb.

ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | .08½ |
| Grits, 80 and finer | .06 |

BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 38 |
| Brass sheets, 24 gauge and heavier, base | 0 43 |
| Brass tubing, seamless | 0 46 |
| Copper tubing, seamless | 0 48 |

WASTE.

| White. | Cts. per lb. | | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 18½ |
| Peerless | 21 | X Empire | 17¼ |
| Grand | 19¾ | Ideal | 17¼ |
| Superior | 19¾ | X press | 16 |
| X L C R | 18½ | | |

Colored.

| | | | |
|---|---|---|---|
| Lion | 15 | Popular | 12 |
| Standard | 13½ | Keen | 10½ |
| No. 1 | 13½ | | |

Wool Packing.

| | | | |
|---|---|---|---|
| Arrow | 25 | Anvil | 15 |
| Axle | 20 | Anchor | 11 |

Washed Wipers.

| | | | |
|---|---|---|---|
| Select White | 11 | Dark colored | 09 |
| Mixed colored | 10 | | |

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard ... 10% Best grades .. 15%

ANODES.

| | |
|---|---|
| Nickel | .50 to .54 |
| Cobalt | 1.75 to 2.00 |
| Copper | .44 to .46 |
| Tin | .49 to .56 |
| Zinc | .23 to .25 |

Prices Per Lb.

COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | 42 50 | 43 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 46 00 | 44 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 48 00 | 48 00 |
| Copper sheet, planished, 16 oz. base | 57 00 | 45 00 |
| Braziers,' in sheets, 6x4 base | 45 00 | 44 00 |

LEAD SHEETS.

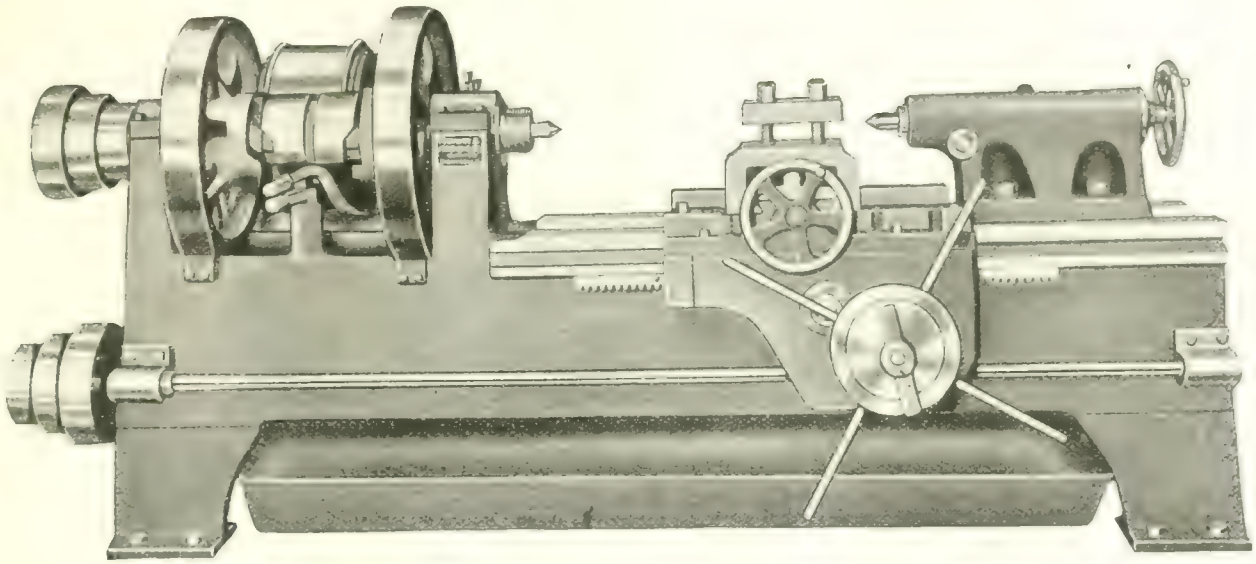
| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $13 25 | $13 25 |
| Sheets, 3½ lbs. sq. ft. | 13 25 | 13 25 |
| Sheets, 4 to 6 lbs. sq. ft. | 12 50 | 12 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

| | |
|---|---|
| Acid, boracic | $ .15 |
| Acid, hydrochloric | .05 |
| Acid, hydrofluoric | .14½ |
| Acid, nitric | .10 |
| Acid, sulphuric | .05 |
| Ammonia, aqua | .08 |
| Ammonium carbonate | .15 |
| Ammonium, chloride | .11 |
| Ammonium hydrosulphuret | .40 |
| Ammonium sulphate | .07 |
| Arsenic, white | .12 |
| Copper, carbonate, anhy | .35 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .70 |
| Iron perchloride | .20 |
| Lead acetate | .16 |
| Nickel ammonium sulphate | .12 |
| Nickel carbonate | .35 |
| Nickel sulphate | .15 |
| Potassium carbonate | .75 |
| Potassium sulphide (substitute) | .20 |
| Silver chloride (per oz.) | .65 |
| Silver nitrate (per oz.) | .55 |
| Sodium bisulphite | .10 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .41 |
| Sodium hydrate | .04 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | .14 |
| Tin chloride | .60 |
| Zinc chloride | .60 |
| Zinc sulphate | .09 |

Prices per lb. unless otherwise stated.



# *Speed Up Production*

## *with the*

# MONTREAL LATHE

for the economical production of 4.5 , 6 and 155 MM. shells. If you are interested in obtaining maximum production at minimum labor expense, investigate the records of the MONTREAL lathe in plants of the largest producers of shells in Canada.

The MONTREAL lathe is wonderfully simple in operation and construction, yet every worth while improvement has been embodied in the design.

A powerful machine—designed to transmit all the power that the cutting tools will stand—with large broad ways, liberal wearing surfaces and unbreakable apron. The MONTREAL lathe comes to you equipped as you need it—with carriage for rough turning —with rigid single bar for boring, or with swivelling bar for inside profiling.

*Write Now for Prices and Delivery.*

## The A. R. Williams Machinery Co.

LIMITED

64 Front Street West - . - TORONTO

# MILLS ARE MAKING A GREAT RECORD NOW

Output Goes Ahead and Faith is Kept With Pledge to The Government

Special to CANADIAN MACHINERY

PITTSBURGH, Pa., May 13. As to [illegible] supplies of commercial steel, the current flows of steel products strike a balance. On the one hand there is [illegible] with the principles laid down by the Director of Steel Supplies at the New York meeting of April 27, that each mill must ship the maximum tonnage possible against the orders of the Government and its allies. On the other hand, production has been increasing and is at a rate better than was expected, a rate well in excess of any previous rate in the history of the industry.

As explained in previous reports, the 100 per cent. effort to fill war orders does not mean that all steel produced goes into that channel, because some of it is not suited. There is some steel left, and a considerable tonnage, indeed, but it in turn must be given most freely to the commercial industries that are most helpful, indirectly, towards winning the war. This distribution the mills definitely undertook several weeks ago. Since then the merchant blast furnaces have undertaken a similar activity in connection with pig iron, but instead of the producers doing this individually, as is the case with the steel mills in distributing commercial steel, the merchant furnaces have gathered data as to the orders on books, and are now gathering data from consumers as to the use they intend for the pig iron they have on order.

### Increased Production

The monthly blast furnace report of the "Iron Age" shows that pig iron was produced in April at the rate of 40,400,000 tons a year. That is the highest rate in eleven months. It is 1,800,000 tons above the average rate in 1917, and 1,000,000 tons above the average rate in 1916, while it is 36 per cent. above the average rate in January and February of this year. That is not the whole story, however, for the rate increased during April and there has been a further increase since, so that it seems fair to estimate that at the present time pig iron is being produced at the rate of fully 42,000,000 tons a year. The increase in pig iron production has been greater than the increase in coke production, on which the production of pig iron has depended right along, the reason for this divergence being that when coke supplies are insufficient the furnaces do not work economically, and consume more coke per ton of pig iron produced. The furnaces now in blast are nearly all working economically at capacity, and further increases in pig iron output will come chiefly from the blowing in of furnaces now idle on account of lack of coke. The best estimate of capacity has been 43,000,000 tons, but there is now a distinct possibility that the furnaces will show they can do more than this.

The spurt in pig iron production, with more coke supplied, is not temporary. The gain will be consolidated by the completion, in the next few months, of several large by-product coking plants, so that there will easily be a large excess of coke-making capacity, and the only danger threatening is traffic difficulties next winter. Doubtless special efforts will be made to accumulate stocks of by-product coal at the by-product ovens and of coke at the blast furnaces.

Steel ingot production has kept pace with increasing pig iron supplies, but the percentage of production to capacity is lower in steel than in pig iron, this being due to the shortage of scrap. The allowance of the scrap dealers' commission of 3½ per cent. a fortnight ago has not increased scrap offerings materially. While the dealers insisted they ought to be allowed the commission in order to make scrap move, they have not made good thus far on their representations. As was thought in many quarters right along, the scrap does not exist, the nature of industrial operations at present not being such as to bring out much old material. The scrap produced in shell manufacture, large as it is, does not entirely fill the gap.

### Discard Steel

A few months ago the brokers were generally able to pick up shell discard steel without much difficulty, and get it rolled into such billet sizes are were required. Now, with a much heavier production of shell steel the discards are much harder to find. The mills had the problem of finding a market for the discard steel, and usually sold it at a shade less than the set prices for ordinary soft steel, but now they are strictly limited as to where they may dispose of the discards. The government has found some war uses for discard steel and is trying to find more. While the material is harder to work, there are many cases where in actual use in war it serves the purpose at least as well as ordinary soft steel. Posts for barb wire entanglements are mentioned in this connection.

### Steel Corporation's Bookings and Shipments

The Steel Corporation's unfilled obligations decreased 314,524 tons during April, against a decrease of 232,049 tons during March. The April decrease was equal to about 24 per cent. of the full capacity for the month, while shipments may be estimated at about 88 per cent. of capacity, from which it would seem the bookings represented about 64 per cent. of capacity. This compares closely with the average of bookings, similarly estimated, for the three preceding months of the year.

While shipments of steel are being rigidly confined to the filling of war orders, when the steel that can be produced fits such orders, it does not follow that the Steel Corporation does not book any additional commercial business. It is the rule with some of the departments to book regular customers for additional tonnages as their old tonnages are worked off. These bookings have nothing to do with the distribution of steel, which is the concern of the government, since the customers are given absolutely no delivery promises. The mills want to serve their regular customers to the extent possible, and they can appraise their prospective requirements the better by having the formal contracts on their books.

### Steel Supply Prospects

To the commercial consumer of steel the present increase in shipments is of particular interest, for the reason that when production was especially restricted the production was as far as possible of war steel, and as the total supply of steel increases a proportionately greater amount of steel cannot be put through the finishing departments that make war material because formerly they were getting more than their proportion of the output. Thus the increased output means, in a sense, a larger surplus of steel that cannot be used in filling war orders. This steel, however, is to be distributed to the industries that will help most in indirect manner, and the success of the buyer in placing an order, or in securing a delivery, depends chiefly upon the use to which he intends to put the steel.

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## GOOD TRAINING AT START

(Continued from page 523)

of age. "Give me a boy who is full of life, even of devilment around the shop. I always pay a little more attention to that kind, and work with him. I always try to make them see that they are only beginning their real education when they start their trade. They can't become experts without an education. The man with the learning can arrive at a given conclusion ever so much easier than the chap who does his work by thumb-nail plan. When I was able to do so I have bought correspondence school courses for some of the apprentices I was particularly interested in. I read a great deal myself," concluded Mr. Rennie, "but I never get time for fiction. Mechanical and technical papers interest me most of all. I strongly advise the young mechanic to read them."

Mr. Rennie lives at 2156 Gerrard street east, Toronto; is the proud father of a family of twelve—"and never much laid out for doctors' bills, either." He prefers the name "Bill" to William or W. J. or Mr. The Toronto Type have him now in charge of the manufacture of Camco Continuous Feeders, Cleveland Folders, and the new All-Angle Grinder.

---

THE history of the development of the turbo alternator begins about 1889, when a 75-kilowatt machine was built by the Parsons' Company to run at 4,800 revolutions per minute. The first method of cooling turbo alternators by means of radial ducts was that covered by the Brown patents in 1901.

# ECONOMY

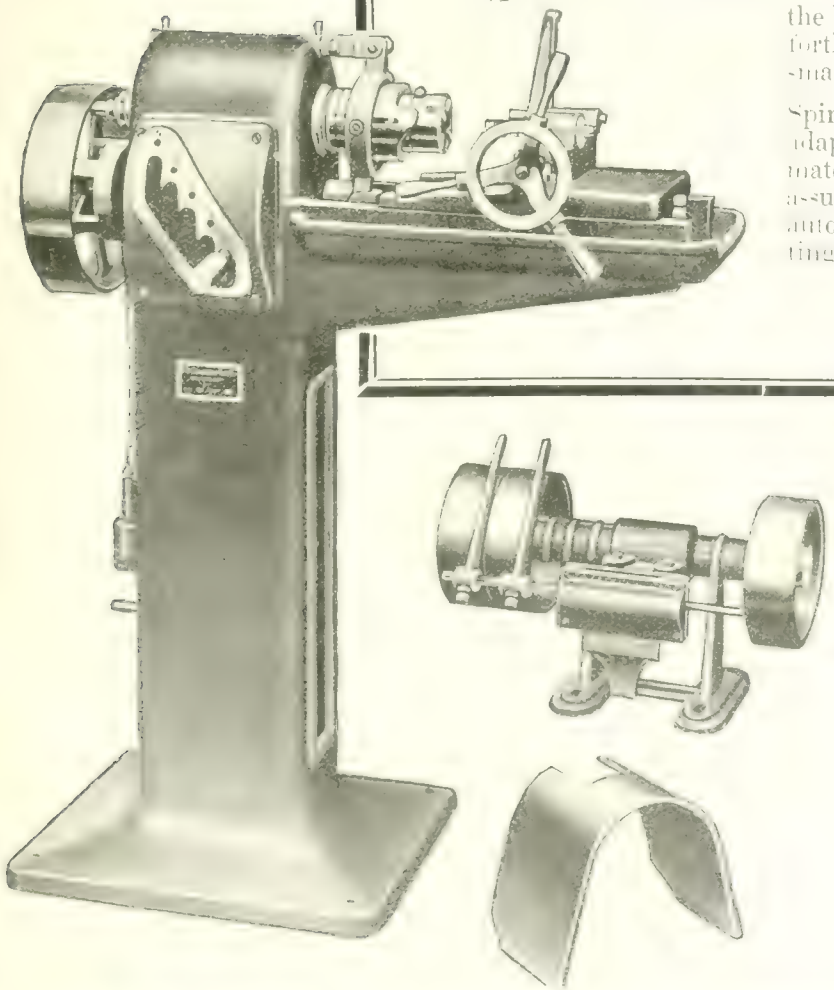
## That is the lesson we are slowly learning

Here is a machine—the Geometric Threading Machine—which has been economizing in screw thread production for a number of years. Busy automatic screw machines cannot profitably be slowed down to cut threads when there is a Geometric Threading Machine at hand. Especially since a Geometric Threading Machine costs one-tenth the price of automatics.

Geometric Threading Machines are employed on a large class of small threaded parts that cannot be produced economically on the ordinary screw machine.

Made in three sizes—to cut ⅛ to ½ inch, ¼ to ¾ inch, and ¾ to 1½ inch diameter threads. The carriage is mounted on slides and on the largest size machine is moved back and forth by rack and pinion, and in the smaller sizes by hand.

Spindle speed changes readily made, adapting the machine to the diameter and material of the work. An adjustable stop assures accurate length of thread, and automatically opens the die head, permitting of drawing the work straight back.







*A line from you brings full details regarding this machine. Tell us your threading requirements — let us recommend the proper Geometric Collapsing Tap or Self-Opening Die.*

**THE GEOMETRIC TOOL COMPANY**
**NEW HAVEN CONNECTICUT**

Canadian Agents: Williams & Wilson, Limited, Montreal; The A. R. Williams Machinery Co., Limited, Toronto, Winnipeg and St. John, N.B.

# SHIPBUILDING AT POINT WHERE IT WILL OVERTAKE THE SUB LOSSES

[illegible] The [illegible] production [illegible] will pass [illegible] This is [illegible] deliveries for January, February and March. The tonnage delivered was:

| | British Vessels. | United States Vessels. |
|---|---|---|
| | tons. | tons. |
| [illegible] | [illegible] | 19,541 |
| [illegible] | [illegible] | 129,700 |
| March ..... | 242,511 | 166,700 |

The deadweight tonnage delivered in [illegible] was therefore [illegible] March was rather [illegible] but the aggregate tonnage destroyed would probably not exceed 400,000 deadweight tons. In March 54 ships of more than 1,600 tons were sunk, and 27 of less than 1,600 tons. Allowing 4,500 tons as the average of the larger ships, and 1,000 of the smaller, the aggregate gross tonnage sunk is about 270,000. That would be equivalent to 405,000 deadweight tons. A monthly average of 300,000 gross seems to have been calculated upon. Losses reported in April are much lower than in March.

This improvement comes at the eleventh hour. The United States has the task of transporting probably a million men to France in the next few months. The output of ships is rising in American yards, but is below schedule and far below needs. The shipyards of the Motherland, responding to the renewed call, have kept ahead of American production. Every week sees added force gained in the shipyards. Fifty-five days is the record from keel to launching on the Pacific Coast. The obtaining of the services of Charles M. Schwab and Lord Pirrie, the two greatest men in this field in the world, gives hope for a speeding up that will definitely begin building up available tonnage. If the United States is to play its decisive part on the battlefields of France the ships must be forthcoming, and the rising scale of output and diminishing losses afford great hope.

## MARKET FOR MACHINERY AND TOOLS IN ENGLAND

J. E. Ray, Canadian Trade Commissioner at Birmingham, England, reports as follows regarding the possibilities of trade with England in machine tools.

"Although it is practically impossible for Canadian manufacturers to export machinery and tools to the United Kingdom on any appreciable scale at the present time owing to circumstances with which all are familiar, it is evident from correspondence and catalogues recently received at this office that they are anxious to obtain the fullest information possible in preparation for after-war trade. In Birmingham and district are located numerous manufacturers of [illegible] machinery and many kinds of tools; nevertheless, the United States and Germany always maintained large business connections in this area before the war, and the former country has increased its sales enormously during the last three years, particularly in lathes, machinery used in the manufacture of munitions, mechanics' hand tools, saws, hatchets, axes, etc.

"United States manufacturers adopt the policy of appointing agents in Birmingham, who always have stocks on hand, and this procedure appears to be quite satisfactory. Canadian firms anxious to discuss the subject of representation in Birmingham, and who are also prepared to make preliminary investigations with a view to after-war trade, can be introduced to influential houses in this city. Any correspondence on the subject should be accompanied by more than one copy of catalogue. It frequently happens that a single copy is held for some time by an interested firm, and in the meantime [illegible] compelled to await its return. The effect is obvious."

## LICENSES FOR THE EXPORT OF IRON AND STEEL

When making applications for export licenses for iron and steel products listed below, the War Trade Board of Canada request that the following instructions be observed:—

Applicants are cautioned to give the net weight under question 7 and the value under question 8. Under question 10, give date the order was accepted from purchaser abroad.

**Pig-iron.**—Applications covering pig-iron must state grade or quality. File on form X-2.

**Billets, blooms, ingots, slabs, shapes, sheet bars.**—State whether steel is Bessemer or open hearth. File on Form X-2.

Separate applications required for each of the following commodities:

**Alloy and high-speed steel and tool steel.**—Applications covering alloy and high-speed steel must show percentages of alloys therein. File on form X-2. If crucible or open hearth steel containing no alloy except manganese under 2 per cent. specify on application "not alloy steel" and file on form X only.

**Bars.** State whether Bessemer or open hearth. Applicants for round and square bars must state "under 2½ inches" or "2½ inches and larger." Make separate application for round and square bars 2⅛ inches and larger. File on form X-2.

Round and square bars under 2½ inches and flat bars. File on form X only. State maximum width of flat bars.

**Boiler tubes.**—Applications covering boiler tubes must specify whether "cold drawn seamless," "hot rolled seamless," "lap-welded steel," or "charcoal iron. File on for X-2.

**Fabricated structural steel.**—When applying for fabricated structural steel (punches, riveted, etc.), state approximate percentage of plates therein, and if only connection plates are used, so state. Also whether plates are "under ⅛ inch" or "⅛ inch and heavier." File on form X-2.

**Ferro-silicon, spiegeleisen, skelp, scrap, mechanical, seamless, tubing, oil-well casing, drive pipe.** File on form X-2.

**Plates (iron and steel).**—⅛ inch thick and heavier. Make separate application for plates wider than 72 inches and file three copies of specification. File on form X-2.

**Pipe (wrought iron and steel).**—Black or galvanized. Applications must state whether "under six inches," or "six inches and over" (inside diameter). Six inches and over, file on for X-2; under 6 inches, file on form X only.

**Pipe (cast iron).**—State tonnage of each size. File on form X-2.

**Rails.**—State if new or second-hand and weight per yard. Make separate application for rails 50 pounds per yard and heavier. State whether Bessemer or open hearth. File on form X-2.

**Sheets.**—Applications covering black and galvanized sheets under ⅛ inch thick must specify gauges. State whether Bessemer or open hearth. File on form X only.

**Wire.**—One copy of specifications in detail, showing sizes, must accompany all applications for wire of gauges lighter than, or equivalent to the following: American steel and wire gauge No. 17. Birmingham wire gauge No. 17. Paris wire gauge No. 7. File on form X.

**Wire rope or cable.**—Applications covering wire rope or cable must specify quality and construction. File on form X-2.

Other items not mentioned above are to be filed on form X.

Failure to file applications in accordance with the above may result in refusal of export licenses.

## EXPORT OF PLATINUM FROM CANADA TO THE UNITED STATES

The following regulations to be observed when submitting applications for the export of platinum from Canada to the United States have been issued by the War Trade Board of Canada under date April 26, 1918:—

Applications for export license from Canada must be accompanied by:

(1) United States import license.

(2) Application for United States export license for equivalent quantity from the United States.

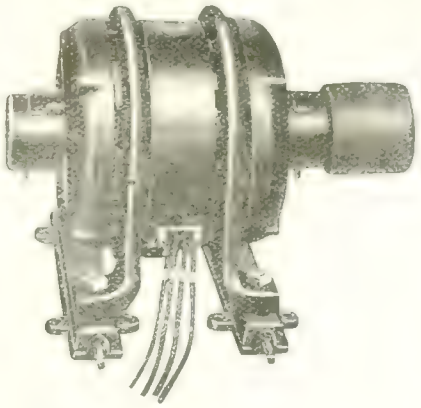
(3) Undertaking by Canadian importer to produce evidence within sixty days from the granting of Canadian export license to the War Trade Board, Ottawa, that an equivalent quantity of platinum has actually been imported.

# Aikenhead's "AK" MOTORS

The A. K. stands out about above all other motors for smooth-running and efficiency.

**Aikenhead Hardware Limited**

**17, 19, 21 Temperance Street TORONTO, CAN.**



The North Western Electric Co., of Chicago, are the makers of A.K. Motors—a name that stands for all that is modern and best in motors.

The A.K. has a constant speed induction motor in 2 or 3 phase, 25, 30 and 60 cycles.

Aikenhead's carry the following A.K. Motors in stock: 25 cycle in 1, 2, 3, 5 and 7½ H.P.; 1470 R.P.M. 25 cycle in 1, 2, 3, and 5 H.P.; 735 R.P.M.

**Write us for A.K. Motor Facts.**

# Aikenhead's Wahlstrom

It has neither collets, sockets nor keys, and is undoubtedly the strongest, fastest positive drive automatic chuck for drilling, reaming, tapping and counterboring.

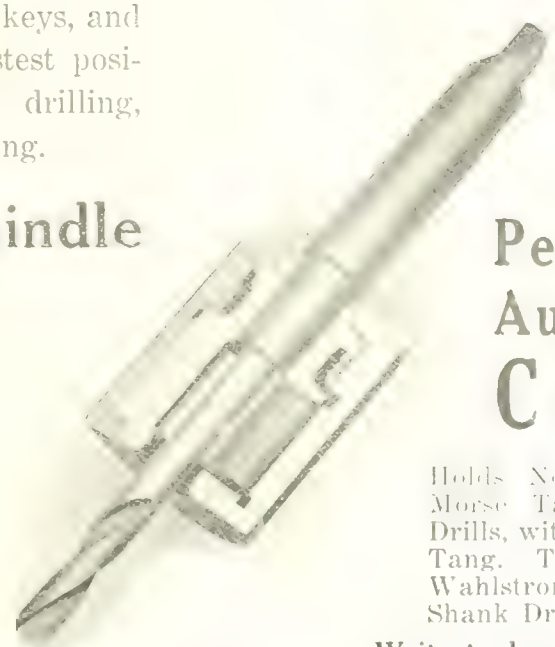
## You Don't Stop Spindle

And waste minutes putting in or taking out the drill. In just two seconds you make tool changes, the Wahlstrom perfectly centering the tool automatically.

**Aikenhead Hardware Ltd.**

**17, 19, 21 Temperance Street**

**TORONTO, CAN**

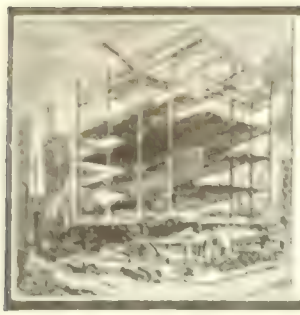


## The Perfected Automatic Chuck

Holds No. 1, 2 or 3 Morse Taper Shank Drills, with or without a Tang. There's also a Wahlstrom for Straight Shank Drills.

**Write to-day for Catalog.**

*If any advertisement interests you, tear it out now and place with other inquiries to be answered*



# INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES

## ELECTRICAL

Toronto.—The extent to which consumption of electricity has increased in [illegible] Ontario served from Niagara Falls may be [illegible] by municipalities served from the Niagara [illegible] of the Hydro-Electric Power Commission of Ontario. When the commission was initiating its operations, the late Premier, Sir James Whitney, a staunch supporter of the project, stated to Sir Adam Beck, that the commission would not require 10,000 h.p. The commission now serves over 121,000 customers, of whom 117,000 are light and 4,000 are power consumers. It supplies over 200 municipalities, and operates about 3,000 miles of transmission lines. In short, over half the population of Ontario is supplied with electricity through its agency. Its contracts with municipalities for the August, 1917, load totalled about 159,000 h.p., [illegible] December, 1917, load was estimated at about 201,000 h.p. The present available supply of power for the 200 municipalities served by the Hydro-Electric Commission is exhausted. The shortage is acute.

## MUNICIPAL

**Aylmer, Ont.**—The town is consider[illegible]

**Hamilton.**—The city is considering putting in a six-inch water main on Hunt street.

**Leamington.**—The council is working on plans for the erection of a water reservoir having a capacity of 1,200,000 gallons.

**Port Dover, Ont.** Tenders will be called about June 10 or 15 for the erection of a swing bridge, costing between $15,000 and $20,000, for the town council [illegible]

**Markdale.**—A meeting held the other evening, addressed by Deputy Fire Marshal Pointon, of Toronto, brought in recommendations for more adequate fire protection for Markdale. The fire tower will be heightened; 500 feet of hose will be secured, reel and ladder will be se[illegible] [illegible] provided.

**Ullsonburg.** The by-law to cancel a [illegible] and to guarantee $25,000 bonds on the Huntley Manufacturing Company, Limited, was carried by a majority of 401 votes. The company's plant was destroyed by fire in March, and it received many tempting offers from outside points. It will erect a modern factory building at once, 120 by 180 feet, to employ about 75 skilled mechanics.

**Trenton.**—Trenton ratepayers endorsed two money bylaws, one for $16,000 to install modern fire-fighting apparatus, including a new motor fire engine and chemical extinguisher, the other for $21,000 to purchase a waterworks system from the Hydro-Electric Commission of Ontario, who acquired it from Seymour Power and Light Co., when that concern was absorbed by the Hydro. Both bylaws were carried by large majority in heaviest poll ever registered on money bylaws in Trenton.

**Hamilton.**—The local fuel administrator has secured the cancellation of the order keeping down fuel purchases to 70 per cent. of the amount needed up to March 31, 1919. City Clerk Kent had always contended that such a restriction would be more harmful than beneficial, pointing out that only the midsummer and fall purchases last year saved the local situation, which was sufficiently acute to occasion alarm. Early in the week, he persuaded the Board of Control to petition for the suspension of this paragraph of the regulations, and the provincial fuel administrator lost no time in complying. Householders are now permitted to lay in as much coal as they can get.

## PERSONAL

**G. Barrett**, formerly of Chatham, has gone to the Quinlan & Robertson, Ltd., shop at Campbellford, Ont., where he takes the position of general superintendent.

**J. A. S. Germain** has resigned his position as secretary-treasurer of the Canada Stove and Foundry Co., and has opened an office as manufacturers' agent at 104 Delorimier Ave., Montreal.

**J. A. St. Germain**, for the past twelve years secretary-treasurer of the Canada Stove and Foundry Co. of St. Laurent, has severed his connection with that firm, and has opened an office in the old Montreal office of the above company. The Canada Stove will have no connection with the new office, but Mr. St. Germain will continue to handle all their lines, in addition to a general agency for other lines of manufactured articles, principally relating to hardware.

**Capt. N. Marin**, of Port Arthur, died suddenly at Kingston after a couple of hours' illness of heart failure. He arrived with the tug Laura Grace from the head of the lakes for the M. T. Co., and was to have remained here for the summer with that company. He was aged 65 and was well known in marine circles. He is survived by a grown-up family.

## TRADE GOSSIP

**Lightning Started Fire.**—Started by a bolt of lightning, fire destroyed the Alvinston flax mill on May 10 at a loss of approximately $10,000. It was owned by McCaull Brothers, of Petrolea.

**Busy at Galt.**—The Galt Brass Co. will erect an addition 114 x 164 feet to their plant and the R. McDougall Co. will add a three-storey building 120 x 64 feet to their factory.

**Making Extension.**—The Canadian Machinery Corporation is completing a new assembling room, about 200 feet square. A dance on the evening of the 17th inst. will mark the opening of the building.

**Selling Out Plant.**—Notices are appearing announcing the sale of the property and machinery of the Quebec Ammunition Co., Ltd., 112 St. Patrick Street, Montreal. Wilson & Motherwell, 232 St. James Street, Montreal, are the liquidators.

**Have Big Orders.**—An order for $2,500,000 of shells for the United States has been placed with the Dominion Forgings and Steel Company of Hamilton, and other orders are expected in the future. This is one of a number of steel orders which are coming to Canada.

**To Develop Power.**—North Vancouver contemplates the purchase of power site of the Naire Falls Power Co. The figure will be approximately $75,000. The idea is to secure a supply for the domestic lighting and heating of Greater Vancouver.

**Want More Money.**—Brantford machinists are demanding recognition of a new wage schedule calling for 55 cents per hour for toolmakers and journeymen and 45 cents per hour for improvers. The matter will probably be referred to a board of arbitration.

**Blames the Company.**—A coroner's jury, empanelled to enquire into the death of Alfred W. Ingram, Harry Sylvester and George Cameron, employees of the Hamilton Tar & Ammonia Works

# Advantages in Using the Almond Line of Chucks?

Almond Chucks are powerful, accurate and durable, and they cost less to operate than other chucks. This is one big advantage in using them.

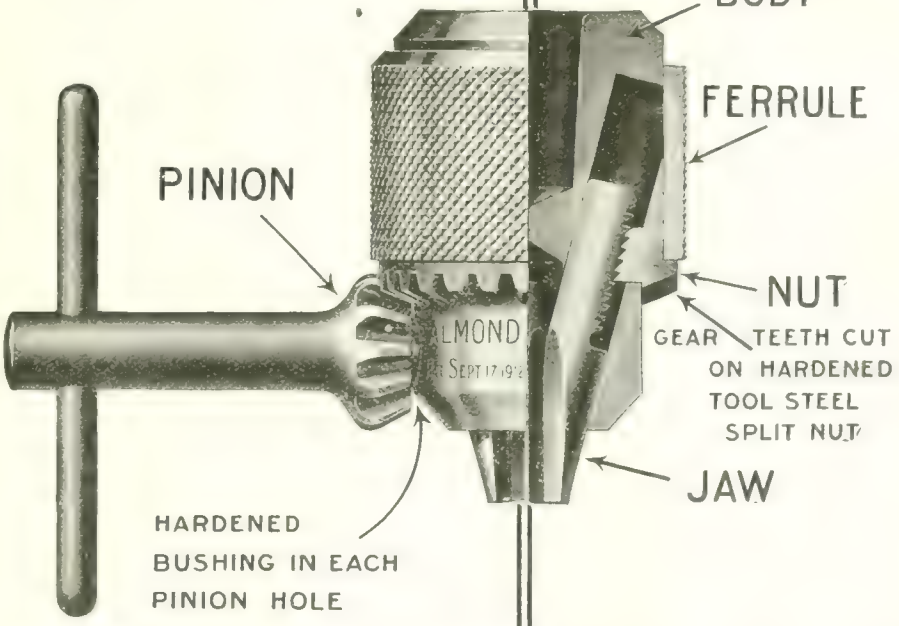
## *Quick Deliveries*

We are well equipped to quickly fill your requirements for all sizes of Drill Chucks, and the smaller sizes of Lathe Chucks —5″, 6″, 7½″ and 9″. This is another important advantage you get in adopting Almond Chucks.

Almond Service saves time and money. Specify Almond in your next order—especially if it needs filling in a hurry.

**T. R. Almond Mfg. Co.**
5 Maple Ave.
Ashburnham, Mass.

*Almond*
*Geared Nut Chuck*



# Waiting Your Request

In the M.E.C. illustrated catalog. It describes minutely the most dependable labor-saving devices including these deservedly famous

**M E C** Air Cylinders, Air-Operated 2 and 3 Jaw Chucks, M.E.C. Master Hinge Collet Chucks and Collapsible Taps.

In your hands it will point the better way to compensate for any shortage of skilled labor with which you may be contending. Write to-day for your copy.

**MANUFACTURERS EQUIPMENT COMPANY**
76-179 N. JEFFERSON STREET, CHICAGO, ILL.

Canadian Agents: J. R. Stone Tool and Supply Co., Detroit, Mich.
New York: J. R. Stone Tool and Supply Co., 30 Church Street

# BOILERS Upright or Horizontal

Our new Boiler Shop and modern equipment enable us to turn out the very best quality of Boiler Work.

**Let us tender on your work.**

We also make

## STEEL PLATE WORK

**of all kinds.**

STEEL PIPING
STEEL FLUMES
SMOKESTACKS
STEEL TANKS
AIR RECEIVERS
STEAM JACKETED KETTLES

and any other kind of Steel Plate Work to your specifications.
Workmanship right, and prices right.

**Marsh Engineering Works, Ltd.**
Established 1846
BELLEVILLE - - ONTARIO

Hydro Electric Power For Sale

G.T.R. and C.N.R. connections.

Write

STERILIZED WIPERS
NO LINT
E. PULLAN WIPERS & WASTE CO. LIMITED TORONTO

The same firms—time after time

sending in copy for this section is one of the most convincing proofs of its worth to anyone with machinery or equipment to dispose of.

do for them.

Try it yourself! That lathe, drill or whatever it is, describe it fully and send in your copy to-day for next week's issue. You'll find that the frequent use of this section will help you dispose of equipment you have in a hurry, whether it be men or equipment.

Canadian Machinery
*Classified Advertising Section*
143 University Ave., Toronto, Ont.

Co., Hamilton, who were killed in an explosion, found that the company was to blame for not taking the proper precaution in having the ammonia tank which caused the fatality regularly inspected, or the pressure therein gauged.

**Business Change.** — The Canadian Welding Works, Limited, has taken over the business of the Dominion Architectural Iron Works, Limited, and will move into the premises of the latter immediately. The Canadian Welding Works will continue to carry on the work previously done by the Dominion Iron Works, and will also enlarge on their present business. The location of the new factory will be at 175 McCord street, Montreal.

**Twenty Quebec Bridges.**—"The steel that Canada has made up into shells since the outbreak of the war would be sufficient to build the Quebec bridge twenty times," says ex-Commissioner Chalmers, at Edmonton, now an inspector under the Government Munitions Board. He says that shell-making is being well maintained in the Dominion, although some of the plants had gone out of action, this being due to the fact that a different size was asked for and some of the plants did not care to go to the length of adapting their equipments to the changed requirements.

**New Plant Rushed.**—An American company, represented in Toronto by the Holden-Morgan Company, has purchased three and three-quarters acres in Ward One as a site for a large ammunition factory. It is claimed that the company will work on the largest ammunition contract ever awarded in Canada, and will manufacture shells, which are larger than any heretofore turned out in the Dominion. The factory has to be erected and in working order within sixty days, and a staff of several hundred men are working night and day to accomplish it. The site of the new factory is a part of the Wm. Harris estate, and the sale was arranged through Pearson Brothers, local real estate dealers.

**Toronto Man's Idea.**—One of the most promising improvements upon the modern airplane which inventive genius has recently devised is the product of the brain of Lloyd Lott, for a short time with the Sheet Metals Products Co., Toronto. Mr. Lott's invention is a detachable fuel tank for airplanes, the moving of a lever throwing the gasoline tank clear of the machine, whatever its position or angle. It is estimated that 75 to 85 per cent. of aerial mishaps in active service are due to fire and explosion. The new device is in the nature of insurance against such accidents. While cutting off the tank, it provides for the feeding of the engine for a sufficient time for safe descent from an emergency receptacle.

**The Annual Meeting.**—The stockholders of the Joseph Dixon Crucible Company held their annual and regular meetings on Monday, April 15. The following directors and officers were elected:—Directors, George T. Smith, William G. Bumsted, J. H. Schermerhorn, George E. Long, Edward L. Young, Harry Dailey and Robt. E. Jennings. Officers—George T. Smith, president; George E. Long, vice-president; J. H. Schermerhorn, vice-president; Harry Dailey, secretary; William Koester, treasurer; Albert Norris, assistant secretary and assistant treasurer. Of the 20,000 shares of stock, 19 379 were voted. Undoubtedly a greater number would have been voted had it not been that a number of shares are held by estates, the executors of which do not feel at liberty to vote in an election. The report made by President Smith and the remarks made by him on the business of the company were received by the large number of stockholders present as most satisfactory and pleasing in every way. The American Graphite Company, incorporated under the laws of the State of New York, is a subsidiary of the Joseph Dixon Crucible Company, and its anuual election was held on the same day as that of the Joseph Dixon Crucible Company's, and resulted in the election of the following officers:—George T. Smith, president; George E. Long, vice-president; J. H. Schermerhorn, treasurer; Harry Dailey, secretary. The directorate is the same as that of the Joseph Dixon Crucible Company.

## TENDERS

**Will Build.**—Grace Church, Brantford, will likely erect a Sunday school building and parish hall, to cost about £35.000.

**Edmonton.**—The Merchants Bank of Canada are getting out plans for a $50,000 addition to their building on Jasper avenue.

**Calgary, Alta.**—The Alberta Flour Mills, Ltd., 816 First St. West, are receiving prices for reinforcing and structural steel in connection with the erection of their flour mill to cost $1,500,000. A. Ingram is the engineer.

**Toronto.**—In connection with the erection of $95,000 Childs Co. restaurant on Yonge street, at the corner of Dundas East, Bennett & Wright, 72 Queen E., have the wiring and A. Matthews, Ltd, 256 Adelaide St. W., the roofing contract.

**Toronto.**—Sealed tenders will be received up to 12 o'clock noon of Monday, May 20th, 1918, for the construction of a concrete and stone ford over the Etobicoke River on the grounds of the Toronto Golf Club, Long Branch, Ont. Frank Barber, engineer. Plans and specifications may be seen at 40 Jarvis street, Toronto.

**Rebuilding Halifax.**—Tenders are being called for repairs to "Bloomfield" High School, costing $36 000; repairs to "Chebucto" school, costing $25,000; repairs to "Joseph Howe" school, costing $35 000; repairs to "St. Patrick's" Boys' School, and repairs to "St. Patrick's" Girls' School for the School Board. 81 Sackville St. Clerk S. J. Wilson, 81 Sackville St.

**Windsor, Que.**—Sealed tenders will be received until noon, May 25th, 1918, for the re-construction in cement of two

piers of the Windsor and Brompton Bridge, crossing the River St. Francis, between the municipalities of the town of Windsor and of the parish of St. Francois Xavier de Brompton. J. A. Lagasse, N.P., sec.-treasurer of the Windsor and Brompton Bridge Committee, Windsor, Que., Co. Richmond.

**Walkerton.**—Tenders will be received by the undersigned up to the 25th day of May instant, inclusive, for the construction of a concrete dam between 180 and 210 feet long, to replace the Saugeen Electric Light and Power Co,. Ltd., former wooden dam across part of the Saugeen River on the Company's mill property at Southampton, to connect with the concrete dam already erected thereon, and for the doing of certain excavation, filling and other work connected therewith. Plans and specifications may be seen at the Company's office at Walkerton, Ontario.

**Ottawa.**—Tenders for Dominion Government office buildings, Ottawa, will be received until 4 p.m. on Monday, May 27, 1918, for the construction of a Dominion Government office building, O'Connor street. Ottawa, Ont. Note.—Blue prints can be obtained at the office of the Chief Architect, Department of Public Works, by depositing an accepted bank cheque for the sum of $50, made payable to the order of the Honorable the Minister of Public Works, which will be returned if the intending bidder submit a regular bid. R. C. Desrochers, secretary, Ottawa, May 7, 1918.

## MARINE

**Vancouver.**—The Faith, the world's largest concrete steamer, and the latest innovation in the ocean-carrying trade, which completed its trial trip at San Francisco a few days ago, will make its first ocean voyage from California to Vancouver with a load of salt.

**Collingwood.**—Another new steamer has been launched at the yards of the Collingwood Shipbuilding Company here. The vessel is of the poop, bridge and forecastle type, with engines amidships, and her dimensions are: 261 feet overall, 251 feet b.p., 43 feet 6 in. beam, 20 feet depth moulded, and she will carry approximately 2,900 tons deadweight.

**Quebec.**—Three vessels launched within three days, such is the record of old Quebec. Two vessels, both built of steel, at the Davis shipbuilding plant, at Lauzon, have been launched and one wooden vessel. A large wooden vessel built at the Quinlan and Robertson yards on the St. Charles River will be launched. More vessels are on the ways at the various shipyards about Quebec.

**Hamilton.**—At the last meeting of the Board of Trade, G. E. Main submitted a list of 120 shipbuilding concerns doing business in Canada, and stated that Hamilton was particularly well situated for this class of industry, both on account of its harbor and dockage facilities, and its nearness to the Welland Canal. He suggested that an effort be made to se-


# A Much Better Outlook for the Allies

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### An Auspicious Issue

These heartening words are from the front page of THE FINANCIAL POST of May 11th. They are contained in an editorial by Col. J. B. Maclean, whose vigorous words on every phase of the war have been pregnant with truth. They come with added force from a Canadian business point of view in the Trust and Loan Number of THE FINANCIAL POST, an issue which gives present conditions in this field fully and clearly, and which points with certainty to factors bearing on conditions to be expected in the future. To have this week's issue of THE POST by you is to be fortified with information of the utmost value in the conduct of business in Canada.

### Canada's Business Week

Read carefully down this list of THE POST'S more important contents this week. In every article mentioned there is business value:

**Canadian Concerns Take the Heavier Taxation Burden.**
**Eastern Farmers Feel Need of Expert Help.**
**H. Pitts to Investigate Before Action re Toronto Railway.**
**Budget Speech at Ottawa Interests Wall Street.**
**West Increases Wheat Acreage by 20 Per Cent.**
**Big Increase in U.S. War Orders is Expected.**
**Progress in Reconstruction at Halifax.**
**New York's Influence Excites Strong Securities Market.**
**Bank Clearings for Week Still Show a Decline.**
**The Strategic Position of Canada in Relation to Food.**
**Present Situation and Prospects—Canadian Mortgages.**
**Conditions and Outlook for Western Mortgage.**
**Biggest Boom in Western Farms Since Before the War.**
**Earnings and Profits of Trust and Loan Co.'s Analyzed.**
**Mortgage Loans of Insurance Companies on Down Grade Still.**

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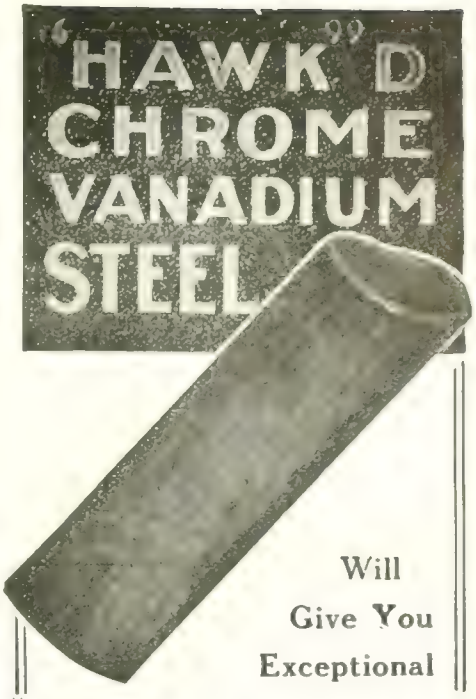


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[illegible] of this nature for Hamilton.

**Quebec.**—It is learned on good authority that Chief Justice Dorion of Ottawa has granted exemption from military service to all the shipyard employees working on shipbuilding at the Davie yards at Lauzon, Que. It was agreed that should the draftees working at the yards be enlisted their leaving would deprive various departments of experienced men and the entire plant would have been hurt. Mr. Davis, however, was told not to enlist any more men of military age.

**Owen Sound.**—According to latest reports, it is the intention of the government to offer for sale the steamer La Canadienne, which has wintered in Owen Sound harbor for a number of years past. The La Canadienne was formerly engaged in lake survey work. She is a steel vessel about 165 feet in length, with 27 feet beam and 11 feet depth. Should the Department decide to offer the boat for sale, it would be a good opportunity for Georgian Bay shippers to get a good package freighter, even though her passenger capacity would be limited.

**Cleveland.**—The log jam is still on at the head of the lakes. Fourteen cargoes were floated at Duluth on May 9 and 29 vessels were lined up at the docks. It will take two days to clean up the waiting fleet. Carriers as a rule are being worked out in from 24 to 30 hours, but in some cases boats have been held three days. A steady improvement in despatch is looked for, but it will be a week or more before loading is good all around. Receipts are more liberal at Lake Erie ports, and there will be a good-sized fleet at this end of the route the first of the week. The grain movement is not heavy enough to cut any figure, and that trade is not taking care of much tonnage.

**Toronto.**—Complying with the order of the Minister of Marine almost every Canadian vessel on fresh water has been fitted out with the new life preserver recently adopted by the department. The change has cost the larger lines a considerable amount of money. In many cases the old life preservers were left intact on the vessels, while others have discarded them. Final notice to steamboat owners who had not as yet equipped their vessels with them reached local vesselmen last Saturday. Some ten thousands will be required to equip the steamers of the Toronto Ferry Company. The number necessary to equip the local excursion and tourist steamers is well up in the thousands.

## INCORPORATIONS

**Standard Electric and Acetylene Welding Co.,** has been incorporated at Montreal, to carry on the business of iron and brass founders, mechanical engineers, tool makers, etc. Capital, $10,000.

Incorporation is granted to the Perfection Mfg. Co., to make, buy, sell, lease and deal in agricultural, creamery, cheese factory, dairy and farm machinery, etc. Capital $100,000, and head office in Montreal.

**Beaver Stamping Co.** has been incorporated at Ottawa with a capital of $40,000 to manufacture metal stampings at Walkerville, Ont. The incorporators are R. T. Herdegen, P. Wells and B. F. Kiesel, all of Detroit, Mich.

**The Interprovincial Mfg. Co.,** Montreal, has been incorporated, with a capital stock of $200,000, by Edouard F. Surveyer, William L. Bons, E. M. Silver and others, to manufacture automobile bodies, caskets, carriages, machinery, etc.

**Dodd Heating Systems Ltd.,** has been incorporated at Ottawa with a capital of $100,000 to manufacture heating, lighting and power appliances and apparatus, etc. at Toronto. The incorporators are John O'Neil, H. S. Dodd and J. Sheedy, all of Toronto.

**The Manitoba Bridge & Iron Works, Ltd.,** Winnipeg, has been incorporated, with a capital stock of $1,000,000, by Thomas R. Deacon, president and general manager; Hugh B. Lyall, secretary, and others, to take over the company of the same name.

**Shand Engineering and Contracting Co.** has been incorporated at Toronto with a capital of $40,000 to carry on the business of engineers and contractors at Sault Ste. Marie, Ont. The provisional directors are James Shand, S. P. West and G. W. Goodwin of Sault Ste Marie.

**Canadian Graton & Knight, Ltd.** has been incorporated at Ottawa by R. H. Jackson, F. P. Brais and J. Bruneau, all of Montreal, to manufacture leather belting and leather sundries of all kinds. The capital stock is $100,000 and the chief place of business is Montreal.

**New Incorporations.**—Joint stock companies incorporated include the following: Zimmerman Manufacturing Company, Limited, Hamilton, capital $1,000,000; Perfection Manufacturing Company, Limited, Montreal, capital $100,000; Webster Motors, Limited, Sherbrooke, capital $75,000; the Perfect Shoe Company, Limited, Montreal, capital $50,000; Prest-o-lite Company of Canada, Limited, Toronto, capital $800,000; Homes Foundry Company, Limited, Sarnia, capital $500,000.

**The Canadian Forging and Socket Co.** last week was granted a charter to do business in Canada, with a capital of $250,000, and expects to open in the building formerly occupied by the F. S. Carr Co., at Tilbury, Ont., as soon as the preliminaries can be arranged. The incorporators are:—E. J. Beattie, Detroit; W. J. McKenzie, Pontiac, Mich.; Gerald McHugh, of Windsor; James Foster and E. G. Odette, of Tilbury. The company proposes to engage in the manufacture of munitions.

**Holmes Foundry Co., Ltd.,** has been incorporated to make, buy, sell and deal in goods, wares and merchandise and property of all kinds, and without limiting the generality of the foregoing in steel, iron, brass and aluminum products; to carry on the trades and business of iron masters, iron founders or smelters,

and of manufacturers and rollers of steel and iron into any and all forms, etc. The share capital is $500,000, and the head office and place of business is at Sarnia, Ont.

**Prest-O-Lite Co.**, is incorporated to make, produce, deal in, etc., materials of every kind employed in the producing or generating of acetylene and other gases; also to generate, produce, use, purchase and sell or otherwise deal or traffic in acetylene and other gases in portable cylinders, and to manufacture, produce, use, purchase and sell or otherwise deal or traffic in all machinery, apparatus, appliances and fixtures for any purposes relating in any manner to the production, use and distribution of acetylene and other gases.

**To Develop Peat.**—In this week's "Gazette" announcement is made of the incorporation of the National Peat, Limited, with a capital of $100,000. The purposes of the company, as set forth in its charter, are: to carry on the business of treating, refining, concentrating, mining, excavating, reducing, precipitating, analyzing, manufacturing, buying and selling peat and all by-products thereof. The provisional directors of the company are: Edward Lindsey Middleton, Albert Edward Knox, Frances Morrow, Thomas Louis Monahan and Florina Berrini.

## CATALOGUES

**The Link-Belt Co.** have issued a book regarding their silent chain drive. Besides dealing technically with the value of the product, the book is illustrated profusely. It shows the chain belt in use in many operations, doing work on machines running many revolutions per minute, and on others where great wear and tension is constantly applied to the drive.

The Armstrong Cork & Insulation Co., of Pittsburgh, Pa., have issued a little booklet, "Satisfaction or ———." It deals with the importance of having drinking water systems established in industrial plants, claiming that in this way, by attending to details, a firm will be able to keep its employees for longer periods, and reduce the hiring and firing troubles.

The Ready Tool Co., Bridgeport, Conn., have just published their Quick Reference Catalogue No. 16. This catalogue illustrates and describes their chrome nickel lathe tools with the tool steel bearing; shaper and planer tools; tool holder for bench and watch lathes, which is the smallest tool holder on the market; boring tool holders; boring bars and internal threading tools; cutting off tools; threading tools; side tools; shaper or milling machine vise hold downs; lathe dogs; milling machine dogs; tail grinder dogs; balanced grinder dogs; handy holders; the Hill holdback dog; belt sticks; high speed steel cutters; and lastly, a price list of extra cutters. This catalogue, which is small enough to be carried around in one's lower vest pocket, will be sent to any reader of this publication upon request.


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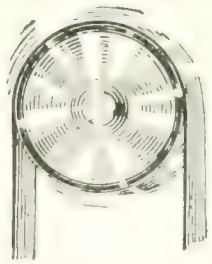

Lanco Balata Belting

[illegible] one of the most expensive items on the market.

When the cost of raw material increased the price of the belt to where it is to-day, we were a little afraid that it would result in a diminution [illegible]. We have been very agreeably disappointed the sales have not dropped off.

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*A weekly newspaper devoted to the machinery and manufacturing interests.*

Vol. XIX. TORONTO, MAY 23, 1918 No. 21


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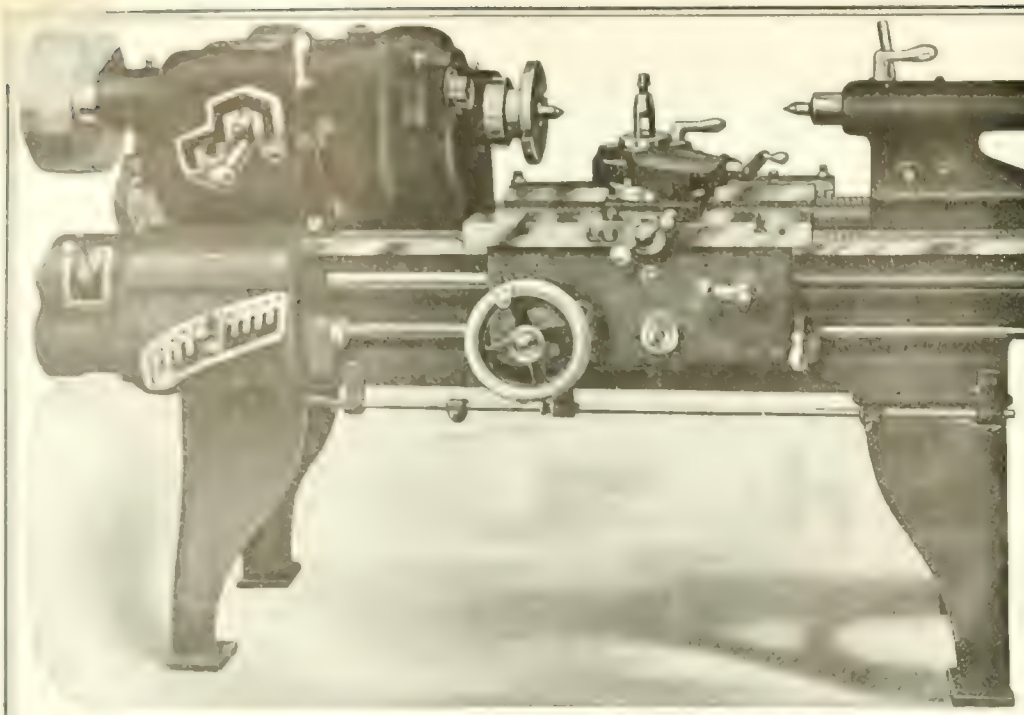

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CANADIAN MACHINERY
AND MANUFACTURING NEWS

Volume XIX. No. 21 May 23 1918

# Pattern Making: Economical and Efficient Methods

By M. H. Potter

*The pattern is in many cases the connecting link between the engineering department and the manufacturing departments of an industrial plant and consequently important to the accomplishment of plant processes, which enhance the pattern shop's importance and call for the best judgment in the choice of methods.*

ONE of the first places in which to begin the work of economy and efficiency is the pattern shop. In most instances this department offers more opportunity than the machine shop or assembling and designing departments. As a matter of fact this department has been somewhat overlooked and naturally the methods of procedure can be greatly improved upon.

The workmanship should be kept to a high standard, the lumber used of course depending upon the number of times the pattern is to be used; patterns from which few castings are to be made can be produced from a second grade lumber and with a little less labor in their construction. Any patterns made for constant use should be of the better grades of pattern lumber. Patterns which are to be used but once can be cheaply made. The lower grades of white pine is good enough for cheap patterns and pine of the better quality is adapted to the better patterns. Mahogany is used to advantage in making small size patterns and in facing larger patterns.

### Principal Points

The proper allowances for machining and shrinkage should be given careful attention. In order to prevent unnecessary cost due to machining and finishing the pattern must receive consideration. Although changes can be made in the pattern after a casting has been machined such alterations are expensive and by the proper forethought can be avoided. As a rule the draftsman is not familiar with all the conditions in the foundry and machine shop. It is up to the pattern maker to recommend and make such changes as will effect a decrease in the cost of moulding or machining or produce a better casting. Unnecessary expense can in this way be saved by inspection before proceeding with the work in hand.

Cheap patterns should not be classed as those made by inexperienced workmen but rather those which are intended for limited use and will only go to the foundry once or twice. Instances have occurred where the foundry when given a contract to produce a number of castings from patterns furnished have found it cheaper not to use the patterns supplied but to make up new patterns which would permit of not only quicker moulding but less castings. All this must be taken into consideration, as it is in the early stages of the work that great savings can be effected.

Such opportunities for saving in this particular department have led many of the larger and more progressive manufacturers to assign one employee to this work and by his efforts endeavor to eliminate the waste of time and materials in incorrect pattern making. He must not only be familiar with the most advanced methods of pattern making, molding and machining, but also in close contact with the design and requirements of the product. A man of such knowledge, provided he is one with practical experience, will effect not only a saving in time and labor but also delay. A proper uniformity of castings will be secured, and unnecessary stock, meaning a reduction in weight, and correct designs will prevail. The loss of castings due to cracking, which causes a delay in production will be practically eliminated, as most any of the ordinary troubles can be avoided by proper supervision in the pattern shop.

### Checking

The checking of patterns by the drafting department is something that should always be done; although this is ordinary routine in any large shop, many of the smaller ones do not adhere to it strictly. The only practical way to determine as to whether or not the proper allowances have been made to produce the desired casting is to carefully check the pattern. If this is not done the pattern maker soon becomes aware of the fact, and knowing that his work is not checked soon becomes careless. A careful inspection of the pattern before it goes to the foundry will expose any weakness in the design and thus save a loss in the foundry. It will enable the foundry to produce a more perfect casting at a lower cost. Many minor details in the design which would increase

PATTERN REQUISITION.

DATE _____ ORDERED BY _____

PATTERN NO. _____ SYMBOL _____

NAME _____

MATERIAL TO BE USED _____ GRADE _____

PATTERN O.K. BY _____ CHECKED BY _____

PATTERN SHOP

MATERIAL AND LABOR COST.

DATE PATTERN NO.

SYMBOL NAME

| MATERIAL USED | QUANTITY | NAME | COST |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

| LABOR | HRS | DESC— | COST. |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

FOREMAN.

C. K.

FORM 2.

castings may not turn out as expected and the pattern wil be redesigned. It is best therefore especially on work in connection with a new design, to limit the outlay as much as possible until it is determined that the results are satisfactory. A considerable amount of knowledge is required in most cases to tell from a drawing as to which is the best way to undertake the work. When a man of such skill can be secured his salary is a secondary consideration, as he is in a position to effect a great saving of both time, labor and delays.

Many manufacturers of a stock product rely upon interchangeability to secure economy and eliminate complications. The various parts of the pattern, whenever practical, are made so as to be interchangeable. In core making particularly is a great saving made.

### Machine Equipment

Special labor-saving machinery is another great help to the pattern maker and a cost decreasing element. In fact labor-saving machinery of this type is practicall yessential; without it patterns cannot be made in an economical way. Its use enables boys at a low rate to turn out first class, satisfactory work in less time than the experienced pattern maker working by hand can do it. Of course, such help requires a certain amount of training and familiarity with the various machines used. The up-to-date pattern shop has its special machine tool equipment the same as the tool room or the machine shop, that is if reduced labor costs are an important requirement.

In order to secure good results and prevent delays the foreman pattern maker and the inspector must keep in close touch with the drafting, foundry and machine shop departments. This co-operation will enable them to know exactly what results are being obtained and where the trouble and delays are. Success cannot be attained to any great extent unless this is made a practice of. By seeing the results of his work the pattern foreman is enabled to shape his endeavors and those of his department to secure the results wanted. On the other hand the inspector is in a like position and can do away with the repetition of errors and delays. This is especially true in shops employing a majority of unskilled help and depending upon the special machine equipment to make up the deficiency.

### Routine Forms

A pattern requisition form as illustrated in Fig. 1 or a similar form has found favor with a number of concerns. It is self-explanatory is made out in part (material to be used and grade) by the pattern inspector. By this method no unnecessary expense is made in patterns.

The material and labor cost form shown in Fig 2 is essential; by referring to same the accounting department can determine the actual cost of the pattern. The symbol number is the machine or apparatus number to which it is a part.

Although the pattern record form is of minor detail, see Fig. 3, it enables the interested party or department to know exactly how many times the pattern has been to the foundry, the number of castings made, the condition and the repair work necessary. It also enables immediate location in case of alteration or inspection. As any other records are valuable for reference, for fixing costs and estimating purpose, so are these pattern records which are easily kept at no great cost.

While red tape is far remote from most pattern shops, the introduction of a certain amount of system and supervision would not be wasted in this particular department. Especially when the underlying principles and elements mean so much to the results finally secured and the costs involved.

A close investigation of many pattern making departments in well managed and seemingly efficient organizations would no doubt make certain the fact that should the patterns be purchased outside the cost would be considerably less. Not only in the cost of the pattern itself is this true, but in the molding and machining. I know of one instance where a concern effected a saving of 15 per cent. in their pattern cost by having their patterns made by a concern who made a specialty of pattern making.

PATTERN RECORD.

PATTERN NO. SYMBOL

NAME. NUMBER OF PIECES TO PATTN.

DIVISION NO. IN STORES DEPT. RACK NO.

| SENT TO FOUNDRY. | RETURNED FROM FOUNDRY. | REPAIRS. | CONDITION. |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

FORM 3.

### Purchasing Patterns

There are two methods of purchasing patterns, namely on contract and on an hourly plus material basis. If the former is to be employed the duties of the inspector are most important and the need of a man possessing a broad knowledge of pattern making, molding and machining from a practical standpoint is self evident. The hourly plus material system lends itself more readily to this work and when, as in any line or work, a reliable concern is employed, the results obtained are most satisfactory. It stands to reason that the company which specializes in one line of work can become most expert at it and can afford to install up-to-date machinery and keep abreast of the times. To those unable through volume of work to keep a pattern making department busy at all times, such a concern means a great saving.

The storing of patterns and the keeping of a record to locate them is very important. It avoids the making of a new pattern, and will in some instances through alterations avoid the necessity of making another pattern. The system used varies greatly with the nature of the business engaged in, but by careful study and consideration the patterns can be grouped so as to be easily and readily located.

Owing to the fire risk and more so to the vigilance of the insurance inspectors the pattern shop is generally kept clean and frequently swept. However a saving could be made in the majority of cases, if a closer watch was kept over all waste lumber. It should be a duty of the sweeper to sort and keep all nails, etc., found in the sweepings.

## A PORTABLE MOTION PICTURE MACHINE

F. C. P.

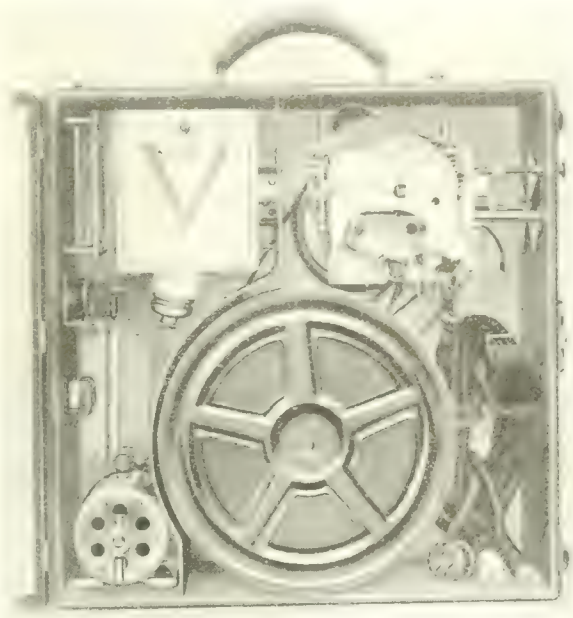
A recognized factor in sales work is the dealer's mental attitude, and the dealer must be genuinely enthusiastic about the goods, factory and entire organization. He must feel the advantages inherent in the product—then only is he prepared to sell successfully to the public.

A number of successful firms are using the motion picture machine in this manner and are securing splendid results. Notably among these are motor car manufacturers.

The motion picture projector is equipped with a film portraying, interestingly, the factory, the methods of manufacture and the product in actual service—and the dealer has at hand the most effective sales help which he could possibly have.

The salesmen handle the projector more conveniently than a suit case weighing as it does but 20 pounds, and is carried threaded, ready for instant use. Its operation is very simple, once connected with an electric light socket, the salesman need pay no further attention to its operation. He can concentrate entirely on his selling talk. There is tremendous selling force of a sales talk built around a motion picture of the factory, the methods and the product under actual service conditions.

This electric machine will project a 12-foot picture at any distance from 50 feet to 80 feet according to the focal length of lens. A 4-inch lens will give any size picture up to 12 feet in diameter, and any throw up to 50 feet



PORTABLE MOTION PICTURE MACHINE ADAPTED TO SALES PURPOSES.

Proportionately smaller size pictures at throws less than 50 feet.

A 6-inch lens will give any size picture up to 12 feet at any throw to 80 feet, and proportionately smaller-sized pictures at throws less than 80 feet. This does not prevent one from using the projector in a small room where there is but a 6 or 8-foot throw for 2 to 4-foot picture.

There is a small rheostat directly in back of the lamp house, which is connected up in series with the lamp, enabling one to vary the illumination to suit the size of picture, throw, density of the film or darkness of the room. The total current consumption does not exceed 500 watts, so that it can be attached to the ordinary light socket.

This projector is designed particularly for use for sales promotion work, publicity work and conventions, and a successful exhibition can be given before an audience of practically any size, as is frequently used for exhibitions before as many as 1,500 to 2,500 people. For "Safety First" meetings, where the lecturer goes from one factory to another, showing pictures under many and varied conditions, it takes care of all requirements.

## DEPARTMENTAL INTERDEPENDENCE IN FACTORIES

By M. M.

In the work of running a modern factory each department is more or less dependent on the preceding one as to the speed at which the work can be turned out, and this cannot be too well recognized by the responsible heads. If the drawing office sends good drawings to the smithy and pattern shops with the object of getting the best and easiest working from the smiths and moulders, and the pattern makers know—or will be told—the easiest way for dealing with any particular pattern in the foundry, then you can get your forgings and castings to favor the work of the machinists, and this department can again work to the advantage of the fitter and erectors, while generally the rate and volume of the output is accelerated, and all without any man working harder than usual. In cases where annealed malleable castings are made outside, it often occurs that much delay arises from causes connected with annealing, this raising the question as to whether it is not better to have one or more high temperature crucible furnaces and produce wrought iron castings directly fit for use as soon as cold, thus saving delay without appreciably increasing cost, as for most purposes this class of casting takes the place of the annealed castings. For all purposes of quick and full production it is assumed that the works are well equipped, and that no store's delays occurs, but each department must also quite clearly recognize that it is dependent on others to a large extent to enable it to secure a large and quick output of a continuous character.

SEMI-STEEL is considered to be a great heat and acid-resisting material since it is purer than grey cast iron. In recent tests for loss of weight under heat, grey iron lost 34 per cent. whilst semi-steel lost only 9 per cent. One direct practical advantage of this characteristic is evidenced by the demand for semi-steel bars for locomotive grates. Gears made from semi-steel frequently outwear steel gears, since the high graphitic carbon in the former acts as a lubricant. This is the greatest and most important point of difference between the two. In the case of semi-steel graphitic carbon exists in exceedingly small flakes and granules, whereas in grey cast iron the graphitic is usually present in the form of large flakes.—D. S.

THE types of aero engine in most common use are:—(1) Rotary, represented by Gnome, Le Rhone, Clerget. (2) Radial, represented by Salmson. (3) Vertical, represented by Beardmore, Green, Renault. (4) Vee, represented by Sunbeam, Wolseley, Rolls-Royce. (5) Arrow Head, represented by Sunbeam.

## LOCOMOTIVE REPAIRS

Maintenance of [illegible] ordinary industrial activity and unfavorable [illegible] strain that is placed upon the overworked and heavily taxed locomotives, with [illegible] hauling and repair, makes the question [illegible] vital of railroad problems.

[illegible] the past winter, and its further signi[illegible] of the Canadian Railway Club at Montreal, when a very comprehensive paper was presented to the meeting by E. R. Battley, master mechanic of the Grand Trunk Railway; a reprint of this paper appeared in the March 28th issue of CANADIAN MACHINERY. While the article in its entirety dealt very thoroughly with the importance of proper facilities and effectual methods of handling the work, through suitable equipment and systematic organization, it also formed a basis of an interesting and instructive discussion, in which many of the members participated, proving the extreme value of the paper as an educational feature, particularly under existing abnormal conditions.

In opening the discussion, W. H. Winterrowd emphasized the difficulty the C. P. R. and other roads had experienced, especially during the past winter, in obtaining anything like a sufficient supply of skilled labor. One of the fundamental problems of present-day railroad shop maintenance—and the same may be said to apply to all other industries—is the making of mechanics out of the class of men that are offering themselves for employment. This might be summed up in the words of Mr. Winterrowd:

> "It used to be possible for an engine-house foreman to instruct his men to perform certain work. This cannot be done to-day. Conditions are such that the foreman is compelled to direct almost every movement of unskilled labor."

With reference to machinery and other shop equipment, it was pointed out that maximum efficiency was only attainable by adopting systematic handling of the material. Proper routing of the work was necessary to avoid overlapping. Speaking on the importance of this, and the economic feature of handling work rapidly, Mr. Winterrowd said:

> "At the Angus shops of the C. P. R. the electric storage battery trucks have been a very important factor, and material is moved in and out of the stores and through the various shops in a minimum time and with minimum labor."

What mileage a locomotive should cover before being sent to the shop for repairs has always been a debatable question, and it is doubtful if a satisfactory basis could be arrived at under present conditions. In commenting on this, Mr. T. C. Hudson said:

> "It is difficult to arrive at just what mileage a locomotive should make between shoppings, as the conditions under which they operate vary so much. The size of the wheels should be considered and the conditions known as to grades, curvatures, etc. A small wheeled engine in heavy freight service has a tendency to wear tires down quickly, and sometimes it is impossible to get more than 35,000 or 40,000 miles between shoppings. On the other hand, it has been found possible to get more than double this mileage from a large wheeled engine in through freight or passenger service."

Apart from the general deterioration, due to ordinary wear and tear, other factors are involved in the running of a locomotive that have considerable bearing on the service period between overhaulage. Not the least of these is the unknown—or rather variable—quantity of the human element. No two engineers will be of one mind regarding the operating details of locomotive running. Very often the question of lubrication, properly or improperly applied, may mean a difference of several hundred miles, or days as the case may be, in the service period of the engine. Difference of opinion between the operating engineer and the locomotive foreman as to what repairs are actually necessary after a run is sometimes a question for argument, and frequently an engine may be placed again on the road owing to the lack of available material with which to make the needed repairs; such conditions may materially affect the serviceable life of the locomotive. In this connection Mr. Winterrowd said:

> "Another point regarding the maintenance of power on the road and its repairs at the shop is the proper utilization of material and having the same on hand when required, and also the utilization and reclamation of materials that can be put to use in place of new material."

The making and replacement of piston rings received some attention, following a question regarding the machining of the ring bore. In answer to this, Mr. Winterrowd said:

> "The amount of finish you put on the ring depends upon the way the ring is made. If you have a fine casting it may not be necessary to do it at all. Our usual practice is simply to rough away a small amount of the rough spots."

Frequency of cylinder repairs was claimed to be the result of inexperience or thoughtlessness on the part of the operating engineer or his fireman, who in many instances overlooked the consequences of carrying too much water in the boiler. As stated by Mr. W. Spence:

> "I would like to say that amongst engineers some of us are under the impression that the locomotive cannot be properly handled with a full boiler of water. My experience has been to run with as low water as you can consistent with safety, but always have enough, so that if the inspirators should fail you will have sufficient time to dump the fire. In running with a full boiler of water we do not get good results. It destroys the lubrication, also the piston rings, and the engine will not give good mileage. You can destroy the rings in a hundred miles if you are not careful of the water."

J. W. Buckland, in speaking on the advantages of preparedness, intimated that it was generally found that brake gear and spring gear would "break in the spring-time," and thought it would be advisable to have materials ready to ship for prompt replacement. He said:

> "We could keep more locomotives running if we had the material ready to ship out to the point required, and not wait until the locomotive foreman discovers that some casting has been broken and has to order it through the stores, taking ten days or two weeks to get it."

Commenting on this subject of prompt repairs, E. J. McVeigh said:

> "One of the best locomotive foreman I ever knew told me that he considered the only plan on which to run a roundhouse was to run it the same as a fire station—always be ready for the unexpected, and expect it to happen."

Mr. McVeigh also dwelt briefly on the need of closer co-ordination of officials and department heads. He thought this feature was a weak link in the existing organization, as many were reluctant to acknowledge or recognize the weakness. He said:

> "The trouble is that when the mechanical department change a standard they throw out something that has been in use for years and call it obsolete, but they say nothing to the supply department until they want the article, and we then discover that they have been waiting for it for the past two weeks. If we could have closer co-operation there is no question but that the railways would receive considerable benefit."

In reply to a query by G. E. Smart (chairman) regarding the adoption of standard accessories, Mr. Winterrowd said:

> "On the Canadian Pacific Railroad when a locomotive is designed or redesigned we always keep in mind the parts already in existence on other engines. The interchangeability of parts is a very important matter, and on this road there are always a very large number of locomotives on which parts are interchangeable."

In this connection Mr. T. C. Hudson stated:

> "We have found that it is good practice and pays to standardize as far as possible the parts that enter into the maintenance of locomotives, such as grates, injectors, crossheads, etc. This is a considerable advantage, especially to the locomotive foreman, as he requires all our sympathy and help in this respect, so that he may

be able to make repairs promptly and keep the wheels turning, especially at this time when it is almost impossible to get new equipment. The stores, no doubt, do all that is possible, but in some cases material can not be secured owing to war conditions; and on this account we have had to make material from the scrap pile and use our ingenuity in making it into articles, which, before the war period, would not have been considered good practice."

The possibility of discrimination in favor of particular equipment, or adopted an elastic standard to cover the various makes, was advanced by Jas. Powell, secretary. He thought it well to include as many standard parts as possible, but said:—

"In the case of specialties, such as injectors and mountings, if you decide to adopt one make as standard another manufacturer comes along and points out the particular advantages of the appliance he has for sale, as against the one you are then using, and his appliance may be used. The result is that you get away from standards."

The consensus of opinion appears to be that it is essential that every facility be provided to enable the locomotive foreman to make necessary repairs with the least possible delay. The position of this official is not an envious one and therefore every encouragement should be given him in the discharge of his duties. Speaking along these lines, E. S. McMillan said:

"I never ran across the man yet who pined for the job. We have come across little boys who wanted to be motormen or locomotive firemen, but I have not yet met the man who was anxious to take on the job of locomotive foreman."

The keys to the situation are apparently sufficient organization, close co-ordination of men and departments, and the development of a higher standard of skilled workmen. Apart from the general all-round acquirement of the foreman in charge, the capabilities of each individual workman are factors that go a long way in making or marring the success of this branch of the service. Conscientious training of the men is an essential necessity. The practice of the C. P. R. in this connection was stated by Mr. Winterrowd in these words:

"We endeavor to specialize in assigning the work which these men have to do, which means that the closest supervision is necessary to obtain good results. The question of careful supervision and training of the men is a vital one."

## FIRE PREVENTION AND DIRT IN WORKSHOPS

By M. M.

Although the majority of workers in a workshop think that it is a place where all dirt can be deposited it is really very necessary that the workshop should be kept as clean as a housewife keeps the kitchen at home, and if this was done there would be a great saving of wastage of material, labor and time which is caused by fires. The greatest cause of fires is disorder, the neglect to clear away the refuse of manufacture, shavings, and sawdust for example. In one workshop a bottle had been found containing petroleum under some shavings, and inquiry elicited the information that it belonged to a man named "Old Joe" who had left three months previously. It should be remembered that many kinds of waste are subject to spontaneous combustion, or in other words, to the generation of heat through oxidization. Experiments made with some dirty cotton "wipes" showed that the temperature had gone up in six hours from 70 deg. to 440 deg Fahr.

Many accidents happen from the fact that cleaners do not sweep under the mat. It is also quite common for them to leave a ring of dirt round the gas stove. Then, where men are allowed to get their dinner in the factory—a most objectionable practice—the greasy sandwich papers are allowed to lie about and often generate heat. It is essential that workmen should not only be expected, but allowed, to clear up after work. It is also a valuable example.

Out of 3,609 fires in the city of London in 1914 no less than 1,415 have been scheduled by the fire brigade authorities as due to carelessness and probably the same proportion of fires all over the world is due to the same cause. In one case there had been paper chains on the gas lights, in another a man snatched a light from a girl in a celluloid factory, and then struck a match to find it amongst the celluloid chippings. Several lives were lost in the fire which followed. A bad fire was caused in one factory owing to the hands not having a place in which to put their coats and hats. One of the men had left a lighted pipe in his coat which he hung up under the staircase. Again, it is common to find that there is nothing provided with which to put out a fire—no extinguisher or water buckets or hydrants or hose. Again, the amateur factory brigade often proves inefficient when a real emergency arises, and in one case it was found necessary to get a crowbar to get at the hydrant, and when at last this particular brigade had got the trap open, they found it was a drain and not a hydrant.

In the choosing of a watchman care should be exercised, and a watchman should most certainly not be selected because he was the oldest man in the works. That is the very reason why he shouldn't be chosen. Tell-tale clocks should certainly be used, and in a place where dangerous things are made one watchman had been allowed to walk round and pick up a great deal of grit on the rubber shoes provided. However, this particular watchman was wary and did not go into this part of the works until a pair of unused rubber shoes had been brought. With the tremendous increase in factory work it is surprising how few precautions against fire are taken. Employers do not seem to realiez the responsibility that rests on the provision of suitable fire-fighting appliances. Again, coal is liable to spontaneous combustion, and to avoid this it should not be stacked more than 10 feet high. Coal of course differed in readiness to fire. Iron pipes should be inserted in the stacks at a distance of 50 feet, and when a thermometer lowered down these pipes showed 110 deg. it is necessary to look into the matter twice a week. If the heat does not go down trenches should be made a foot deep. If water is used there should be plenty of it. Iron trimmings are also subject to heating. They begin to oxidize, and wood or other inflammable material mixed with them soon causes a fire. Sometimes the wood will get full of grease or petrol and on one occasion a loss of $250,000 was caused by the petrol being fired by a greasy rag.

## MONAZITE FOR GAS MANTLES

By M. M.

The mineral survey now being conducted in Ceylon in co-operation with the Imperial Institute has led to the discovery of beach deposits of monazite sand which will usefully supplement the commercial supplies of thoria required for the manufacture of incandescent gas mantles. Samples of the sand have been investigated by the Imperial Institute and the results are so promising that the Government of Ceylon has arranged to work the deposits. Suitable British concentrating machinery has been selected by the Institute for the purpose, after experimental trials, and will shortly be shipped to the colony.

This is the last chapter in the story of the long struggle to rescue the gas mantle industry from German domination. Formerly the monazite sands in Brazil were the only commercial source of supply of thoria, and these were controlled by the German Thorium Syndicate. The Brazilian monopoly was broken by the discovery of extensive deposits in the native state of Travancore in India, so rich that samples examined by the Imperial Institute were found to contain nearly twice as much thoria as the Brazilian deposit.

The German syndicate, however, obtained control of the company formed to work the Indian deposits and continued to exercise a dominating influence in the industry till the outbreak of war. Since then the company has been reconstructed, and given a British character, and it is understood that another portion of the deposits in Travancore has been taken up and will be worked by a second British company. It is of interest to note that the work of the Mineral Survey has shown that Ceylon can furnish several thoria minerals besides monazite, and amongst these is thorianite, the richest known source of thoria. This new mineral when it first came on the market was sold in the British Isles at as high a rate as £1,600 per ton, but the deposits have proved to be fairly limited.

## INDUSTRIAL GYMNASIUMS

By F. R. A.

[illegible] gymnasium in Cleveland, Ohio, U.S.A., provided by a manufacturing company, which may be emulated by [illegible]

Vigorous physical exercise daily, under the direction of a trained instructor, conserves the health of the employees and builds up the physical endurance of the men to a point which later on will enable each man to assume added responsibility, if necessary.

It is of interest to note that the plan applies to the executive officers, superintendents, managers, heads of departments and others on whom rests the responsibility for the solution of important manufacturing and selling problems. Under the provisions of the new plan which has been tried out thoroughly, the men holding responsible positions are urged to spend an hour each morning [illegible] gymnasium which has been completely equipped in the basement of the administration building. The men enrolled in the different classes are paid by the company for the time they spend in the gymnasium and no business appointment or other important task is permitted to interfere with this schedule. The men are compelled under the penalty of a heavy fine to report at the gymnasium at a specified time and are not permitted to leave until the class is dismissed.

While many other large industrial firms have erected pretentious gymnasiums in times of peace for the optional use of their employees outside of regular business hours, this is the first concern to start a movement of this kind to improve the health of its employees and pay them for their time to make them more efficient.

It is pointed out by the officials of this industrial plant that members of President Wilson's Cabinet have been taking regular exercise daily under the personal direction of Walter Camp and their program is along the same lines as the plan in effect at Cleveland. The Government realizes the great benefit to be derived from regular exercise and is recommending that all manufacturing and industrial plants set aside fifteen minutes a day to be devoted to breathing exercises and light calisthenics. The American soldiers abroad spend several hours a day in athletic games. Troops landing in France are immediately marched to an athletic field where they participate in interregimental games. This exercise limbers up their muscles after the long journey on the transports.

The results of the training, so far, have been gratifying to both the company and the men. The plan may, later be extended to include all of the five thousand or more bookkeepers, clerks, accountants, salesmen, stenographers, skilled and unskilled workmen in the plant.

An experienced athletic coach and director, who is a graduate of the Chicago Training School and prominent in Y. M. C. A. circles all over the country, conducts the course of instruction outlined for the busy factory workers. It consists of passing the medicine ball, setting-up exercises, stall bar work, hand ball, wrestling, club swinging, bag punching and many other forms of calisthenics. Following a strenuous workout in the gym. the men jump under a battery of shower baths. During the first few weeks there are always many sore and aching muscles, lame backs and stiff joints that require attention. All the men are required to undergo a rigid examination by the medical examiner and the doctor makes out a comprehensive report of his findings and this is filed in the superintendent's office. The examination is repeated regularly every month and compared with the original report. The records are carefully kept and are as accurate as it is possible to make them.

In case a man is found to be nervous, underweight and suffering with some minor trouble, he is given medical attention and advised by the physican and physical director as to the proper course to pursue to improve his condition. In many cases a change of diet and the consumption of plainer foods that give greater nourishment have helped materially to remedy the ailments. The vice-president of the company, who fathered the adoption of the preparedness idea, is highly pleased with the results which have been obtained and declares that it has set up a new social equality between the officers of the company and its department managers.

This gymnasium is considered to be one of the most democratic institutions in the world, as it is a place where men meet on an equal basis and get to know each other more intimately, as they are dressed alike, do the same stunts and forget their business cares, and it gives them new enthusiasm and better spirit.

One of the superintendents, who is 36 years old and weighs 216 pounds, joined the class, experiencing for a time great difficulty, as he had never taken up any gymnasium work before. His muscles were soft and flabby and his weight made it almost impossible for him to perform many of the gyrations. It was necessary for him to start in very slowly, but after attending class regularly for a period of ten weeks he is now able to take the regular work assigned to any of the other members. In this time he has reduced his weight 7½ pounds and his waist measurement 1½ inches, while his chest expansion has increased ½ inches; right arm 1 inch; left arm ½ inch; left and right leg each 2 inches. His health was never better and he is now losing from ¾ to 1 pound a day.

It is declared that while the fat men lose weight under this strenuous daily exercise, the thin and underweight men gain, as a foreman 47 years old, who tipped the scales at 122 pounds when he enrolled in the class, is now 5½ pounds heavier and many of his other measurements have increased from 1 to 3 inches and he says that he is getting stronger every day.

CLASS AT WORK IN GYMNASIUM OF LARGE INDUSTRIAL PLANT.

Gymnasium work of this nature cures minor ailments. Three other members of the class were reticent about taking up the work as one was recovering from a prolonged illness, while the other two suffered with indigestion and stomach trouble. The first gained 13 pounds in weight, the second 7½ pounds, and the third 2 pounds, and all say that their health is much improved. Some men who complained of having too large a waist measurement and protruding stomachs have been able to reduce them as much as 2¾ inches and expect to take off a few more inches within the next few weeks. A table has been compiled with data of a few members of class number one, the ages of these men ranging from 32 to 48 years and all have been in the employment of the company from ten to thirty years. This table bears out the statement that all who have taken advantage of this gymnasium have been greatly benefited by the course of training.

# Notes on the Design and Testing of Air Lift Pumps--I.

By A. W. Purchas

*The air-lift pump has become one of the most economical methods of raising water, the simplicity of construction and the almost entire absence of moving parts giving reliability in operation and avoiding the necessity for skilled supervision. The design of these pumps being subject to more or less development the subject matter of the following article is of more than passing interest.*

THE subject of air-lift pumping has not received the attention it deserves from engineers, and has fallen into disrepute with many. There are several good reasons for this, among which may be mentioned the lack of a satisfactory theory, the low efficiency of most installations, and the lack of complete and accurate reports of tests, so that the causes of the low efficiency are obscured.

An attempt is made in this paper to rectify the first, to show how the second can be improved, and to point out in what respects many reports of tests are lacking in information essential to a thorough analysis for checking theoretical formulae and deductions.

An account is given of several series of tests, with a description of the methods and the equipment. The theory of the pump is then reviewed, and a novel method of approaching the subject is given, from which it should be possible to evolve rational formulae for designing.

### Equipment and Methods for Testing

General.—The wells on which these tests were made form part of a water supply system, of which an account was presented to the Institution of Civil Engineers some time ago. Series A of tests was given at that time, but further investigation showed that the author had wrongly calculated the actual volume of air used, and the average velocities of the rising mixtures in the eduction-pipe. By their kind permission, it is possible to reproduce these test-figures with the errors corrected, and other valuable deductions added.

On pulling the eduction-pipes from the wells, after they had been in operation for some length of time, the interior surfaces were found to be heavily encrusted with nodules of rust, some ⅜-inch high, of such rugged outline as to leave no trace of smooth contour on the surface of the pipe. The tests of Series A are of one eduction-pipe when newly installed, and the tests of series B are of the same pipe when encrusted as described above. A comparison of these two series shows some very interesting points. Fig. 9. The eduction-pipe used in the tests of series C was badly encrusted, but that of series D was clean.

Air-Injection Foot-Pieces.—The foot-pieces used in the various tests are shown:—

For Series A in Fig. 1
For Series B in Fig. 1A
For Series C in Fig. 2 and 2A
For Series D in Fig. 3

The merits and faults of these are discussed later under the theory of the pump (page 13).

*Read before the Institute of Electrical Engineers, November, 1917.

### Lift

In series A and B this was measured by lowering a float on the end of a steel tape line between the eduction-pipe and the well-casing. The float was a piece of wood ¼ inch by 1 inch in section, and 6 feet long, weighted to float upright with about 5 feet submerged. This method, however, is not recommended, as the float will sometimes become wedged between the pipe-couplings.

In series C and D the lift was measured with the device shown in Fig. 4. This consists of a piece of heavy brass-pipe, inside which a small copper-float is free to slide at the least impulse. The whole is suspended by a duplex rubber-covered cable, graduated in feet, one wire of which is connected to the case, and the other terminating in a lump of solder on the lower side of the insulator, which forms the top of the case. At the top of the well an electric bell and batteries completed the installation. The case was lowered into the well, and its reaching the water surface was indicated by the bell at the ground surface ringing. By this means it is possible to measure the depth to the water surface within an inch. It is absolutely impossible to estimate correctly the lift from the gauge-pressure of the air at the well-head, and this should never be attempted. Some injection foot-pieces put from 5 to 10 lb. per square inch extra pressure on the air, and there sometimes is a loss of 5 lb. pressure due to friction in the air-pipe. A combination of these losses might make an error of 30 feet in the estimated lift. To estimate the lift from the air-pressure required to start the well flowing is equally impossible since, once the well is started, the lift nearly always increases. Reference to tests 1, 2 and 3 of series D, among others, shows that under certain conditions the air-pressure at the well-head may be less than that equivalent to the submersion head of the foot-piece. This may be accounted for by noting that a column 600 feet high of air under 135 lb. per square inch pressure will exert an additional pressure on the base of a column of 3.25 lb. per square inch, due to its weight.

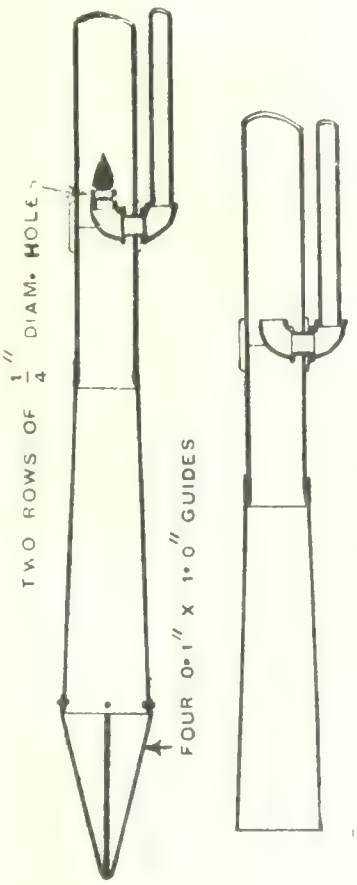



FIG. 1. SERIES A.



FIG. 1a. SERIES B.

An alternative method of measuring the lift is recorded by Mr. Kenneth Allen in a paper read before the Engineers' Club, of Baltimore (in 1908, on the wells at Atlantic City, U.S.A.

### Air-Compressor and Measurements of Air Used

The air-compressor is a two-stage, with both air and steam cylinders compounded. The sizes of the more important parts are as follows:

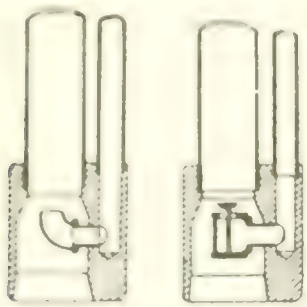
| | |
|---|---|
| Diameter of the air-cylinder | [illegible] |
| Diameter of the steam-cylinder | [illegible] |
| Stroke of the pistons | [illegible] |

The air is drawn through a combined forecooler and filter outside and on the shady side of the building, and passes through an intercooler between the two air-cylinders. The cooling water is circulated by a double-acting piston pump of 5½ inches bore, and 5 inches stroke, driven direct from the crank-shaft of the compressor. The suction valves of the low-pressure cylinder are semi-rotary, and are mechanically opened and closed by an eccentric on the main crank-shaft. All other air-valves are automatic, spring loaded and air-cushioned.

Many tests, which would otherwise be of the greatest value to the designer, are rendered of only doubtful value because the volume of air used was not carefully measured; hence the average velocities of the rising mixture can only be approximated. These velocities are the most important items affecting the efficiency of the pump, and those on which more than any other accurate data are required at the present time.

It is found in checking the published figures from too many tests that the volume of air used was calculated from the known displacement of the low-pres-

— that the temperature at the beginning of the air at the intake.



The true volumetric efficiency of a compressor based on the ratio of air drawn in at atmospheric pressure and temperature to the displacement of the low-pressure piston will vary:

The above figures are taken at random from various sources, and it is impossible to state average values.

Returning to the tests here recorded, prior to each series the air-valves of the compressor were examined, and their seats put into good condition. On 25th and 26th April, 1914, tests were made of the volumetric efficiency of the compressor, and again on 7th and 8th May, at the end of each test of the air-lift pump. The discharge from the compressor was measured by means of an orifice, the form of which and the method of connexion to the air-receiver are shown in Fig. 5. This meter is a duplicate of that used by Professor R. J. Durley, of McGill University, Montreal, to determine the coefficients of the discharge or air through certain forms of orifice. An account of his work is to be found in the Transactions of the American Society of Mechanical Engineers, vol. 27.

The formula given in the above paper for calculating the flow through the orifice, is:

$$Q = 0.6299 \ Cd^2\sqrt{\frac{i}{T}},$$

Q is the weight of air passing through the orifice in pounds per second.

C is the coefficient determined by experiment.

$d$ is the diameter of the orifice in inches.

$i$ is the pressure inside the meter-box

T is the absolute temperature F. inside the meter-box.

This formula only applies to sea level,

above, the following formula was used to compute the discharge:

$$Q = 0.1632 \ Cd^2\sqrt{\frac{i}{T}} P^a$$

$P^a$ is the absolute pressure in pounds per square inch of the air inside the meter-box. This equals the barometric pressure, plus 0.036 $i$.

For testing air-lift pumps, it is probably more convenient to install a meter in the air line between the compressor and the well. This is more expensive to install, but the volumetric efficiency of a compressor is a very variable quantity, which cannot otherwise be measured during the tests of the well-pump. Such a meter is shown in Fig. 6. The principle is identical with the foregoing, and the same coefficients of discharge

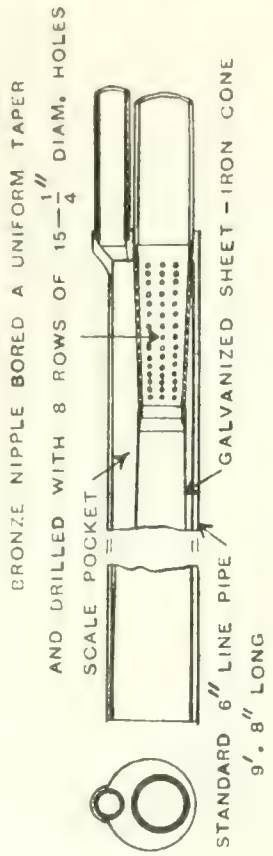

BRONZE NIPPLE BORED A UNIFORM TAPER
AND DRILLED WITH 8 ROWS OF 15—1/4" DIAM. HOLES
SCALE POCKET
GALVANIZED SHEET-IRON CONE
STANDARD 6" LINE PIPE
9'. 8" LONG

FIG. 3. SERIES D.

may be presumed to apply, if the velocity of approach and the head be maintained within the limits tested by Professor Durley. In this meter the discharge will be found by means of the formula:

$$Q = 0.1632 \ Cd^2\sqrt{\frac{i}{T}}p,$$

in which—

$i$ is the difference of pressure on the two sides of the orifice, measured in inches of water.

$p$ is the average of the absolute pressures of the air on the two sides of the orifice.

From the foregoing formulae, the volume of air is found by the formula:

$$W = \frac{p}{53.17 \ t},$$

in which—

W is the weight in pounds per cubic foot.

$p$ is the absolute pressure in pounds per square foot.

$t$ is the absolute temperature F.

A third and similar method of measuring the volume of air is possible through the research of Professor William Watson and Mr. Herbert Schofield, who determined the coefficient of orifice placed in the suction-pipe of a compressor.

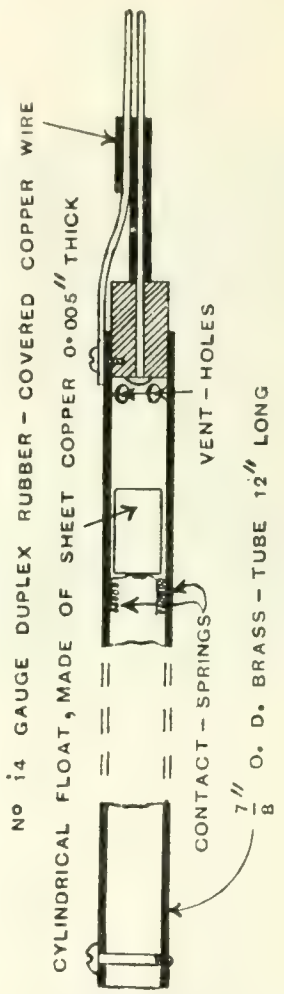

No 14 GAUGE DUPLEX RUBBER-COVERED COPPER WIRE
CYLINDRICAL FLOAT, MADE OF SHEET COPPER 0·005" THICK
VENT-HOLES
CONTACT-SPRINGS
7/8" O. D. BRASS-TUBE 12" LONG

FIG. 4. APPARATUS FOR MEASURING LIFT.

### Quantity of Water Raised

The discharge-pipes of the wells at Oilfields rise about twenty feet above the ground, and discharge over the rims of small tanks, against curved hoods which deflect the water downwards. The pipes are bent to gradual curves, and the last few feet are inclined about 70 degrees to the vertical. Permanent derricks of a light California oil-well pattern are built over the wells, and were the discharge-tanks erected vertically over the wells, they would have to be removed each time the eduction-pipes were pulled. From these small tanks the water gravitates through 6-inch mains, laid along an overhead platform,

to two 84,000 gallon corrugated galvanized iron tanks and one wooden tank of like capacity. The iron tanks average 32 feet 9 inches in diameter, and 13 feet 4 inches in depth. The circumference of each ring of these tanks was carefully measured and checked, also the depth of the corrugations and the thickness of the plates. These measurements were taken when the tanks were full to the level at which the measurements were being taken, and from these figures a table of capacities was prepared for each eighth of an inch of depth.

Prior to each test, the well was pumped for sufficient time to allow all conditions to become constant, and the water meanwhile delivered into one tank. At the commencement of the test the water was diverted into another tank and switched back into the first again at the end of the test. All outlets from this measuring tank were closed and under observation at all times during the test.

Such facilities for measuring the quantity of water are rarely available, but there are several alternatives, such as weirs or Venturi tubes, which give equally accurate results. Many tests record only the combined performance of two or more wells; this is unfortunate both from the owner's point of view, and from that of engineers, as the information is too general; the extra cost of individual meters for each would undoubtedly be justified by showing some chance of improvement in the efficiency of one or more of the wells.

One writer who has contributed the results of some very instructive tests, measured the quantity of water pumped in a reservoir, the size of which unfortunately would only permit of runs of ten minutes' duration. It is the author's opinion that no test of an air-lift pump should be of less than one hour's duration, and that it is better to run this length of time and measure the water with some form of calibrated meter, than to run shorter tests and measure the water in any other way.

### Indicated Horse-Power of Compressor-Air Cylinders

For this purpose an external spring Tabor indicator was used. This instrument had seen but little use, and was in perfect condition throughout. Great care was exercised throughout the tests to obtain true representations of what was taking place inside the cylinders. The revolutions of the compressor were recorded by an Ashcroft counter, and were controlled by a steam throttle-governor, which was operated by the variation of both the speed of the engine and the pressure of the air in the receiver.

### Nature of the Discharge from the Wells

These observations were taken by two observers for three periods of five minutes each during each test. Where the discharge was 50 per cent. or more of the total cycle, the intervals were remarkably constant. The values here given are averages of times observed with an ordinary watch:

Series A.—These observations were recorded in the paper presented to the Institution of Civil Engineers, and are therefore not repeated.

Series B

Test 1. Periods of discharge of thirty-five seconds' duration at intervals of one minute and twelve seconds.

Test 2.—Periods of discharge of forty-three seconds' duration, followed by a pause of five seconds, then a discharge of perhaps ten gallons, followed by a pause of thirty-three seconds before the cycle recommenced.

Test 3. A steady flow of emulsion ending in two short and violent ejections, the whole lasting thirty-three seconds. After a pause of five seconds, there would be a discharge of ten to twenty gallons, followed by a pause of twenty-eight seconds before the cycle recommenced.

Test 4. Periods of discharge of thirty-three seconds' duration at intervals of twenty-three seconds. During the interval there would be one fairly strong spurt lasting one second.

Test 5. Periods of discharge of one second at half-second intervals.

Tests 6, 7 and 8. Discharge similar to that of Test 5, but at higher velocities.

In all cases the discharge consisted of an emulsion of air and water, and not of alternate volumes of air and water, as Dr. Pohle claimed for his system.

Series C

Test 1. Periods of discharge of forty-two seconds' duration at intervals of two minutes and seven seconds.

Test 2. Periods of discharge of thirty-six seconds' duration at intervals of fifty seconds.

Test 3. Periods of discharge of forty-one seconds' duration at intervals of twenty-six seconds.

Test 4. Periods of discharge of two to four seconds' duration at intervals of two to five seconds. Very irregular.

Test 5. Very similar to that of Test 4.

Test 6. Similar to Tests 4 and 5, but the intervals did not exceed half a second.

Tests 7 and 8. Very similar to Test 6.

Series D

Test 1. Periods of discharge of forty seconds' duration at intervals of fifty-two seconds. During these intervals, however, there were five discharges of one to ten gallons each.

Test 2. Periods of discharge of five seconds' duration at intervals of five seconds.

Test 3. Periods of discharge from five to ten seconds' duration at intervals of five seconds.

Test 4. Periods of discharge of short duration, one beginning before the previous one had quite subsided. The velocity of discharge did not appear to be as high as in Tests 2 and 3.

Test 5. Similar in nature to that during Test 4, but at higher velocity.

Tests 6, 7 and 8. Practically continuous discharge of emulsion of small air bubbles and water.

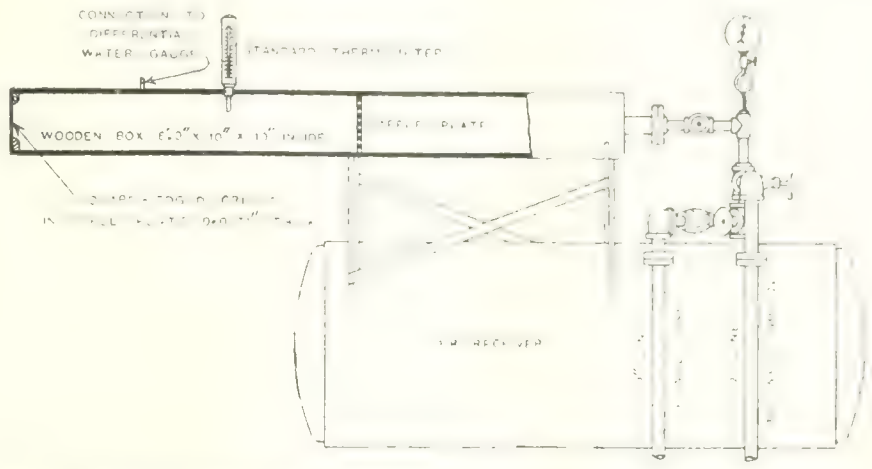



FIG. 5 ORIFICE METHOD FOR MEASURING THE VOLUMETRIC EFFICIENCY OF A LOCOMOTIVE AIR COMPRESSOR.

### Method of Recording Observations

The comparison and analysis of published tests will be greatly simplified, if some standard form can be adopted. Most of the published tests lack certain important items, and other information, such as the submersion, is given in different ways, so that their analysis requires considerable work.

The author has adopted what he believes to be the most convenient form, and one which includes all details necessary to examine the behavior of the pump itself. The observations might, of course, be extended to include every part of the plant down to the fuel consumption, but such details can be foretold with fair accuracy by the manufacturers of the compressor. Since efficiencies of 80 per cent. seem possible with the air-lift pump in the near future it would not seem inopportune for some authoritative body to outline a method of making and recording tests of the air-lift pump, and its reverse the entanglement type of hydraulic air-compressor.

Probable Accuracy of the Tests at Oilfields

Water Pumped.—The [illegible] equivalent to:

Horse-power of the Air Compressor.—The probable maximum error would be [illegible] of series D.

Volumetric Efficiency of Compressor.—The probable error in measuring the volume of air flowing through the orifice during the tests of series D is not more than 2 per cent., as the pressures and temperatures were all recorded within this margin. The values assumed for the tests of series A, B, and C, were based on the experiments made in April and May, 1914, taking into consideration the following :

(1) The speed of the compressor.

(2) The known condition of the air-valves and guides.

(3) The volumetric efficiency shown on the indicator cards.

(4) The temperature of the air in the compressor suction pipe.

(5) The known condition of the scale in the cooling jackets, and the quantity of cooling water supplied. The cooling water was supplied by a piston pump driven direct from the compressor crank-shaft, in all cases.

It is difficult, therefore, to form a definite opinion of the probable accuracy of these latter values.

Indicated Horse-Power.—The maximum difference between the highest and the lowest "mean effective pressure" recorded during any one test, for the same end of a cylinder was 1.3 per cent. for the low-pressure cylinder, and 1.8 per cent. for the high-pressure. Considering the attention paid to details in the use of the indicator and the low speed of the compressor, the probable accuracy of the values given for the indicated horse-power is within 1 per cent.

### Theory of the Air-Lift Pump

This subject is here treated in the following sequence:

(1) Design of air-injection foot-pieces.

(2) Nature of the rate of change of velocity of the mixture to the eduction-pipe.

(3) Operation of the pump as a whole.

(4) Submersion of the injection foot-piece.

Foot-Pieces.—The design of the foot-piece does not play such an important part in the ultimate efficiency of the pump, provided:

(1) That the fundamental laws of the losses in transmission of air and water are carefully kept in mind, when designing; and

(2) That the air is injected into the water in the form of small bubbles.

Any attempt to use the injector principle is pure waste of time, and generally leads to throttled air and water passages, and a back pressure on the air of two to five pounds per square inch, which represents so much wasted energy, for which no corresponding gain can be shown elsewhere. This throttling effect is very marked in the tests by Messrs. Brown and Behr, which were made with an inch diameter air-line terminating in a ⅝-inch diameter nozzle. Some of the tests by Messrs. Davis and Weidner show the same fault.

Fig. 1 shows the foot-piece used by the author in the tests of series A. Its obvious fault is the contracted water-passage, and its only excuse is its cheapness. The real reason that this was abandoned was the choking of the bottom of the air-pipe with rust and scale, so that eventually it caused an additional air-pressure of 30 lb. per square inch. Alternate exposure to warm air and water will corrode steel at an extraordinary fast rate. Before putting the eduction-pipe back into the well, after discovering this trouble, the "eddy cone" was removed, and series B of tests was made with the foot-piece shown in Fig. 1A. The foot-piece shown in Fig. 2 was originally used in Well No. 1, the aim being to inject the air in the form of small bubbles. This type suffered from the same faults as the previous ones. Series C of tests was made with the type shown in Fig. 2A.

When Well 2 was last re-tubed, it seemed probable that the eduction-pipe then inserted would be the largest ever required, and therefore full advantage was taken of previous experience and first cost was not so important. Fig. 3 shows the design of the resulting foot-piece, and this is the type used in series D of tests. The following points were aimed at in the design:

(1) To avoid loss of air-pressure in transmission from the well-head to the foot-piece, and keep the air-pipe outside the eduction-pipe without resorting to the use of the annular space around the outside of the eduction-pipe. An air-pipe run inside the eduction causes additional frictional losses in the rising mixture, with no corresponding gain elsewhere.

(2) To provide a pocket to catch such scale and rust as may form in the air-pipe, and thence fall into the foot-piece.

(3) To introduce the air into the water in the form of small bubbles, as it has been claimed that the velocity of slip of an air-bubble through water varies as the square root of its volume. Since designing this foot-piece the author has found that Mr. Joseph P. Frizell, member American Society of Civil Engineers, outlined the same type of foot-piece in 1880, and in "Engineering News" of 8th June, 1893, referring to the reverse process of compressing air by entanglement with falling water, wrote: "This method was suggested by observing the very moderate velocity with which bubbles of air rise in still water, the velocity varying with the size of the bubble, from nine inches per second or thereabouts for minute bubbles such as result from a slight agitation of the water, to as many feet per second in the case of great masses of air."

Mr. Kenneth Allen, describing the equipment and tests of the wells under his charge at Atlantic City, U.S.A., in a paper read before the Engineers' Club of Baltimore in 1908, also from his experience supports the same.

Mr. Edmund M. Ivens, on page 143 of his book, "Pumping by Compressed Air," writes: "The small openings mentioned divide the air bulk into small streams and thoroughly aerate the column. Considerable gain in economy over other systems is realized thereby, as may be seen by comparison of the curves and tables."

(4) To provide orifices for the air that would not corrode and choke up, as did those drilled in steel and used in the foot-piece shown in Fig. 1

(5) To so proportion the water passages that there should be no sudden change in the velocity of the rising column. The water-passage at the bottom is 6 inches in diameter. From this point upwards the passage gradually contracts, and the water therefore is gradually accelerated until it reaches the bronze taper-nipple. As the water rises through this, it is assumed that the air is uniformly admitted through the 120 ¼-inch holes, and that the velocity of the mixture is constant. Beyond this nipple the velocity of the mixture gradually increases until the size of the eduction-pipe is increased.

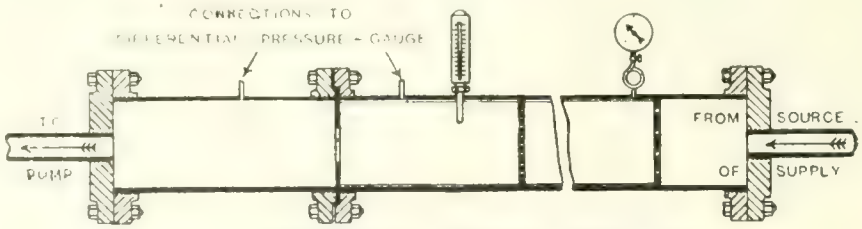



FIG. 6. HIGH-PRESSURE AIRMETER ORIFICE TYPE.

(6) To provide some form of guide on the lower end of the foot-piece as shown in Fig. 1, to prevent its catching in the joints of the well casing when being lowered into the well.

There is no necessity for the foot-piece to be as long as that shown, unless it is so built as to form an auxiliary air-reservoir at this point; a feature which has some advantages. It is equally possible to combine all the above points with the exception of No. 1 in a

foot-piece to be used on an air-line inserted inside the eduction-pipe, and this latter construction is sometimes necessary if the well casing be small.

**Velocity of the Rising Mixture**

The air in the eduction-pipe expands as it rises, due to the diminished head of liquid above it, and it may safely be assumed that it does so isothermally on account of the large volume of water by which it is surrounded. In the case of a single bubble of air rising through water, the pressure on the bubble will vary directly as the head of water above it. In an air-lift pump in operation the air-bubbles are rising through a mixture of variable density, since the ratio by volume of air to water per foot length of eduction-pipe increases as the outlet is approached. Under these conditions the pressure in the eduction-pipe will vary as the ordinate to a hyperbolic curve, and the volume of each bubble as the ordinate to a straight line.

To find the volume of air passing any point in the eduction-pipe per unit of time:

Let $P_1$ be the absolute pressure of the atmosphere.

$P_2$ be the absolute pressure, equivalent to the head of submersion of the foot-piece.

$V_1$ be the volume of air delivered per second to the pump, measured at pressure $P_1$, and a temperature equal to that of the liquid being pumped.

$x$ be the distance of the point under consideration above the point of air injection in feet.

L be the distance in feet from the point of air injection vertically to the outlet of the eduction-pipe.

The same weight of air, and likewise the same weight of water must pass each point of the eduction-pipe per unit of time; the volume of air flowing per second through the outlet of the pump is $V_1$ cubic feet, and the volume of air entering the eduction-pipe during the interval is $V\frac{P_1}{P}$. The increase of volume of the air in ascending the eduction-pipe is—

$$V_1 \left(1-\frac{P_1}{P}\right),$$

and the total volume of air passing the point under consideration per unit of time is—

$$V\frac{P}{P} - \frac{x}{L}V\left(1-\frac{P}{P}\right).$$

The sum of the volume of air and water passing per second being thus found and cross-sectional area of the pipe being known, the average velocity can be calculated. This average of what is in some cases a widely varying quantity is the only value that can be calculated, and forms a very valuable deduction in analyzing the results of tests and in designing the pipe for a new installation. In cases where the air is injected in the form of small bubbles, and the pump is run at or over its most economical capacity, the velocity at any point appears to remain fairly uniform, and as has been pointed out above, these conditions should exist in a well-designed pump; therefore the average velocity calculated by the above method will be a close approximation to the true value. (To be continued.)

## RUST PREVENTATIVE

By M. M.

A NEW rust-proofing for electrical or other machines is an application to the surface of the iron or steel of iron phosphates, which are insoluble and not corroded under ordinary conditions. After thorough cleansing, a bath containing ferric and ferrous phosphates is prepared and the articles immersed therein, and then a little manganese dioxide is added at boiling water temperature. The articles are left in the bath until hydrogen is no longer given off. The articles are then air-dried, when they may be treated with mineral oil or painted, japanned or otherwise finished. As the phosphate surface is attached chemically to the metal no rust forms even in cracks in the paint.

## PRESERVATION OF TEST FRACTURES

By M. E.

A clear coat preservative varnish to protect bright articles is sold under various trade or fancy registered names. A chemist friend advises that although various brands are on sale they are all more or less identical, consisting of a solution of celluloid in amyl-acetate. Further, that if by exposure thinning is required, the addition of amyl-acetate acts similarly to turps in ordinary paint; he also suggests that for many purposes the bought material is profitably thinned down. Those who have used the material do not need to be reminded of the characteristic pear drop smell and pungent odor evident. One of the most annoying things about the retention of ferrous test specimens is that if the fracture is exposed, a few days suffices to spoil its appearance, and indeed, the fractured surface seems peculiarly liable to rust.

Tin foil pressed well home is some protection, but it is by no means ideal. The marketed compound previously referred to has many advantages for the purposes indicated, and is superior to any other method. If a small tin of the substance is available and the fractured portion of the specimen dipped bodily as soon as pulled, the excess being ejected by a sharp movement, it dims the lustre of the break very slightly, but allows preservation for months without corrosion or alteration. The effect of the solution does not in the least impair the characteristic features of the break. The evaporative quality of the amyl-acetate is very rapid, and a few minutes only is needed to dry out; the protective coat then left is a thin film of transparent celluloid. It is more than probable that the brilliantly-colored protective coatings now much in evidence for bright goods have a similar basis, the color being added merely to make visible the treatment. It is understood that the preparation of the compound is by no means difficult, and involves nothing more than dissolving celluloid in the evaporative media. However, the value of the translucent solution is particularly great in the instance quoted, and the value of a material for the protection of bright work which does not alter appearance is worth notice. As it can be procured in small quantities at most cycle accessory dealers, it is quite commercial and convenient for use.

## MECHANICAL ECONOMIZERS

By K. M. E.

THE greatest advances of the past decades have been made in the basic field of the raw materials of mechanism. Modern metallurgy, for example, has made enormous strides, and grows less and less dependent upon initial material of high relative purity. This has set free large quantities of low grade material hitherto not utilizable for highest quality of products, and recently it has been found expedient to allow higher percentage of deleterious ingredients to increase production. The increase in permissible contents of phosphorous and sulphur in steel has not been attended with any visible ill-effects, provided always that circumstances condition use. Thus the field of supply has been extended in a double sense with benefit all round.

Hand-in-hand more modern organization serves to give increased individual production, while productive means themselves have been also improved. The economies of waste by its limitation have also been duly studied, and especially process economy in material has been duly enhanced in importance. Practically at every point of the compass the saving virtue of thrift imposed by real necessity has served to give benefits, whose ultimate outcome is difficult to foresee. Elimination of waste, the utilization of inferior raw material without detriment to the finished product, greater ingenuity in mechanism itself, better organization, increased specialization, economy of material itself, substitution of one material for another, all these make productive engineering a field of surpassing interest which will increase rather than diminish in the future.

Problem after problem has been attacked and made to yield some economic result. The entire art of metal working from first to last is altering visibly year by year; at no point is it stable or lacks definite improvement, and no detail is so small as to escape analysis in competent hands. It is quite possible that in the near future iron castings will give way to steel in a universal sense, while the electrical furnace will shift the centre of gravity of the steel trade to new quarters.

To attempt the enunciation of the economic value of all the advances made would be extremely difficult, but as a total they must be immense. Their full exploitation may indeed so enable productive costs to be cut that increased average wages will not hamper the profits of industry and solve the most difficult of all the outstanding problems—that of labor.

# Underlying Principles of Forging Machine Die Design--II.

By F. R. Frost.*

*Abstract: [illegible] are familiar with successful practice.*

tool begins to upset the stock, it will, of course, buckle at "T," but being supported by the die at this point, and by virtue of the fact that the friction along the side of the die will cause the forward end to upset first, the stock will gradually carry back in the die and produce a uniform upset, as shown by Fig. 43. The use of this method is also indicated in Figs. 44, 45 and 46.

### Limit to Heading Tool Travel

RULE No. 3. In an upset requiring more than three diameters of stock in length, and in which the diameter of the upset is one and one-half times the diameter of the bar, the amount of unsupported stock beyond the face of the die must not exceed one diameter of the stock.

This rule, as will be noted, is a combination of Rules 1 and 2. As an example, if the stock to be upset, as in Fig. 47, is 1 inch diameter by 6 inches long, and the diameter of the hole in the die is 1½ inches, then the amount of stock as at "U," extending beyond the face of the die must not be more than 1 inch.

However, if the diameter of the hole in the die, as in Fig. 48, is reduced below one and one-half diameters, then the length of the unsupported stock beyond the face of the die can be correspondingly increased. If the diameter of the hole in the die is not over one and one-fourth times the diameter of the stock, then the amount of stock beyond the face of the die may be increased to one and one-half times the diameter of the bar.

This rule also applies to cases where the upsetting takes place in either straight or taper holes in the heading tools, as in Figs. 49 and 50. If an effort is made to allow a greater amount of stock unsupported beyond the face of the dies, as in Fig. 51, the stock will buckle outside of the dies, as shown in Fig. 52.

It will be readily seen that such a limited travel of the heading tool as at "U," Fig. 47, would not provide sufficient stock to entirely fill the impression in the die, hence in

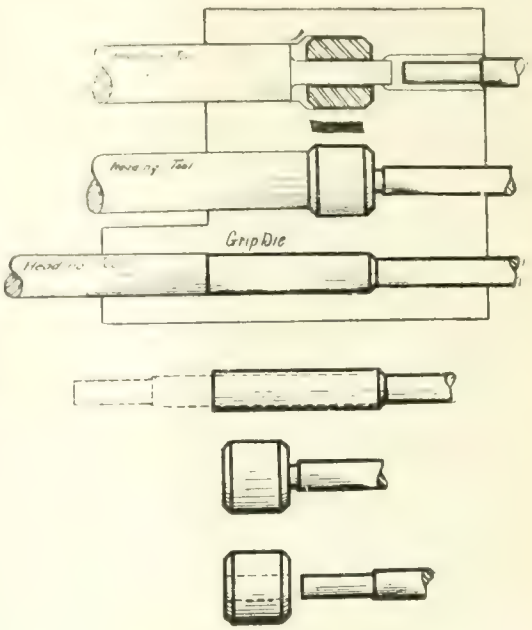



FIGURE 45.

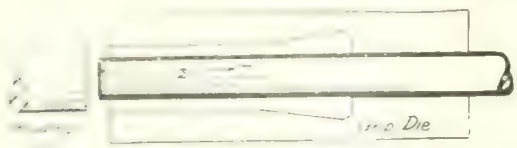
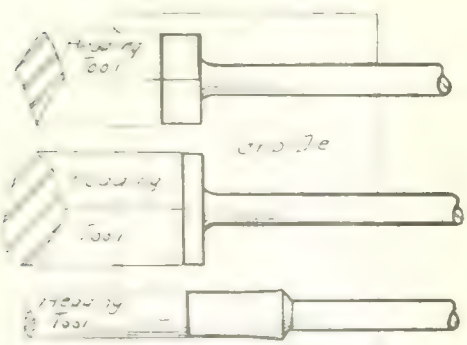
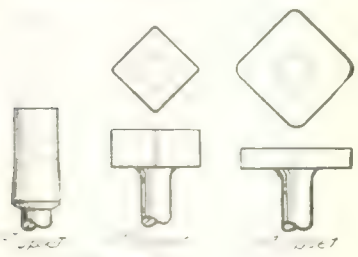


FIGURE 42.

FIGURE 43.





view of the limited heading tool travel on account of rule No. 3, many upsets can to advantage be made tapering, as indicated in Fig. 53.

The taper upset possesses many valuable qualifications, particularly in that if the angle of the taper is approximately four degrees on each side, as indicated in Fig. 53, the increased diameter of the upset, as the heading tool advances, increases the pressure in the direction of the bottom of the impression in the taper tool, and more fully insures a uniform and well filled upset.

Fig. 54 shows how progressive taper upsets can be made, keeping in mind in each case that the diameter of the taper hole near the middle of the unsupported portion of the stock must be kept within the requirement

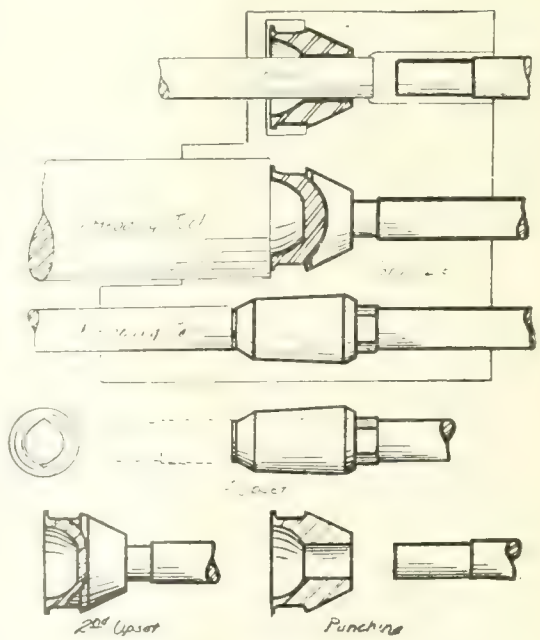



FIGURE 46.

FIGURE 47.

of Rule No. 2. A large amount of stock can be gathered in few operations by this method, for while the first die impression is limited to the size of the bar, thereafter it is the dimensions of the taper upset that governs the size of the next die impression, and not the diameter of the bar.

The taper upset is also valuable in properly distributing the stock at desired points, such as at the base of the final upsets in Figs. 55 and 56; in more easily filling a large flange, as in Fig. 51; or, by inverting the taper, securing the advantage of filling the outer flange, and enabling the second forming tool to more easily place the stock, as in Fig. 58.

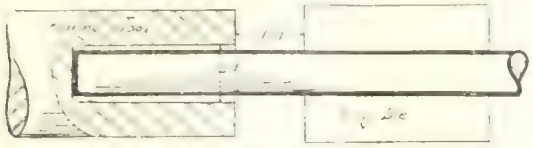


FIGURE 48.

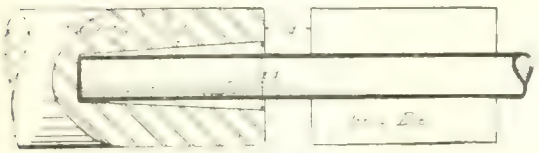


FIGURE 49.

FIGURE 50.

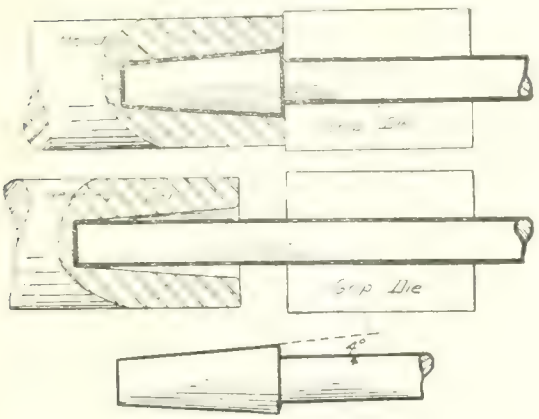



FIGURE 53.

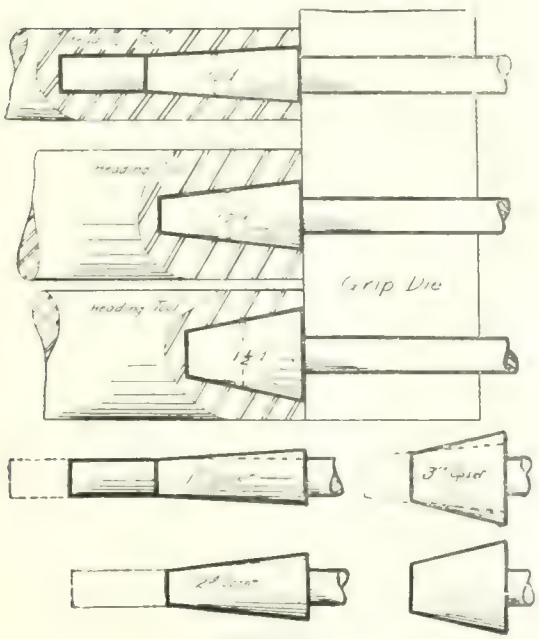



FIGURE 54.

Another form of die having great possibilities, but whose limits are more frequently misunderstood, is the sliding die, as shown in Fig. 59. Such dies are, of course, in quite general use; and are invaluable in upsetting stock at a considerable distance from the end of a bar. Rule No. 1, however, is still with us, as the total length of unsupported stock, measured from the bottom of the die impressions as at "V," must not exceed three diameters of the bar.

The practical application of this form of die is shown in Figs. 60 and 61.

In case the length of unsupported stock is more than three diameters, as shown in Fig. 62, then both rules 2 and 3 must be kept in mind as applying to the relative diameter of the upset, as at "W," and the length of stock extending beyond the face of the die, as at "X."

Fig. 63 represents a failure in a sliding die, as the middle of the stock, being beyond the face of the die, and hence unsupported, would buckle, the same as indicated in Fig. 64.

In any extensive application of the sliding die, it is generally necessary to gather stock in several impressions, and here not only must Rules 2 and 3 be kept in mind, but the fact remembered that the friction along the side of the die will cause the upsetting to take place near the front end of the die. For this reason, if the first upset is formed in the rear half of the dies, then the second impression should be in the front half; the third impression in the rear half; the fourth impression in the front half, etc., in order in each case to bring that portion of the upset which naturally swells the most into the bottom of the next impression where is is more difficult to carry it. The idea is shown in Fig. 65.

In the application of the sliding die, Fig. 66, an upset is made in the sliding portion of the die, and another at the front face of the die at the same stroke of the machine.

Fig. 67 represents a double sliding die, in which two upsets are formed in the

FIGURE 51.

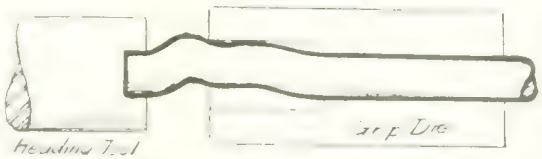
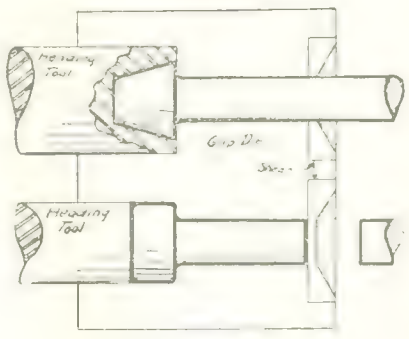
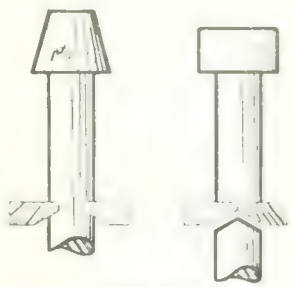
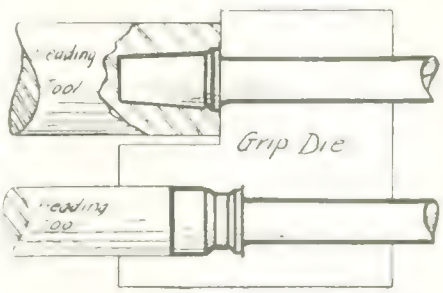



FIGURE 52.



FIGURE



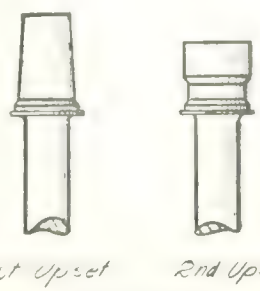
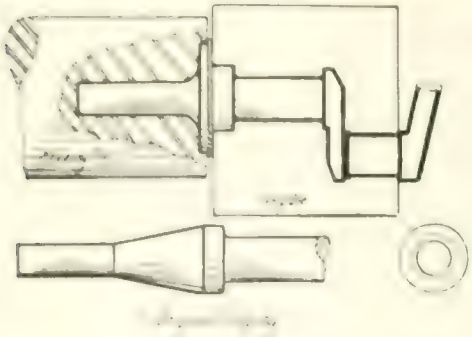
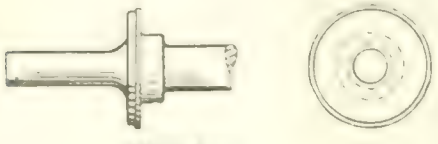
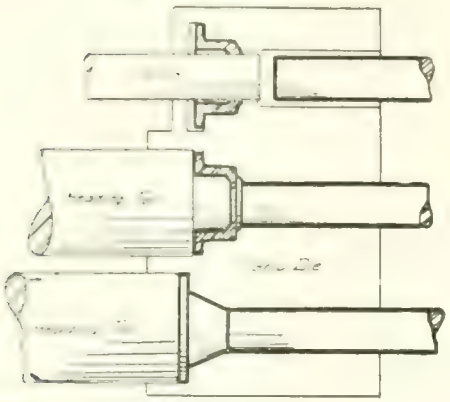



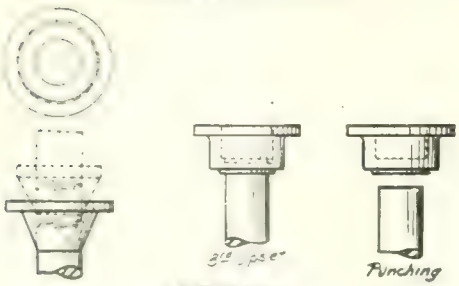

FIGURE 56.

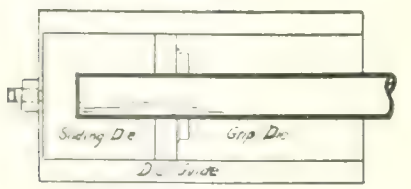
ing die, in which the stock is gathered in the first impression, and the forging is practically cut from the bar. Upon being lowered to the final impression, the upsetting is completed, and as the bar is turned one-fourth of a revolution the forging is severed completely from the bar.









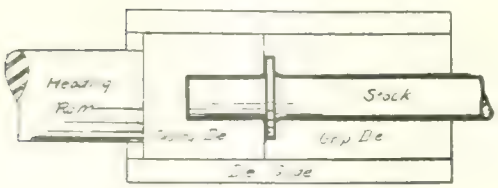



FIGURE 60.

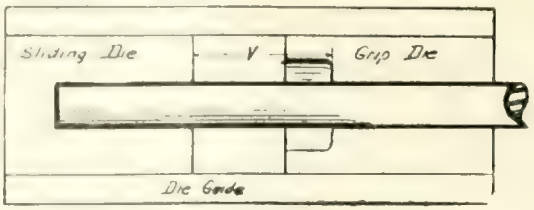



FIGURE 59.

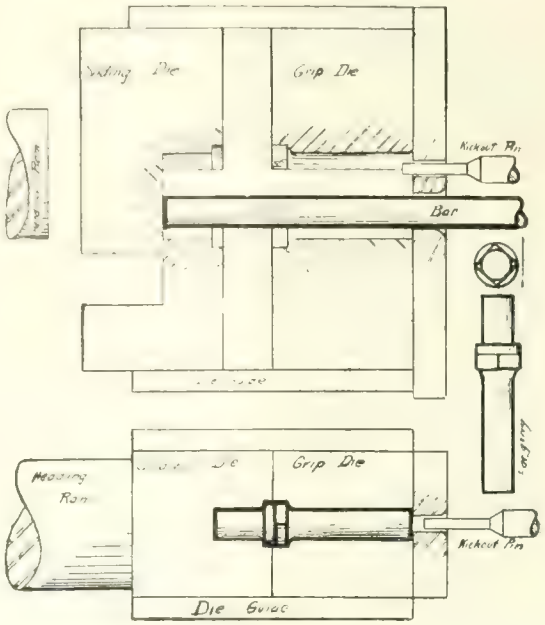
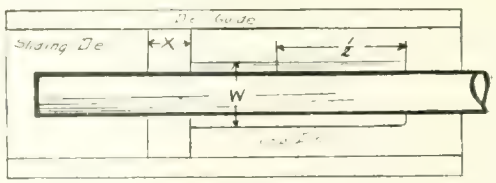



FIGURE 61.

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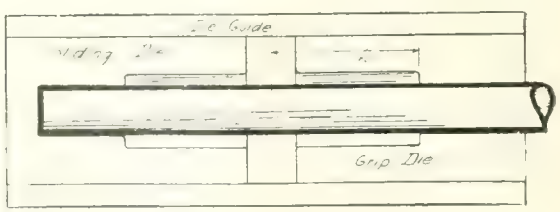



FIGURE 63.

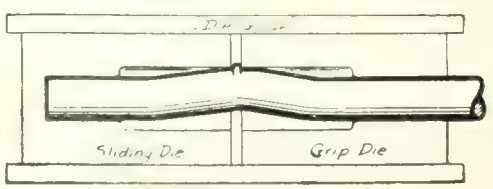



FIGURE 64.

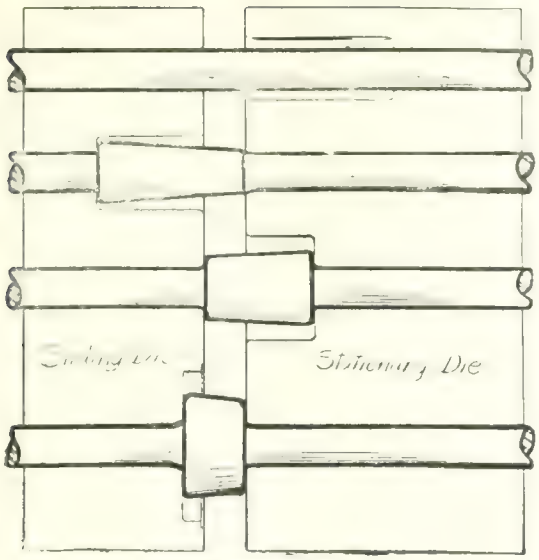



FIGURE 65.

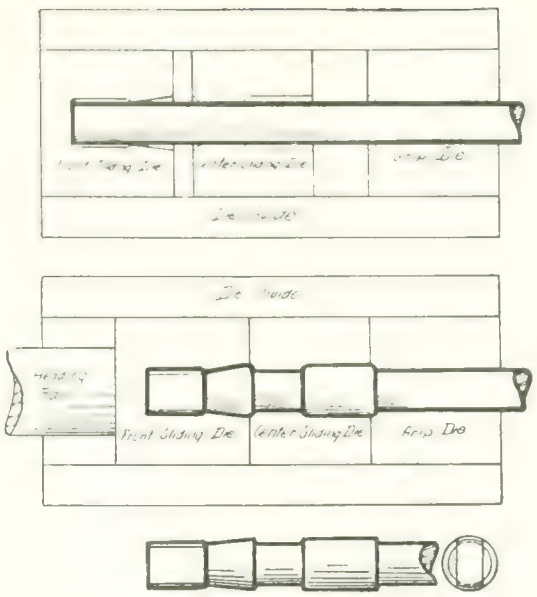



FIGURE 67.

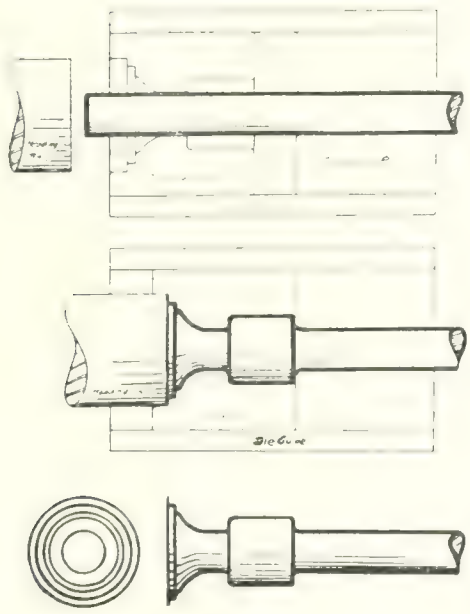


FIGURE 66.

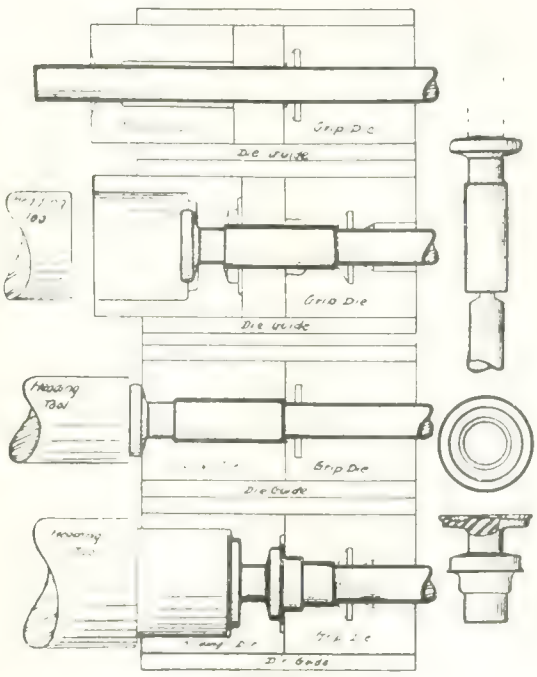



FIGURE 68.

## EXTRUDED METAL

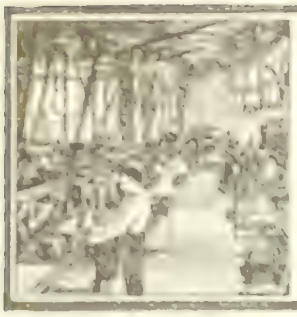
By M. L.

Metal wire and rod made by the extrusion process is coming more and more into common use. For many years wire and rod have been made by the drawing process in which the metal is pulled through dies, successively reducing its diameter or shape. Volume of production was limited at first by the time consumed in attempting to reduce the wire too much at one draft, which resulted in pulling the metal apart, and in the frequent annealings necessary to soften the wire.

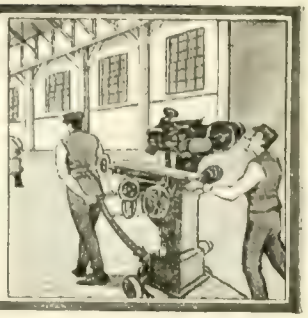
By the extrusion process the metal is pushed through the die while quite hot, thus overcoming at once the two limiting conditions of wire-drawing. The wire does not break because it is pushed through the die, and it does not get hard because it retains its softening temperature during the extruding. The process has been used in producing lead wire and lead pipe for a number of years. The problem of extruding lead, however, presents very few difficulties, as the softness of the lead allows it to be forced through the steel die cold.

For lead extrusion, the necessary equipment consists of a multiple plunger pump, a hydraulic accumulator, and a hydraulic press with attachments. Briefly these attachments consist of a heavy steel cylinder with a die-holding arrangement on one end, the other end being open to form a close fit to the plunger or ram of the hydraulic press. In extruding lead wire, a larger piece of lead is placed within this cylinder and the press started. Lead wire will flow continuously from the hole in the die until the ram reaches the end of its stroke; it is then withdrawn for a new supply of lead. During the two strokes of the ram there occurs no break to the lead wire, the second supply of lead welding perfectly to what remains of the initial charge. In producing lead pipe a long arbor is used, the point of which enters the die in such a way as to form a ring-shaped nozzle, which determines the cross section of the pipe.

Recognizing the possibilities of this process, experiments were made with the object of producing brass rod and wire by the extrusion process. Difficulties at once arose. It was found that to secure desired results all the metal must be quite hot during the extruding, that hydraulic presses of great power were necessary, and that dies suitable for lead extrusion would not withstand the temperatures essential to successful results. These difficulties have, however, been overcome and a number of firms are now making brass rod by the extrusion process. A valuable feature of this process is the practicability of extruding the brass through odd-shaped dies to form certain cross-sections very expensive to obtain by other methods.



# DEVELOPMENTS IN SHOP EQUIPMENT



*Makers of equipment and devices for use in machine shop and metal working plants should submit descriptions and illustrations to Editorial Department for review in this section.*

### MOTOR DRIVEN DRILL AND TAPPER

[illegible] without danger to machine or operators is the purpose of the new Barnes self-oiling, all geared drill and tapper which handles high speed twist drills from ½ inch to 2 inches.

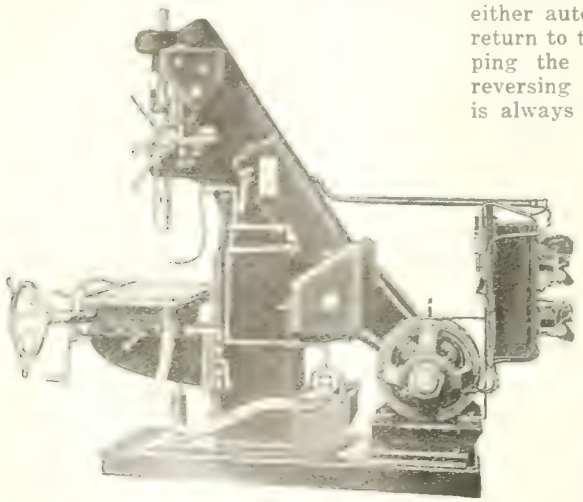
[illegible] machine, built for heavy-duty work and rapid production. Belts are entirely eliminated, all power being transmitted through gears. With the exception of the spindle sleeve and cross spindles, all bearings and all gears are continuously lubricated by an automatic self-oiling [illegible] pumped from the reservoir at the base of the machine by a geared pump.

Eight changes of speed are provided, with control levers within easy reach of the operator from his position in front of the drill. The spindle may be stopped by placing the shifter lever on the neutral position, or by throwing out the clutch gear. All transmission gears except the friction clutch gears are cut from special high-grade chrome nickel steel, heat-treated, and tempered to prevent wear, and to increase strength and stiffness.

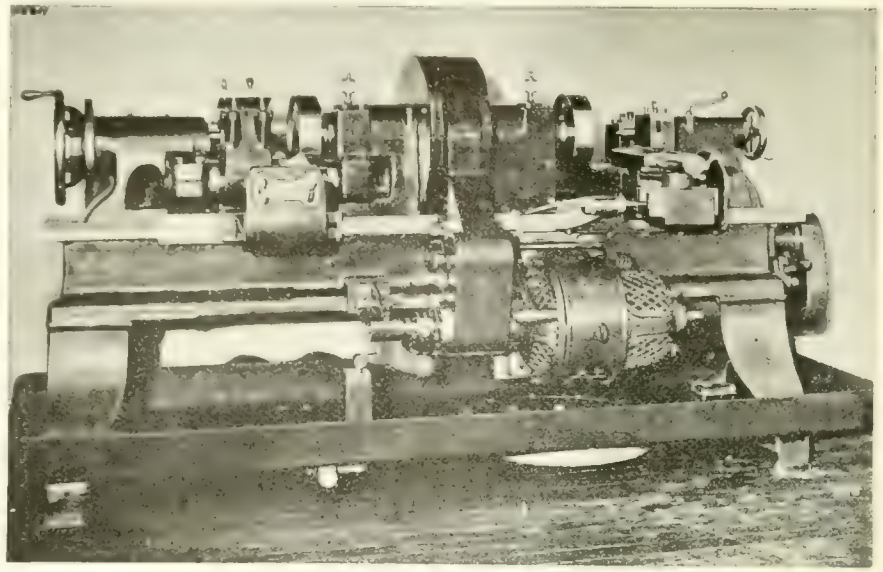
There are ten instant changes of geared feeds, controlled by levers directly in front of the operator. The feeds are indicated in plain figures on an index dial plate. All important feed gears are cut from steel and are case-hardened. A safety collar protects the machine against damage from overloads.

For tapping, the machine may be equipped with an automatic reversing mechanism, which is very desirable, especially for depth tapping. A trip on this mechanism can be set so that the instant the tap reaches the depth required, the spindle will automatically reverse. It is also possible to set the shifting lever so that when tripped, either automatically or by hand, it will return to the neutral position, thus stopping the spindle instantly instead of reversing it. A small hand trip lever is always ready for use if it is desired to stop or reverse the spindle at any point in the operation.

These machines are driven through a silent chain by a Westinghouse 10 h.p. direct-current motor provided with a Westinghouse automatic starting panel. This panel is shown exposed in the illustration, but is provided with a metal case when desired. All gears are entirely enclosed, meeting the requirements of modern safety laws.



[illegible] AND TAPER.



CENTER DRIVE LATHE.

### CENTER DRIVE LATHE

The center drive lathe, shown herewith, was originally designed for the Ford Motor Company, for turning both ends of the driving shaft simultaneously.

The work is passed through an opening in the left hand tail-stock, which opening is brought into position by indexing the barrel of the tail-stock 180°, at which position the work passes direct into the spindle in the head-stock. After the work has been passed through the tail-stock, the tail spindle is again indexed at 180°, which then brings the center into position.

The work is then mounted on the centers, after which the chucks (which are of the floating type), are bound or clamped to the work. The chucks are then secured to the driving plate.

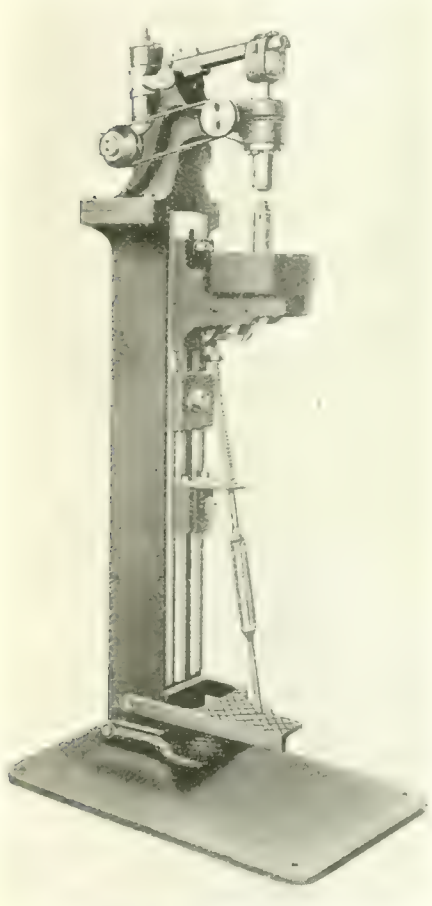
When the machine is started, two carriages feed toward the center of the headstock, thereby turning the various diameters at each end of the work, as well as the outer portion.

While this diameter-turning is in progress, the back arm tools are simultaneously squaring down the shoulders which are necessary on the shaft. The action of the carriage transmits radial motion to the back arm block, which mo-

tion is obtained through the medium of the cam-slot, which is secured to a bracket, fastened to the rear of the carriage.

An extension arm with a roller, which is in contact with the path cam, is secured to the back arm bar and block, from which relationship it will readily be seen that the length of the cam in its longitudinal travel along the bed must necessarily create a rocking or radial action to the back arm block and tools, thereby performing the squaring operation.

This machine is being driven by a Westinghouse type 5 h.p. SK motor, which runs at 1,100 r.p.m., and the stopping and the starting of the spindle



MACHINE FOR BURR-RIVETTING.

is obtained through the medium of an internal expanding clutch provided on an extension of the motor shaft. The drive from the motor to the head spindle is through a set of sprockets and a Morse silent chain, and an idler pulley is provided to take up the slack.

These machines have proved very successful in the factory of the Ford Motor Company. They were designed and manufactured by the Reed-Prentice Company of Worcester, Mass.

**Working at Midland.**—A syndicate contemplates the establishment of a plate mill at Midland, also improvements to the shipbuilding plants.

## COPPER RIVET HEADING MACHINE

THE machine shown in the accompanying engraving has been designed by the High-Speed Hammer Co., Rochester, N.Y., to facilitate the heading of the copper rivets used in holding heavy harness together.

This high-speed riveting hammer compresses the work, holding the washer or burr tightly to the work during the riveting operation, and produces a dependable, finished head on the rivet without swelling or bending the rivet shank, accomplishing the whole operation at the rate of about two seconds per rivet head.

The hammer strikes 2,600 blows per minute without subjecting the operator to strain or shock.

Two-foot treadles are provided, pressure on the top one compresses and centers the work, pressure on the lower one causes the peining tool to form the finished had with a rapid succession of flexible rotary blows, which are delivered through the centering sleeve.

## CALLING SYSTEMS

FOR quickly locating officials or employees in factories or other large buildings, telephones and office boys are inefficient and unsatisfactory; they take too much time and bother a lot of people unnecessarily. By the installation of the calling system illustrated herewith and manufactured by the Standard Electric Time Co., Springfield, Mass., much of this trouble is avoided.

The calling instrument is fitted with telephone type-ringing keys, and furnishes any number of codes desired. The regular model gives forty-five different numbers. These various numbers are secured by merely pressing down keys as indicated in the cut. Automatic control is secured with the electric starting device on the extreme right end of the instrument. Depressing this key gives three rounds of the number or continuously as desired. The instrument can also be started manually by the plunger shown on the top of the case.

The instrument is furnished in a neat oak case, and is of such compact size that it can be placed upon the telephone desk or similar location. If the system is to have extensive use, the signals should be operated from 110-volt AC or DC current, or with a large battery system, in which case a relay must be used with the instrument to break the current. Both instrument and relay are wound to operate from 24-volt battery current. The relay is designed to break considerable current with very little arcing. It is mounted on a slate base and enclosed in steel case.

A great variety of signals can be used comprising vibrating horns, motor horns, buzzers and vibrating polarized or single stroke bells and gongs with 110-volt current. With ordinary battery voltage high wound vibrating bells serve well. All signals should be carefully selected according to the noise conditions. It is wise also to take note where the machinery noise tends toward a bell tone or a horn tone. For instance, some noisy machines make a sound very similar to a horn; in such departments loud gongs will be more easily heard, whereas if the machinery makes a ringing, metallic sound the horn will be more effective. For industrial plants an ideal arrangement consists of the automatic calling system and a master clock with automatic program attachment. The latter will sound the working hours of the plant and utilize the same signals and wiring of the calling system, thereby giving greater value for the investment cost. There is no possible confusion between the two, because the calling instrument gives a very quick, short ring, whereas the program clock has a long three to to five-second ring. Inasmuch as the signals are located throughout the plant in all departments this furnishes an ideal starting and dismissal signal very much more satisfactory than the ordinary steam whistle blast. This equipment

CALLING INSTRUMENT.

also lends itself to a further advantage of providing not only single, but double and triple rings if desired. For instance, one ring can be used for wash-up signal, two rings for dismisal, or one ring for male help, two rings for female help, etc. The master and program clock will be furnished wound to operate properly from the same battery used for the calling instrument and relay. It is entirely automatic and exceedingly accurate and reliable.

THERE has recently appeared upon the commercial market an anti-friction alloy which is made by impregnating graphite with molten metal under hydraulic pressure. By this method the high lubricating nature of graphite is combined with the mechanical strength of the metal used, and the resulting alloy has been found to possess many desirable properties which tend to give a very promising future in the realm of mechanics. While bearings made of this substance must of necessity be restricted to a limited size, their manufacture forms a practical and noteworthy achievement in the great field of scientific endeavor.

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## IS THE STEEL TRADE DUE FOR A REACTION?

ONE of the features of Britain's industrial effort since 1914 has been the expansion of the steel industry. From seven to twelve millions of tons is a large increase at any time, and when the latter was announced last year, reference was made to further increases expected.

That these further increases would be accompanied by an increase in price was hardly to be expected, yet reference is made in recent advices from Britain to an evident agitation for an increase in maximum prices, while at the same time some concern is being displayed regarding the future demand for so much steel and iron. There may be some commercial politics at work behind the two activities, but an interesting feature of the case which is not disputed is the large supply of high speed steel which is now available.

English makers of high-speed steel who have been accustomed to receive orders greatly in excess of their capacity have now caught up with the demand, many of them actually reporting that new orders are not keeping up with production. The London *Ironmonger* states that conditions are intensified by the return to Sheffield from various seaports of large quantities of high-grade steel which had been purchased for shipment to Russia. In addition to the loss of that market it is understood that France and Italy are extending their home manufacture of tool steel and require less from Sheffield; there is also a heavy drop in the consumption of the shell shops and export trade has been reduced to a minimum by Government regulation.

Just how long the latter feature will obtain is at present a matter of conjecture but it is reasonable to expect that Canadian built and owned ships will be allowed to remove some proportion of a surplus essential like high-speed steel and the re-appearance of this material of English manufacture should not be unlikely. Its return is at least desirable to the extent to which it may forestall and prevent the revival of such business with German firms at a later date.

## EFFICIENCY IS NOT ALWAYS PROGRESS

DURING recent years the word efficiency has attained a widespread notoriety, having been used and misused with a frequency only equalled by that later arrival, "camouflage."

The outstanding example of efficiency extraordinary is of course the German nation. It is also a convincing demonstration that there are limits to the development of efficiency beyond which it is not safe to go.

The efficiency curve of a nation as shown by the Hun tragedy is somewhat akin to the characteristic curve of a shunt-wound dynamo. Up to a certain point an increase in load is accompanied by an increase in output, but when the peak is passed the curve droops with increasing rapidity. A further increase in load means a disastrous drop in output accompanied by failure of the machine to generate.

Students of the situation, especially with reference to industrial conditions, will doubtless agree with a recent utterance by a certain Englishman who said: "We are now undergoing a phase of reaction against efficiency. A few years ago we were all for efficiency, and especially for German efficiency; but now, when we see the effect of efficiency on a great nation which had set itself to govern the whole world and had lost its own soul, there was reaction against an efficiency which might lead to such disastrous moral results."

Progress, however, viewed in the light that it places happiness and contentment above material accomplishment, is a higher ideal than straight mechanical efficiency which is an admirable feature of machinery but becomes repulsive when applied too strictly to human beings.

Modern science enables machines to be made which are exact duplicates of each other in ability as well as dimensions. Man, a creature of flesh and blood, has variations in these respects which form the real bond of union and human interest amongst the inhabitants of the world. The moment an attempt is made to level out the efforts and demands on men just so soon does progress come to a standstill.

As remarked by a contemporary, "We cannot avoid the conviction that the mechanics of the past, who were masters of craft, were more human than will be the mechanics of the future, brought up to perform for a few hours a day one simple operation, and one only. We doubt, indeed, if the fact that they will enjoy more leisure will ever quite counterbalance the dwarfing effect of performing for five or six hours a day an operation compared to which squeegeeing the mud off a pavement is a high art.

## SHIPBUILDING EXPERIMENTS PROCEED APACE

DURING the past twenty years more progress has been made in the fundamental branches of marine engineering than in the preceding twenty centuries. Metal hulls and reciprocating steam engines marked the high tide of progress, the methods of design and construction being well standardized at the close of the nineteenth century.

Gradually, however, the wave of evolution began to accumulate momentum again: steam turbines, alone or combined with engines; then gear drives, mechanical, hydraulic and electrical; internal combustion engines; new hull systems, saving material and increasing strength; all followed each other with great rapidity.

Most spectacular, perhaps, has been the development of the concrete ship from a latent state of freakishness to the status of a large industry destined to influence the result of the present struggle.

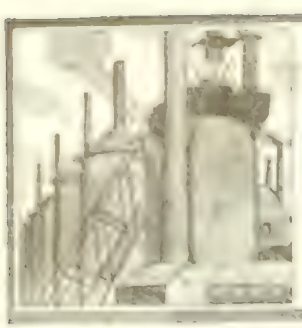
The necessity for speed and economy in ship construction has enabled consideration to be given to almost any idea which promises to reduce cost and increase output, and the use of electric welding on a large scale for hull construction is now being exhaustively investigated at one of the leading shipyards in the New York district. Part of a full size hull will be constructed, three-quarters of the work being riveted to afford comparison with the welded work. Testing will be done very completely, including shifting loads while partially submerged, as well as abuse by bumping and ramming.

Time and cost on a 10,000-ton ship are expected to be reduced by one month and $40 a ton, due to abolishing or greatly reducing the railroad journey from rolling mill to fabricating plant when the latter is not at the shipyard; the templet maker's work; the marker's work; the punching; the work of fitting the plates ready for riveting.

These items apply in considerable measure to present conditions in Canada. The large resources of electrical energy may well be utilized in work of this nature when munitions have waned and the results of the test will be awaited with more than ordinary interest.

# FACTORY MANAGERS AND SUPERINTENDENTS

The Russell Motor Car Co. Ltd. have handled extensive contracts [illegible] Just now they are putting in complete [illegible] 9.2 order. The photographs on this page are [illegible] large measure have been responsible for the successful carrying out of the contracts of the Russell Motor Car Co. Ltd.



# MARKET DEVELOPMENTS

# War Work Now on a Scale Larger Than Ever

## Business of Munitions Going Ahead as Though War Were Sure to Last For Long Time Yet—New Shops Being Rushed to Completion to Handle Contracts on Very Large Scale—Prices Remain Firm in Nearly All Lines

THE rumour in the Street has it that price-fixing has been considered by the War Trade Board at Ottawa, and that many obstacles have been found in the way. The chiefest of these would no doubt be the fact that the measure would in effect amount to fixing the price on something that is not produced in this country. Dealers are not worried over the possibility, and contend that the business is almost entirely under Government control now, regarding the avenues in which trade shall be directed, etc.

Signs continue to increase that the machine tool trade recognize the war business as being on a more permanent basis now than for some time past. One Toronto manufacturer is going ahead turning out a batch of 25 heavy special tools that are applicable for war work only. He has not made a sale yet, nor does he want to until his machines are all on the floor ready for delivery. It can readily be surmised though that this firm does not consider it likely that the war work will wind up quickly.

The demand for machine tools and for supplies, for carbon and high speed material is brisk. New plants that will not machine a shell for two months yet are in the course of building to handle new contracts on a scale that has not been known in the past.

Scrap metal dealers find themselves in the position of being able to secure large supplies of the non-ferrous metals, for which there is not the keenest demand at the moment. The result is that their yards are being well stocked, but they lack the materials that are called for now in the munitions plants where they are turning out the makings of shell blanks.

Drawings of the new 155-mm. shell are being studied by the firms here. There is a tendency now to make the walls of the shells being turned out now thinner than those previously made. The idea of the ordnance experts apparently is that the thinner wall will break into many more pieces than the thicker one of the older type shells. Pieces returned from the battle front frequently show a base with a large piece of the wall attached to it, whereas it is claimed shells with thinner walls would have broken into pieces, and added to their destructive force many fold.

## ONLY THE WAR TRADE IS SERVED BY FIRMS MAKING MACHINE TOOLS

Special to CANADIAN MACHINERY.

MONTREAL, Que., May 21, 1918.—Resumption of the munitions activity throughout Canada has occupied the attention of Canadian manufacturers for the past few weeks. Several large firms have recently obtained orders for different sized shells, and in some instances new plants will be erected to handle the additional business. The most recent contracts call for large shells for naval purposes. Considerable difficulty is still experienced in obtaining machine tools, as the general demand at present is quite heavy. A local firm of engineers has recently purchased a plant for the purpose of manufacturing a line of Scotch pumps that have previously been imported, and which at the present are almost impossible to secure owing to the restrictions placed on such equipment coming from Britain. Local activity in every line of industry is quite brisk, and particularly so in connection with shipbuilding. Two wooden vessels of 3,000 tons each are expected to be launched from the yards of the Fraser, Brace Co., and in the near future two or more steel vessels from the yard of the Canadian Vickers. The feature of the present situation is the almost total elimination of all activity other than that required to carry on the war. The acute condition of steel may be soon recognized by the Ottawa authorities as a basis of some sort of regulation and price control.

### Steel

Conditions in the local steel situation have shown little variation from those of the past few weeks, and the general market is quiet, although business is carried on in considerable volume, but through the medium of the Government, very little ordinary business being recorded. Local mills are all working to capacity, and while some of the output is available for domestic requirements, the greater portion is utilized for war purposes. Manufacturers requiring to obtain steel from the States have been experiencing increased difficulty in getting supplies through owing to the increasing demands across the line and the inability of the railroads to provide adequate facilities for the desired transportation. Some of the American plants have had to curtail their output owing to the necessity of diverting material to keep the more essential industries operating nearer to capacity; this condition is becoming more emphasized, particularly in respect to some of the smaller establishments, and it is anticipated that in the near future some of these will have to still further curtail or cease operating entirely, at least for a temporary period. The summer months have always been a signal for reduced production, and with the pressure that will undoubtedly continue it is very apparent that the steel situation may develop a still more acute position than that of the present. It is not unlikely that some action may be taken by the authorities at Ottawa towards a better regulation of conditions here in Canada, but so far little is known among the local dealers in this connection. Dealers report a quiet market, with activity confined to war work exclusively. No price changes are announced, and those quoted are of a nominal character.

**Copper.**—The local situation is not

marked by any pronounced shortage and the requirements for essential war necessities are ample, but the available supply for domestic consumption is not great. However, this is of little importance, as little work of an ordinary character is now carried on. Local quotations are still firm at 29c and 30c per lb.

**Tin.**—The acute and uncertain position of tin is still pronounced. The situation regarding the supplies from Dutch sources has shown little improvement, and while the London market has developed an easier tendency the same has not yet been reflected in the United States or Canada. Local dealers report the demand restricted to essential requirements, and metal is only sold to those in urgent need of it. The quotation of $1.25 is still strong on the local market.

**Spelter.**—Despite the recent advance in the price of spelter the demand that was anticipated has not materialized and the trade are apparently not disturbed over the strength of the past week. The buying is normal but not sufficient to indicate that the advance will be anything but slight, and dealers here do not look for any pronounced demand at present; quotations are unchanged and firm at 10 cents per pound.

### Machine Tools and Supplies

Many local firms in the market for machine tools are having considerable difficulty in obtaining such as will meet their present requirements, and where new tools are required it is often necessary to wait from six to eight months for delivery with the possibility that even then the machines may be diverted for other and more urgent purposes. Apart from the orders that are being placed for standard equipment the general demand for tools at the present time is of a special nature, with the consequence that the machines must be built from the design upwards, the standard patterns and parts being unsuited to the existing requirements. Munitions firms that have recently received shell contracts are now rapidly preparing for their production, one large firm here has received an order for 9.2 inch shells which will run into several million dollars. Another large local firm expects to build a new plant in the east end to handle additional large orders. This latter firm has already contracted for a considerable volume of machinery from a local firm and the production of this is proceeding as rapidly as possible. In this respect it might be mentioned that mechanics are becoming more difficult to secure and manufacturers are seriously handicapped in getting out the tools so urgently required. Activity in all kinds of supplies has been stimulated by recent developments and machine shop accessories are in increased demand both for munition plants and for other lines of industry. Prices in many instances have shown an increase.

### Scrap

Business in old materials is relatively quiet at present and dealers are apparently carrying little stock other than that required to supply the needs of regular customers. The feeling of uncertainty that has characterized this market for some weeks is still a feature of existing conditions, and local dealers report a tendency of nervousness; few price changes are recorded, but slight fluctuations have taken place during the past week. Machine cast iron is strong and in good demand, but the nominal quotation of $31 is the price given by dealers here. Some dealers are looking forward to higher prices on scrap copper.

## POINTS IN WEEK'S MARKETING NOTES

**The plant of the Dominion Iron & Steel Co. at Sydney, N.S., is rolling rails on order for the Government, and is turning out very little sheet steel for the present.**

—

**Labor trouble over wages has not been finally adjusted at Nova Scotia mills, although large increases have been granted to the men since the first of the year.**

—

**The "steel market" has almost ceased to exist at some big points, as the output automatically goes to war purposes, and the balance to orders that have been on the books for a long time.**

—

**Steel mills are making big money in the United States, and the opinion is expressed that the Government may use this to force a lower fixed price after July 1, or increase the war profits tax on the operations.**

—

**A good supply of coke for making pig iron is looked for following the completion of the work on the new ovens at Sydney.**

—

**Steel ingot production for April at United States mills was at the highest ratio yet reached.**

—

**The United States Government arsenal on Neville Island calls for an expenditure of about $40,000,000.**

—

**Rumors heard on the street, and which also are heard in Ottawa, have it that price fixing in Canada, on the plan adopted in United States, has been considered at Ottawa.**

—

**Ontario dealers are turning more to the Nova Scotia mills for steel output, as it becomes harder to secure a supply from the usual sources of supply in United States.**

## NEW EQUIPMENT FOR THE WAR ORDER SHOPS

**This Is Being Turned Out at a Greater Rate Than For Some Time Past**

TORONTO, May 23.—Business in the iron and steel trade is getting to the point where close students of the situation claim it should have been two or three years ago, viz., under control, the motive of the control being the prompt supplying of essential industries with material and the cutting-off of the non-essential lines with equal promptitude. More and more the war rule is being put alongside every bit of business that comes to the market. Not in one place, but in several—with the jobber, the Government and the mills. All these points have to be satisfied that the work is going to assist in the winning of the war, and if this cannot be done, the order stands little or no chance of receiving any attention whatever.

The sequence of events would bring the control of prices in very close relation to the steps that have already been taken, and there are many in the trade who are inclined to welcome such a step, as they can see that the trend of events has been moving in that direction. The big difficulty is that price control is not directly in the hands of the Canadian Government, because the great bulk of material handled here is imported from the rollers across the line, and obstacles might arise in the way on that account. The matter, though, is being discussed, and there is good authority for stating that it has been discussed by the War Board at Ottawa. It's a big question though, and will probably need a lot of discussion before action is taken. Men in the trade are not disturbed about the rumors of price regulation, pointing out that their business now is practically in the hands of the War Department regarding its scope and activity.

Scrap yards are beginning to pile up with metals that are not called for by the war industries. For the lines used in munitions output there is a brisk demand and a scarcity. For the non-war lines there is little demand. This state of affairs is not likely to be remedied as long as the war grip remains on the industrial life of the country. Prices remain the same as quoted a week ago.

### Steel Prices Firm

Steel prices have not advanced as the result of the order that no purchasing shall be done for warehouse purposes, but there is a strong tendency in that direction, and in some quarters a higher price is quoted on plates, but the increase is not quoted locally yet. Black sheets No. 28 are given at $7.75 to-day, being 25c per hundred off the previous price which has been in effect for some time. Premier galvanized No. 28 U. S. are $8.70, against $8.95, and the 10¾ oz. are given as $9, in both instances being a 25c per hundred pounds reduction.

"I do not put much stock in the talk of price control," remarked one jobber today. "It is like trying to control the price of something that we do not own.

[illegible] Scotia." Other dealers were inclined to look at the thing differently. "I believe [illegible]" was the opinion of another dealer. "It would have to be brought about by the Government or the trade boards of the two countries, but they regulate the price at the mills across the line, we regulate the duty here, the Government regulates who can buy and who cannot, so I don't see that it is going to cause much commotion to go the rest of the distance. [illegible] effective in Canada."

Jobbers report a good demand in war lines, and mill deliveries for these purposes are fair. Transportation facilities are good at present.

### Scrap Metals

Large quantities of non-ferrous metals are being accumulated in the second-hand metal yards, for the good reason that there seems to be a rather limited demand for these at this time. On the other hand the yards are for the most part bare of all lines that are being called for by the furnaces working on war contracts. Brass, copper, zinc, lead, etc., are easily secured by traders, but the making of corresponding sales is not done so readily. Prices remain the same as last week.

It should be remembered in this connection that prices quoted in CANADIAN MACHINERY for scrap metals are the prices that would be offered to machine shops for the material they have for sale. They are not the prices at which the dealers here are offering to resell.

### Machine Tools

Several indications have come to our notice in the past few days that would seem to indicate that business interests consider that war orders are on a firm basis for some time to come. The latest of these is that a well known manufacturing house is working at present on a war purpose tool and is turning out twenty-five of them before a sale is made. The idea is that it is annoying to manufacturers to have to get their war plants on the piecemeal basis. It is also contended that deliveries guaranteed by some of the makers will be weeks late on account of the shortage of machine shop capacity to handle the business. This particular manufacturer believes that by placing himself in the position of being able to go to the manufacturer with a pressing war order and guarantee immediate delivery of a good line-up of machine tools, he can book business in a satisfactory manner. Is it likely that a batch of 25 machines would be run through without a sale or a contract if the maker was in doubt about the duration of the business? An advance has been recorded in the selling price of some lathes recently, due no doubt to the great demand for them. As a matter of fact it is hard to imagine that lists are adhered to in these times as closely as when industry is normal.

The demand for supplies is brisk, in carbon and high speed lines, war orders being continually on hand for the standard sizes of cutters, drills, etc., used in the machining of shells. Prices remain stationary.

# IRON TRADE REVIEW HINTS AT SOME CONTROL BEING TAKEN AT OTTAWA

*The Iron Trade Review* says: Tremendous new requirements for war steel not hitherto disclosed apparently underlie the Government's anxiety to command the full output of the mills and furnaces. A great ordnance program in which the Steel Corporation finally has agreed to take the leading part is significant of other enterprises of corresponding magnitude which now are being matured. Construction plans unparalleled in their size and requirements are taking form. A Government fabricating plant is reported to be among the possibilities. Producers quickly have adjusted themselves to the view that at least six months of full operations exclusively on Government business will be necessary. Despite all that is being said, however, as to the insufficiency of steel supply for Government requirements, the authoritative opinion of the industry is that not only will there be enough for war purposes, but in time some will be left over for commercial use.

The needs of the Allied Governments are surprisingly large. In shell bars, 750,000 tons each, it is stated, will be needed at an early date for England, France and Italy. The British continue to call for an unexpectedly large tonnage of plates, shell steel, rails, etc. Much of this is to replace the steel borrowed by General Pershing. The British wants are interesting in the light of the 1917 statistics just announced which show a steel production of approximately 10,000,000 tons, a higher record figure, and approximately 2,300,000 tons greater than before the war. Present production is considerably greater.

In Canada the question of commandeering the entire output of the works has been considered by the Government.

The mobilization of the pig industry on a war basis rapidly is taking place. Normal market movements in iron are suspended, but this has not deterred buyers from putting forth new inquiries.

The Government, concerned over the shortage in pig iron, continues to exert pressure on the railroads to furnish full supplies of cars to the coke regions.

# MILLIONS INVOLVED IN DEALS CLOSED

### Erection of Arsenal and Other Big Projects Are Well Under Way Now

Special to CANADIAN MACHINERY.

NEW YORK, May 21.—The production of crude steel during the first half of May has been at the rate of nearly 43,700,000 tons a year, while the blast furnaces have been producing pig iron at the rate of nearly 42,000,000 tons a year. The Steel Corporation subsidiaries have been producing at the rate of 95 per cent. to 96 per cent. of ingot capacity and independent steel companies are doing as well, their combined output being slightly more than that of the Corporation. If fuel supply is adequate and transportation facilities continue as at present, there will be a record-breaking run at all the plants, undoubtedly, up to Dec. 1st.

Notwithstanding the satisfactory headway being made by steel producers there is a lingering doubt at Washington, according to recent reports, that the Government requirements, including those of the Allies, may not be fully met if the Government does not assume fuller control of the industry. This opinion is strongly combated by the steel companies and there is a general sentiment against commandeering of the steel plants by the Government. It is considered entirely unnecessary and it is believed that such action would result disastrously for all concerned.

### Held a Conference

Executives representing large steel concerns were called to Washington yesterday to consult with the chairman of the War Industries Board to determine the most effective way to control and distribute the steel output. Many phases of the situation, including coal production, the transportation situation, and the possible curtailment of the less essential industries that consume steel, are understood to have been considered. A committee was appointed, including three members of the War Industries Board and five or six representatives of the steel manufacturers, to consider the various questions brought up at the meeting, a report to be made at a subsequent conference.

It is estimated that the construction of the Government arsenal to be built on Neville Island in the Pittsburg district, will require about 100,000 tons of steel, all of which of course will be furnished by the United States Steel Corporation subsidiaries. The equipment of the great plant will require the expenditure of about $40,000,000 and about one-third or one-fourth of this amount will be needed for machine tools. At a meeting of the National Tool Builders'

Association, held at Atlantic City this week, it was declared by an officer representing the Ordnance Bureau of the War Department that the Government will purchase about $10,000,000 worth of heavy machine tools and $5,000,000 worth of smaller tools for the manufacture of guns and projectiles. J. B. Doan, president of the association, brought out the fact, which has been emphasized in recent letters to CANADIAN MACHINERY many times, that there is a scarcity of large size machine tools such are required by the Government, and he pointed out that it is essential to take early steps to increase the production of such machinery that the tools may be available when the Government arsenals are ready for installations. The nation's aircraft program, he declared, collapsed because those directing the work failed to allow sufficient time for making patterns and templates of the special tools required for intricate work before beginning the manufacture of airships.

Gunmakers, shipyards and railroads, as well as manufacturers of agricultural implements, are now actively buying machinery of various kinds. The Wm. Cramp & Sons Ship & Engine Building Co. has come into the market with an inquiry for 18 cranes, the largest of its kind for several months. Four other shipbuilders are buying shop equipment. Makers of tractors are taking bids on $2,000,000 worth of tools.

## BIG MONEY NOW MAY MEAN A CUT

### Government Said To Be Watching Money Made By The United States Steel Industries

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., May 21.—The American Iron and Steel Institute's monthly report of steel ingot production indicates that in April production was at the rate of about 42,650,000 tons per annum. This is the best rate since last November and is about one per cent. above the average rate in 1917. The gain over March, however, is only 1.7 per cent. The increased production of pig iron, however, indicates that the rate of ingot production at present is between 44,000,000 and 45,000,000 tons, ingot production naturally lagging somewhat behind pig iron when there is a change in the rate. While ingot capacity is between 47,000,000 and 50,000,000 tons, the present rate is considered so satisfactory—it being generally felt that in these trying times operation absolutely at capacity can hardly be expected—that the chief concern of the industry now is to maintain the rate of operation rather than increase it. Soon the really hot weather will come, and in the past production has always decreased 10 to 20 per cent. in July and August. Mill managers are endeavoring to devise means that will avoid the usual curtailment. Consideration is also being given to the problem of next winter, to avoid as far as possible a recurrence of the difficulties of last winter.

#### The New Government Arsenal

Announcement has been made of the site of the arsenal, the building of which has been planned for some time past, through a partnership between the Government and the United States Steel Corporation. The site is Neville Island, an alluvial deposit in the Ohio river just below Pittsburgh. The island is well above high water mark, about five miles long and containing some 1,500 acres, with its upper end five miles below the city of Pittsburgh. The site is considered ideal, from the character of the land and its shipping facilities. At its head stands one blast furnace of some 550 tons capacity per day. This furnace was built by the American Steel & Wire Company just before the formation of the Steel Corporation, and under an announced plan whereby the wire company would build a very large steel plant on the island, concentrating all its Pittsburgh district operations at that point. Whether the plant really would have been built if the Steel Corporation had not been formed it has never been possible to decide. The blast furnace is now owned by the Carnegie Steel Company, and being a detached stack has been operated only in times of exceptionally heavy pig iron requirements. Details as to construction are lacking, but rumor has it one or two additional blast furnaces will be built. Then there will be built an open-hearthed steel plant, designed to cast such ingots as will be required for the large guns to be built, up to 16-inch. The blast furnaces and steel plant will be built and owned by the Steel Corporation. The gun and projectile plant will be built by the Steel Corporation and operated by it, but the funds will be supplied entirely by the Government. The Corporation donates its expert service, selecting from all its ranks the men best fitted for superintending the erection and operation of the plant. The Steel Corporation entered into the arrangement at the earnest solicitation of the Government and not only will make no profit but will donate a large amount of engineering and other skill.

About April 1 the representatives of

## COAL MINING AT PRESENT IS REALLY A DEPARTMENT OF OUR WAR SERVICE

Special to CANADIAN MACHINERY.

SYDNEY, May 21.—The extensive programme of reconstruction and new extensions which have been in progress at the plant of the Dominion Iron & Steel Company in Sydney is approaching completion. The reconstructed No. 1 blast furnace is ready for the heating-up process preparatory to being put into full blast, but it is not expected that the furnace will be in actual operation until a sufficient supply of coke is available. The new coke ovens are also approaching completion. It is expected that one battery will be in operation some time in July, and that the other battery will be commencing to make coke some time in September. The completion of these new ovens will make it possible to count upon a steady and full supply of coke, which the existing ovens are inadequate to supply.

The site of the new plate mill has been staked out, and work on the excavations and foundations will commence immediately. It is said that the mill will require a site of 1,140 feet in length. Details of the mill itself are not as yet available.

The Dominion Steel Company is now rolling rails to the order of the Government, and has temporarily at least discontinued rolling shell steel.

A Royal Commission appointed to look into questions affecting wages and labor at the steel plants in Nova Scotia is now in session at Sydney. The whole of the 14th, 15th and 16th of May were consumed in hearing the representations of the men's representatives and the company's case. The men are laying stress on the necessity to increase the rates of the lower paid workmen. There is really very little justification for a request for an increase to the higher paid men, who are earning very good wages. During the period from 1st January, 1916, to date, the Dominion Steel Company has granted wage increase to its workmen on the steel plant aggregating 56½ per cent. to all men, and to ordinary unskilled laborers 71 per cent.

The drafts now being made under the Military Service Act are expected to seriously reduce the available working forces both at the steel plant and at the collieries. The effect will be worst at the collieries, first because the collieries have already given an unusually high percentage of men to the army, and secondly, because the coal output is the basis of all the subsequent manufacturing processes. No one is inclined to dispute the wisdom of the Government in calling for reinforcements, nor dare anyone criticise the action of the Government in preferring reinforcements to production, but coal is a raw material of such primal importance that it must be looked upon differently from any other raw material, not excepting foodstuffs. If the transportation activities of our war effort are restricted everything else is restricted, even reinforcements. Probably the most important feature of the adherence of the United States to our cause is that the United States possesses large and excellent coalfields. The rapid conveyance of Americans to the French battle-front is a matter of ships, certainly, but ships cannot proceed to sea without coal. Coalmining to-day is not a civil industry, but is a department of our military organization.

the Government began to insist upon [illegible] war [illegible] of [illegible] plans and [illegible] of [illegible] to be [illegible]. The [illegible] had been [illegible] [illegible], as well as [illegible] Government representatives claimed that much [illegible] culminated in the meeting in New York April 27 at which the steel industry [illegible] all the steel [illegible] could be applicable to the various war uses. This was simply in deference to the [illegible] War Industries Board, as represented by J. Leonard Replogle, Director of Steel Supplies, and without prejudice to such estimates as the steel makers might make as to what tonnage really was going to be required, or how long it would take for the intensive program of shipping steel to stock the war activities fully and result in the Government desiring a curtailment in the rate of shipping.

The steel industry was not satisfied [illegible] of the information that had been gathered as to how much steel would be required, and presumably the War Industries Board was not satisfied either. One difficulty has been that the programs dealt very largely in total tonnages and very little in matters of time. A given batch of ship contracts, or of shell orders, for instance, would be made up involving a precise tonnage of steel, but not a precise time during which the deliveries would have to be made. The total tonnage would be known, but not the monthly rate at which the steel should be shipped. Probably upon the initiative of the steelmakers, a conference was held in Washington last week between representatives of the steel industry and of the War Industries Board, at which a joint committee was appointed to study in detail the tonnages and rates of delivery that will be required. This committee is now at work. What the Government desires, in the way of ships, shells, guns, etc., is relatively well known, but what is to be determined is the rates at which the various activities, consuming steel for the production of these things, will be able to operate and receive and consume the steel. When this investigation has been completed there will undoubtedly be a much clearer view of how much steel is going to be left, in future, for commercial purposes. At the present time the mills are simply shipping the maximum they can turn out for war activities, and the steel that is not of a character suiting it to war-work is being distributed to commercial consumers, as largely as possible in proportion to the importance of the customer as to his aiding indirectly in the prosecution of [illegible].

### The Market

In the circumstances, there is practically no steel market, for what little steel is available naturally goes to the filling of commercial orders long on the books. It is no novel situation, however. [illegible] pre-vailed early in the year, when production was so greatly curtailed.

Nothing definite is said as to prices that may rule on the million tons of steel products that will be required to fill the orders for 100,000 freight cars, recently let by the Railroad Administration on a cost plus 5 per cent. basis. It is known, however, that the Railroad Administration has demanded concessions from the set prices, and the matter may have to be referred to the President. Discussion on this subject may open up the matter of what prices are to rule after June 30 as the set maxima, the existing prices having been, towards the end of March, continued for the second quarter of the year. The steel mills are making large profits. Even in the first quarter of the year, when conditions were so unfavorable, there were relatively large profits and conditions are now much better. In the circumstances, some members of the trade think it far from improbable that the Government will seek lower steel prices for the future, or the excess profits tax will be increased by Congress. The fact that the subject is not openly discussed does not indicate that it is not a very live topic.

## SHELL OUTPUT IN CANADA IS LARGE

**Official Figures Give Some of the Records of Production Here**

From recent information given out by the Imperial Munitions Board it is found that Canada's contribution during the last year had been very striking. Fifteen per cent. of the total expenditure of the Ministry of Munitions in the last six months of the year was incurred in that country. She has manufactured nearly every type of shell from the 18-pr. to the 9.2.

### 55 Per Cent. of 18-Pounders

In the case of the 18-pr. no less than 55 per cent. of the output of shrapnel shells in the last six months came from Canada, and most of these were complete rounds of ammunition which went direct to France. Canada also contributed 42 per cent. of the total 4.5-inch shells, 27 per cent. of the 6-inch, and 20 per cent. of the 8-inch, and 16 per cent. of the 9.2-inch. In addition, Canada has supplied shell forgings, ammunition components, propellants, acetone, T.N.T., aluminum, nickel, nickel matte, airplane parts, agricultural machinery and timber, besides quantities of railway materials, including no less than 450 miles of rails torn up from Canadian railways, which were shipped direct to France.

During the present year the call has been largely for 6-inch h.e. shells, and Canadian plants are responding with an output which represents over 40 per cent. of the British programme for this sized shell.

**Montreal.**—The Grand Trunk is receiving this month delivery from the American Locomotive Company of ten Mikado type locomotives for use in freight service. These powerful engines can handle a freight train of six thousand tons. Ten locomotives of similar type have recently been received from the Canadian Locomotive Company at Kingston.

## WINNIPEG NOT IN FAVOR OF BEING TIED UP TO WESTERN COAL MINERS

THE *Winnipeg Free Press* objects seriously to the move to have Alberta mines supply the West with coal, to the exclusion of the Pennsylvania article. The *Free Press* says in part:

Worthy of admiration, in a way, is the "nerve" of the Alberta coal operators in hastening to advise the authorities at Ottawa that there is no need to worry about the fuel supply of Canada, west of the Great Lakes, since they will guarantee a full supply from their mines. They are not lacking in confidence or ambition; but it would be literally a cold day for the people of this city if the Fuel Controller were to listen to their siren song.

Alberta is the place where the alien enemies who condescend to operate our coal mines strike every other week for higher pay. The Government has a special representative out there, who is kept galloping around from coal field to coal field, adjusting difficulties which spring up overnight, and boosting wages. Last year, all the miners in the district were out for weeks in defiance of the orders of the officials of the international organization to which they belong; and during the month of March this year most of the coal mines in the Drumheller area were out of business because of labor troubles.

According to very reliable reports, 60 per cent. of the miners in this district are registered alien enemies. They have got their wages up to the point where they can earn $15 a day. Not having any use for so much money, most of them only work part of the time, thus restricting output in an essential of life.

The proposal to put a city of 200,000 people at the mercy of such a combination is amazing. The first thing that would happen, if anthracite coal were barred from Western Canada, would be another wholesale strike, which would be ended by the obliging representatives of the Government putting the wages of the miners up to perhaps $25 a day, on the plea that since coal must be had the demands of the alien enemies must be conceded. Judged by heat values, the coal for Winnipeg houses would cost probably twice what it does under existing conditions—constituting a killing burden upon the poorer element of the population

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago | 37 50 |
| Standard low phos., Philadelphia | ..... |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 32 00 |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | ..... | ..... |
| Victoria | ..... | 50 00 |

## FINISHED IRON AND STEEL

| Per lb. to Large Buyers. | Cents |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 5 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 5 75 |
| Chequered floor plate, 3-16 in. | 12 20 |
| Chequered floor plate, ¼ in. | 12 00 |
| Staybolt iron | 8 50 |
| Bessemer rails, heavy, at mill | .... |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | *3 50 |

F.O.B., Toronto Warehouse

| | |
|---|---|
| Steel bars | 5 50 |
| Small shapes | 5 75 |

F.O.B. Chicago Warehouse

| | |
|---|---|
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

## FREIGHT RATES

Pittsburgh to Following Points

| | Per 100 lbs. C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 38.1 | 50.5 |
| Halifax | 39.1 | 51.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

## METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $30 00 | $28 50 |
| Electro copper | 30 00 | 28 50 |
| Castings, copper | 29 00 | 28 00 |
| Tin | 125 00 | 125 00 |
| Spelter | 10 00 | 9 50 |
| Lead | 9 50 | 8 50 |
| Antimony | 15 00 | 16 00 |
| Aluminum | 50 00 | 50 00 |

Prices per 100 lbs.

## PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¼ to ½ | $ 9 00 | $ 9 00 |
| Heads | 9 65 | 9 25 |
| Tank plates, 3-16 in. | 9 50 | 9 10 |

## WROUGHT PIPE

Effective Feb. 5, 1918.

| | Base | Galvanized |
|---|---|---|
| **Standard Buttweld** | Per 100 feet | |
| ⅛ in. | $ 6 00 | $ 8 00 |
| ¼ in. | 5 16 | 7 29 |
| ⅜ in. | 5 16 | 7 29 |
| ½ in. | 6 55 | 8 12 |
| ¾ in. | 8 28 | 10 41 |
| 1 in. | 12 24 | 15 39 |
| 1¼ in. | 16 56 | 20 82 |
| 1½ in. | 19 80 | 24 89 |
| 2 in. | 26 64 | 33 49 |
| 2½ in. | 42 72 | 53 53 |
| 3 in. | 55 85 | 70 00 |
| 3½ in. | 70 84 | 87 86 |
| 4 in. | 83 93 | 104 10 |
| **Standard Lapweld** | | |
| 2 in. | $ 29 60 | $ 36 08 |
| 2½ in. | 44 46 | 54 70 |
| 3 in. | 58 14 | 71 53 |
| 3½ in. | 72 68 | 90 62 |
| 4 in. | 86 11 | 107 37 |
| 4½ in. | 97 79 | 122 56 |
| 5 in. | 114 00 | 142 82 |
| 6 in. | 147 80 | 185 28 |
| 7 in. | 192 80 | 241 57 |
| 8 L in. | 202 50 | 253 75 |
| 8 in. | 233 30 | 292 32 |
| 9 in. | 279 50 | 350 18 |
| 10 L in. | 259 20 | 324 80 |
| 10 in. | 333 70 | 418 18 |

Prices—Ontario, Quebec and Maritime Provinces.

## WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

## OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 22 50 |
| Copper, heavy | 22 50 | 22 50 |
| Copper wire | 22 50 | 22 50 |
| No. 1 machine composition | 22 00 | 21 50 |
| New brass cuttings | 16 00 | 14 00 |
| Red brass turnings | 18 00 | 17 00 |
| Yellow brass turnings | 12 50 | 12 50 |
| Light brass | 10 00 | 9 50 |
| Medium brass | 12 00 | 12 00 |
| Heavy brass | 15 00 | 14 00 |
| Heavy melting steel | 24 00 | 21 00 |
| Steel turnings | 12 00 | 12 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 27 00 | 20 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 23 00 |
| No. 1 machine cast iron | 31 00 | 30 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 20 00 | 17 00 |
| Car wheels, iron | 26 00 | 30 00 |
| Steel axles | 38 00 | 35 00 |
| Mach. shop turn'gs | 9 00 | 8 50 |
| Cast borings | 12 00 | 12 00 |
| Stove plate | 19 00 | 19 00 |
| Scrap zinc | 6 50 | 6 50 |
| Heavy lead | 7 50 | 7 00 |
| Tea lead | 5 00 | 5 75 |
| Aluminum | 21 00 | 20 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, ⅜" and less | 10 |
| Carriage bolts, 7-16 and up | net |
| Coach and lag screws | 25 |
| Stove bolts | 55 |
| Plate washers | List plus 20 |
| Elevator bolts | 5 |
| Machine bolts, 7-16 and over | net |
| Machine bolts, ⅜ and less | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | 10 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | add 25 |
| Nuts, square blank | add $1 50 |
| Nuts, square, tapped | add 1 75 |
| Nuts, hex., blank | add 1 75 |
| Nuts, hex., tapped | add 2 00 |
| Copper rivets and burrs, list plus | 30 |
| Burrs only, list plus | 50 |
| Iron rivets and burrs | 25 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 37½ |
| Wood screws, O. & R., brass | 32½ |
| Wood screws, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

## MILLED PRODUCTS

| | Per Cent. |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil. Head Cap Screws | net |
| Flat But. Hd. Cap Screws | plus net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. & Semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2 in. | plus 10 |
| Studs | net |
| Taper pins | 40 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | list plus 20 |
| Collar screws | list plus 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | 65 |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add 7 00 |

## BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $47 50 |
| Open-hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.

F.O.B. Pittsburgh.

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails | $5 25 |
| Cut nails | 5 70 |
| Miscellaneous wire nails | 60% |
| Spikes, ⅜ in. and larger | $7 50 |
| Spikes, ¼ and 5-16 in. | 8 00 |

## ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 41 |
| Plumbers' oakum, per lb. | ..... |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila rope | 0 33 |
| New Zealand hemp | 0 33 |
| Transmission rope, Manila | 0 45 |
| Cotton rope, ¼-in. and up | 62¼ |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | net |

MISCELLANEOUS

| | |
|---|---|
| [illegible] | 0 60 |
| [illegible] | 0 65 |
| [illegible] | 18 to 70 |
| [illegible] | 0 53 |
| [illegible] | 0 16 |
| [illegible] | 4 75 |
| [illegible] | 16 05 |
| [illegible] cwt. | 15 50 |
| [illegible] | 0 35 |
| [illegible] | 0 05 |
| [illegible] | 0 33 |
| [illegible] | 0 32 |
| [illegible] | 0 71 |
| Linseed oil, raw, single bbls. | 1 95 |
| Linseed oil, boiled, single bbls. | 1 98 |
| Plaster of Paris, per bbl. | 2 50 |
| Sandpaper, B. & A. | list plus 20 |
| [illegible] | list plus 20 |
| [illegible] | 0 03½ |
| Sulphur, rolls | 0 05 |
| [illegible] commercial | 0 04½ |
| Rosin "D," per lb. | 0 03 |
| Rosin "G," per lb. | 0 03½ |
| Borax crystal and granular | 0 12 |
| Wood alcohol, per gallon | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

CARBON DRILLS AND REAMERS

| | Per Cent. |
|---|---|
| S.S. drills, wire sizes up to 52 | 40 |
| S.S. drills, wire sizes, No. 53 to 80 | 40 |
| Standard drills to 1½ in. | 40 |
| Standard drills, over 1½ in. | 40 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 |
| Bit stock | 40 |
| Ratchet drills | 15 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 40 |
| Sleeves | 40 |
| Taper pin reamers | net |
| Drills and countersinks...list plus | 40 |
| Bridge reamers | 50 |
| Centre reamers | 10 |
| Chucking reamers | net |
| Hand reamers | 10 |
| High speed drills, list plus | 75 |
| High speed cutters, list plus | 40 |

COLD ROLLED SHAFTING

| | |
|---|---|
| At mill | list plus 40% |
| At warehouse | list plus 50% |

**Discounts off new list. Warehouse price at Montreal and Toronto**

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 8 00 | $ 7 75 |
| Sheets, black, No. 10 | 10 00 | 9 50 |
| Canada plates, dull, 52 sheets | 9 00 | 8 65 |
| Can. plates, all bright | 9 50 | 9 50 |
| Apollo brand, 10¾ oz. galvanized | ..... | ..... |
| Queen's Head, 28 B.W.G. | ..... | ..... |
| Fleur-de-Lis, 28 B.W.G. | ..... | ..... |
| Gorbal's Best, No. 28 | ..... | ..... |
| Colborne Crown, No. 28 | ..... | ..... |
| Premier, No. 28 U.S. | ..... | 8 70 |
| [illegible] oz. | ..... | 9 00 |
| Zinc sheets | 20 00 | 20 00 |

PROOF COIL CHAIN

B

¼ in., $12.35; 5-16 in., $11.85; ⅜ in., [illegible]; ⅞ in., $11.20; 9-16 in., $11.20; ⅝ in., $11.10; ¾ in., $11.00; ⅞ in., $10.90; 1 inch, $10.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $15.50; 3-16 in., $11.70; ¼ in., $8.40; 5-16 in., $7.40; ⅜ in., $6.35; 7-16 in., $6.35; ½ in., $6.35; ⅝ in., $6.35; ¾ in., $6.35.

Prices per 100 lbs.

FILES AND RASPS.

| | Per cent. |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 40 |
| Black Diamond | 40 |
| J. Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 37½ |
| Disston | 50 |
| Whitman & Barnes | 50 |

BOILER TUBES.

| Size | Seamless | Lapwelded |
|---|---|---|
| 1 in. | $36 00 | $..... |
| 1¼ in. | 40 00 | ..... |
| 1½ in. | 43 00 | 36 00 |
| 1¾ in. | 43 00 | 36 00 |
| 2 in. | 50 00 | 36 00 |
| 2¼ in. | 53 00 | 38 00 |
| 2½ in. | 55 00 | 42 00 |
| 3 in. | 64 00 | 50 00 |
| 3¼ in. | ..... | 58 00 |
| 3½ in. | 77 00 | 60 00 |
| 4 in. | 90 00 | 75 00 |

Prices per 100 ft., Montreal and Toronto.

OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | |
| Rovalite, per gal., bulk | 18 |
| Palacine | 21 |
| Machine oil, per gal. | 26½ |
| Black oil, per gal. | 15 |
| Cylinder oil, Capital | 49½ |
| Cylinder oil, Acme | 39½ |
| Standard cutting compound, per lb. | 0 06 |
| Lard oil, per gal. | $2 60 |
| Union thread cutting oil antiseptic | 88 |
| Acme cutting oil, antiseptic | 37½ |
| Imperial quenching oil | 39½ |
| Petroleum fuel oil | 13½ |

BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30-5% |
| Standard | 40% |
| Cut leather lacing, No. 1 | 1 95 |
| Leather in sides | 1 75 |

TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 06 |
| Emery glue | 15 to 20 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 35 |

Prices Per Lb.

ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | .08½ |
| Grits, 80 and finer | .06 |

BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 38 |
| Brass sheets, 24 gauge and heavier, base | 0 43 |
| Brass tubing, seamless | 0 46 |
| Copper tubing, seamless | 0 48 |

WASTE.

| White. | Cts. per lb. | | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 18½ |
| Peerless | 21 | X Empire | 17¼ |
| Grand | 19¾ | Ideal | 17¼ |
| Superior | 19¾ | X press | 16 |
| X L C R | 18½ | | |

Colored.

| | | | |
|---|---|---|---|
| Lion | 15 | Popular | 12 |
| Standard | 13½ | Keen | 10½ |
| No. 1 | 13½ | | |

Wool Packing.

| | | | |
|---|---|---|---|
| Arrow | 25 | Anvil | 16 |
| Axle | 20 | Anchor | 11 |

Washed Wipers.

| | | | |
|---|---|---|---|
| Select White | 11 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

RUBBER BELTING.

Standard ... 10% Best grades .. 15%

ANODES.

| | |
|---|---|
| Nickel | .50 to .54 |
| Cobalt | 1.75 to 2.00 |
| Copper | .44 to .46 |
| Tin | .49 to .56 |
| Zinc | .23 to .25 |

Prices Per Lb.

COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | 42 50 | 43 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 46 00 | 44 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 48 00 | 48 00 |
| Copper sheet, planished, 16 oz. base | 57 00 | 45 00 |
| Braziers,' in sheets, 6x4 base | 45 00 | 44 00 |

LEAD SHEETS.

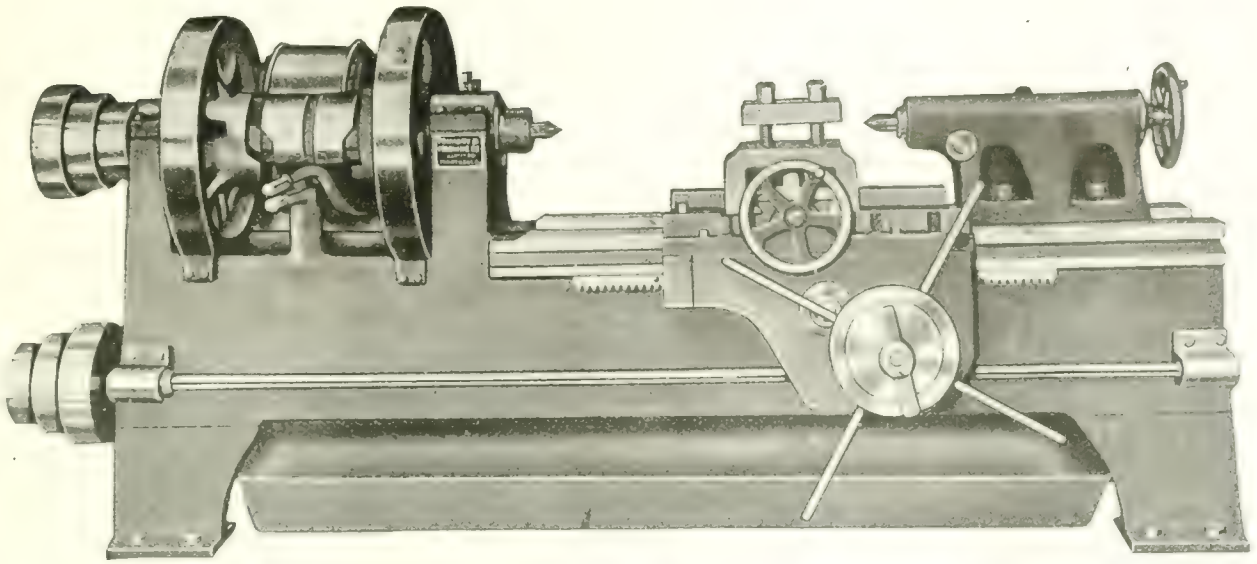
| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $13 25 | $13 25 |
| Sheets, 3½ lbs. sq. ft. | 13 25 | 13 25 |
| Sheets, 4 to 6 lbs. sq. ft. | 12 50 | 12 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

| | |
|---|---|
| Acid, boracic | $ .15 |
| Acid, hydrochloric | .05 |
| Acid, hydrofluoric | .14½ |
| Acid, nitric | .10 |
| Acid, sulphuric | .05 |
| Ammonia, aqua | .08 |
| Ammonium carbonate | .15 |
| Ammonium, chloride | .11 |
| Ammonium hydrosulphuret | .40 |
| Ammonium sulphate | .07 |
| Arsenic, white | .12 |
| Copper, carbonate, anhy | .35 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .70 |
| Iron perchloride | .20 |
| Lead acetate | .16 |
| Nickel ammonium sulphate | .12 |
| Nickel carbonate | .35 |
| Nickel sulphate | .15 |
| Potassium carbonate | .75 |
| Potassium sulphide (substitute) | .20 |
| Silver chloride (per oz.) | .65 |
| Silver nitrate (per oz.) | .55 |
| Sodium bisulphite | .10 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .41 |
| Sodium hydrate | .04 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | .14 |
| Tin chloride | .60 |
| Zinc chloride | .60 |
| Zinc sulphate | .09 |

**Prices per lb. unless otherwise stated.**



# *Speed Up Production*

## *with the*

# MONTREAL LATHE

for the economical production of 4.5", 6" and 155 MM. shells. If you are interested in obtaining maximum production at minimum labor expense, investigate the records of the MONTREAL lathe in plants of the largest producers of shells in Canada.

The MONTREAL lathe is wonderfully simple in operation and construction, yet every worth while improvement has been embodied in the design.

A powerful machine—designed to transmit all the power that the cutting tools will stand—with large broad ways, liberal wearing surfaces and unbreakable apron. The MONTREAL lathe comes to you equipped as you need it—with carriage for rough turning —with rigid single bar for boring, or with swivelling bar for inside profiling.

***Write Now for Prices and Delivery.***

## The A. R. Williams Machinery Co.

LIMITED

**64 Front Street West - . - TORONTO**

## THE FARM DRIVE IN BRITAIN

Science has done the impossible in this war. When the gasoline supply became so limited that all available stocks were taken over for the use of the army, then science provided gas as a propelling power. The photo shows a gas driven tractor in Britain's drive for production. The gas is contained in a huge envelope on top of the tractor and soldiers on leave have been trained to use these tractors and ploughs.

## RECORD ONTARIO MINERAL OUTPUT

THE mineral production of Ontario during 1917 marks high-water point in the record of the mineral industry of the province. The total amounted to $71,060,942, an increase of $5,757,120 compared with 1916. A notable fact in connection with the returns for 1917 is that while metallic mineral production showed an increase of but $1,840,000, made possible by a $3,500,000 jump in the value of the nickel output, which more than balanced a reduction in gold and copper matte, there was a jump of nearly $4,000,000 in the value of non-metallic minerals. The value of Ontario's arsenic production more than trebled, chiefly owing to the increased value of arsenic in the world's markets. The production of iron pyrites was doubled and the value of the output trebled.

### Details of Production

In the following table, issued subject [illegible] output of Ontario for 1917. Comparative figures for 1916 are included:

| | 1917 | |
|---|---|---|
| [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | 119,107 |
| [illegible] | [illegible] | 7,842,880 |
| [illegible] | [illegible] | 6,943,500 |
| [illegible] | [illegible] | 488,690 |
| [illegible] | [illegible] | 1,036,699 |
| Cobalt oxide | 288,611 | 586,290 |
| Cobalt oxide | 458,714 | 533,489 |
| Nickel oxide | 19,438 | 6,533 |
| Nickel (metallic) | 17,847 | 91,923 |
| Other nickel and cobalt compound | 60,956 | 42,026 |
| Molybdenite, concentrates | 26,393 | 108,501 |
| Lead | 70,863 | 172,601 |
| Metallic total | $55,002,918 | $56,845,788 |
| Non-metallic | | |
| Arsenic, white, grey and other forms | 200,102 | 608,184 |
| Asbestos | 100 | 2,150 |
| Brick, fancy and pressed | 318,942 | 462,357 |
| Brick, common | 509,559 | 769,540 |
| Tile drain | 275,471 | 468,886 |
| Do., hollow blocks | 176,953 | 301,528 |
| Cement, Portland | 2,242,433 | 2,934,271 |
| Corundum | 8,763 | 31,213 |
| Feldspar | 42,159 | 27,629 |
| Fluorspar | 10,146 | 64,673 |
| Graphite, refined | 249,586 | 210,018 |
| Gypsum, crushed, ground and calcined | 116,206 | 128,828 |
| Iron pyrites | 471,807 | 1,066,575 |
| Lime | 265,356 | 269,461 |
| Mica | 55,407 | 79,516 |
| Natural gas | 2,401,499 | 3,182,151 |
| Petroleum, crude | 387,846 | 475,000 |
| Pottery | 87,025 | 91,501 |
| Quartz | 223,514 | 382,993 |
| Salt | 700,515 | 1,095,866 |
| Sand and gravel | 470,963 | 427,303 |
| Sewer pipe | 216,749 | 205,810 |
| Stone, building, trap, granite | 755,313 | 749,160 |
| Talc, crude and ground | 111,489 | 179,554 |
| Total, non-metallic | $10,300,904 | $14,218,269 |
| Add metallic | 55,002,918 | 56,845,788 |
| Grand total | $65,303,822 | $71,060,942 |

The total yield of gold in Ontario to the end of 1917 amounted to over $42,000,000. Discoveries of gold continued to be made in various parts of Northern Ontario.

Since the discovery of silver at Cobalt in 1903, shipments of silver have amounted to 274,000,000 ounces, valued at $151,960,000.

### Huge Nickel Ore Reserves

The output of nickel copper matte in 1917 was 78,897 tons. During the year 1,453,000 tons of ore were smelted at the Copper Cliff and Coniston smelters. The known reserves of nickel ore were estimated a year ago at 70,000,000 tons, but it is believed that the results of diamond drilling have added nearly 100 per cent. to the quantity.

The value of the output of non-metallic products for 1917 was greater than in any preceding year except 1913, the amount being $14,218,000 in 1917, as against $15,724,000 in 1913.

Four gold mining companies paid out in dividends $1,699,000 and thirteen silver mining companies nearly $6,000,000. The total dividend distribution by silver and gold companies combined up to the end of 1917 was over $82,000,000.

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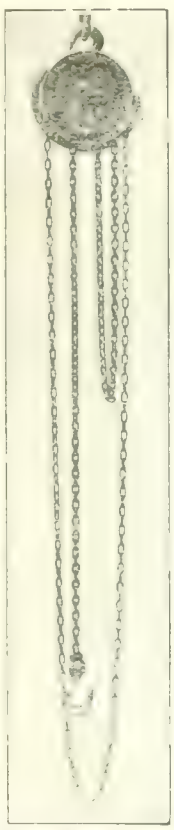
**Old Copies Wanted.**—The publishers of CANADIAN MACHINERY will be pleased to have any copies of May 9th issue that subscribers do not require.

# THE A. R. WILLIAMS MACHINERY CO. LTD

64 FRONT ST., W. TORONTO, ONT.

SALES SUPPLY DEPARTMENT SERVICE

# IN STOCK FOR IMMEDIATE SHIPMENT



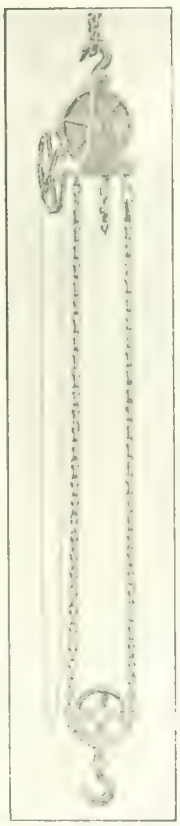
Triple Gear Type.

Use Herbert Morris Chain Blocks for speed, ease of handling, durability and reliability.

Careful manufacture and the use of the best materials, give the Morris block a higher efficiency and therefore a higher speed than any other chain block.

The gears are machine cut and every block is tested with a fifty per cent. overload before shipment.

If you want to overcome your hoisting trouble buy "Morris" Chain Blocks.



Worm Gear Type

"TOLEDO" Pipe Stocks spare the muscle of the man who does the work and save the money of the man who pays the wages, as they enable ONE MAN TO DO THE WORK OF TWO and cost less for repairs.

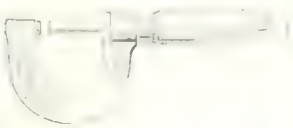
USE "TOLEDO" PIPE STOCKS

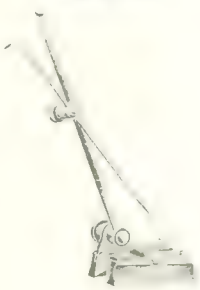
STARRETT TOOLS

TRADE MARK REG. U.S.PAT. OFF.

MECHANICS' TOOLS

Starrett Tools in stock, including Micrometers, Calipers, Dividers, Surface Gauges, Thread Gauges, Combination Sets, Protractors, Scales, Test Indicators, Speed Indicators, etc., etc.



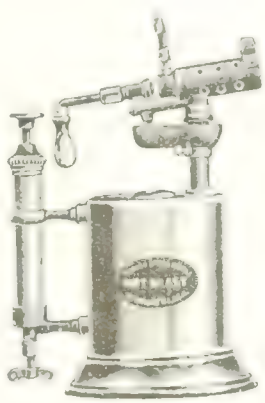


We can save you money on your purchases of these tools. Next time you are in the market for anything in the tool or supply line, give us your trial order and let us prove this.

## EVERYTHING FOR THE STEAM FITTER or POWER HOUSE

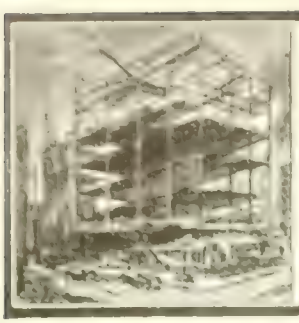
Complete stock of both Brass and Iron Body Valves, Pipe Fittings, Pipe Stillson and Trimo Wrenches, Torches, Chain Tongs, Lubricators, Oil and Grease Cups.

Also a complete line of Transmission Equipment, Power House, Mill and Factory Supplies.



## THE A. R. WILLIAMS MACHINERY CO., LTD.

TORONTO, ONTARIO



# INDUSTRIAL NEWS

## NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

## MUNICIPAL

Napanee, Lennox and Addington Counties are considering building a concrete and steel bridge. The engineer is T. V. Anderson of this town.

Port Dover.—Tenders will be called [illegible] for the erection of [illegible], costing between $15,000 and $20,000, for the Town Council.

**Fergus, Ont.**—The Town Council are considering the installation of a fire [illegible] with the box system and the electric siren were considered. The matter was finally left in the hands of [illegible].

**Goderich.**—The Dominion Road Machinery Co. of Goderich shipped a complete rock crushing plant to Haliburton for the Township of Dysart. This makes the fourth crushing plant shipped within the last two weeks. They also have shipped out two carloads of graders and several more will be shipped before the end of this week. They are being shipped to Winnipeg, Calgary, Quebec, and Sherbrooke.

**Fort William.**—At a meeting of the finance committee at Fort William, the [illegible] was recommended to be [illegible] to the Fort William board of trade. It was also recommended to accede to the request of the Canadian Car and Foundry Company to have the company's bond for $250,000 cancelled, in consideration of their having carried out more than the required expenditure upon the plant here. The solicitor will be asked to take the matter up and see that all legal requirements are complied with.

**Hamilton.**—*The Times* says: City Engineer E. R. Gray informed the civic fathers to-day that new tenders will have to be advertised for in connection with the two boilers for the steam equipment at the Beach pumping station, as he had been advised by the Babcock, Wilson Company, of Montreal, who are Canadian agents for the British boiler manufacturer who was originally given the contract, that the Imperial Munitions Board would not permit the boilers to come to Canada, it being inferred that they are needed for marine purposes Mr. Gray said this unforeseen contingency would not delay matters greatly at the Beach pumping station, providing new contracts were let, as other suitable boilers could be secured from Canadian manufacturers.

## PERSONAL

**J. W. Shackleton** has received the appointment of city engineer of Chatham Ont.

**Stacey Opdyke** has been appointed as manager of the water sterilization department of the Northern Electric Co., Montreal.

**W. R. Daye**, who has been advertising representative of the T. McAvity & Sons, St. John, N.B., has enlisted. His predecessor in the position, Mr. Erb, is also in the service.

**J. A. St. Germain**, for the past twelve years secretary-treasurer of the Canada Stove and Foundry Company, of St. Laurent, P.Q., has severed his connection with that firm, and has taken over the business of the Imperial Supply Co., 104 Delorimier Avenue, Montreal, as wholesale jobbers and general manufacturers' agent.

**J. N. Robinson**, Toronto and Hamilton representative of CANADIAN MACHINERY, has received word of the death in action of his brother, Flight-Lieut. W. Hartley Robinson, of the Royal Air Force. He was serving on the Italian front. Prior to enlisting he was a reporter on the Toronto "Star," and latterly editor of the "Canadian Motorist."

**S. E. Chadsey**, assistant to the general superintendent of the Massey-Harris Co.'s plant at Toronto, has been made general manager of the agricultural implement plant at Brantford, Ont., to succeed Franklin Grobb, who has retired because of ill-health. The latter continues his connection with the company in an advisory capacity only. R. D. Johnson has retired as superintendent of the Brantford factory, and is succeeded by John W. Dunn.

## TRADE GOSSIP

**Change Office Location.**—H. W. Johns-Manville Co., New York, give notice that their Houston office will be located, on and after July 1, at 424-426 Washington Ave., Texas.

**Big Contract.**—Official announcement was made of the acceptance of a contract by the Motor Trucks, Ltd., of Brantford, for the manufacture of war material for the United States Government. The contract involves an expenditure of approximately $7,000,000, and the terms call for completion by January 1, 1920.

**Goes to New Hamburg.**—The North-Light Motor Co. of Toronto, with offices in the Wesley Building, have recently taken over the large two-storey factory at New Hamburg, formerly occupied by the Silversmith Mfg. Co., which is 40 feet by 140 feet long, for the purpose of manufacturing a high-grade, 4-cycle, high speed gasoline motor, for marine, automobiles, trucks, tractors, stationary engines, etc.

**To Build Briquette Plant.**—It is announced that the federal government has sanctioned the plan whereby a plant for the manufacture of briquettes from lignite coal will be established in the Estevan district. The federal government will provide $200,000, and Manitoba and Saskatchewan each $100,000. This plant will be erected as soon as possible, and may prove a factor in the solution of the pressing fuel problem.

**Manufacturers Protest.**—At a general meeting held in the Kerby House at Brantford of the manufacturers of the Counties of Brant, Elgin, Oxford, Norfolk, Haldimand, Welland, Lincoln and Wentworth, it was decided to send a delegation to Toronto to arrange for a meeting in regard to the order for the curtailment of the gas supply of manufacturers in this district. There was a representative attendance of about forty manufacturers present, many of whom were entirely dependent upon gas to operate their respective plants.

**New Equipment.**—The Otis Fensom Elevator Co. have purchased a 50 h.p. motor-driven De Laval 3-in. three stage centrifugal pump for use in connection with a hydraulic elevator, which they will install in the Bell Telephone Building. The Hydro-Electric Power Commission of Ontario have purchased six De Laval single and multi-stage pumps for the Ontario Power Company. These range in sizes from 100 to 150 h.p., and all will be motor driven. Sales were made by the Turbine Equipment Co., Ltd., Toronto.

**Coal Mixing Plant.**—A coal mixing plant is to be installed by the Grand Trunk Pacific Railway at Edson, and contracts for the construction work are now being awarded. The purpose of the works will be to combine three different grades of Alberta coal into a standard fuel, which will be used on all locomotives of the system between Winnipeg and Prince George ,and the consumption of home mined coal will thereby be increased to the extent of 200,000 tons a year. The plant will be in operation about the 1st of August, and employment will be given to some fifty men.

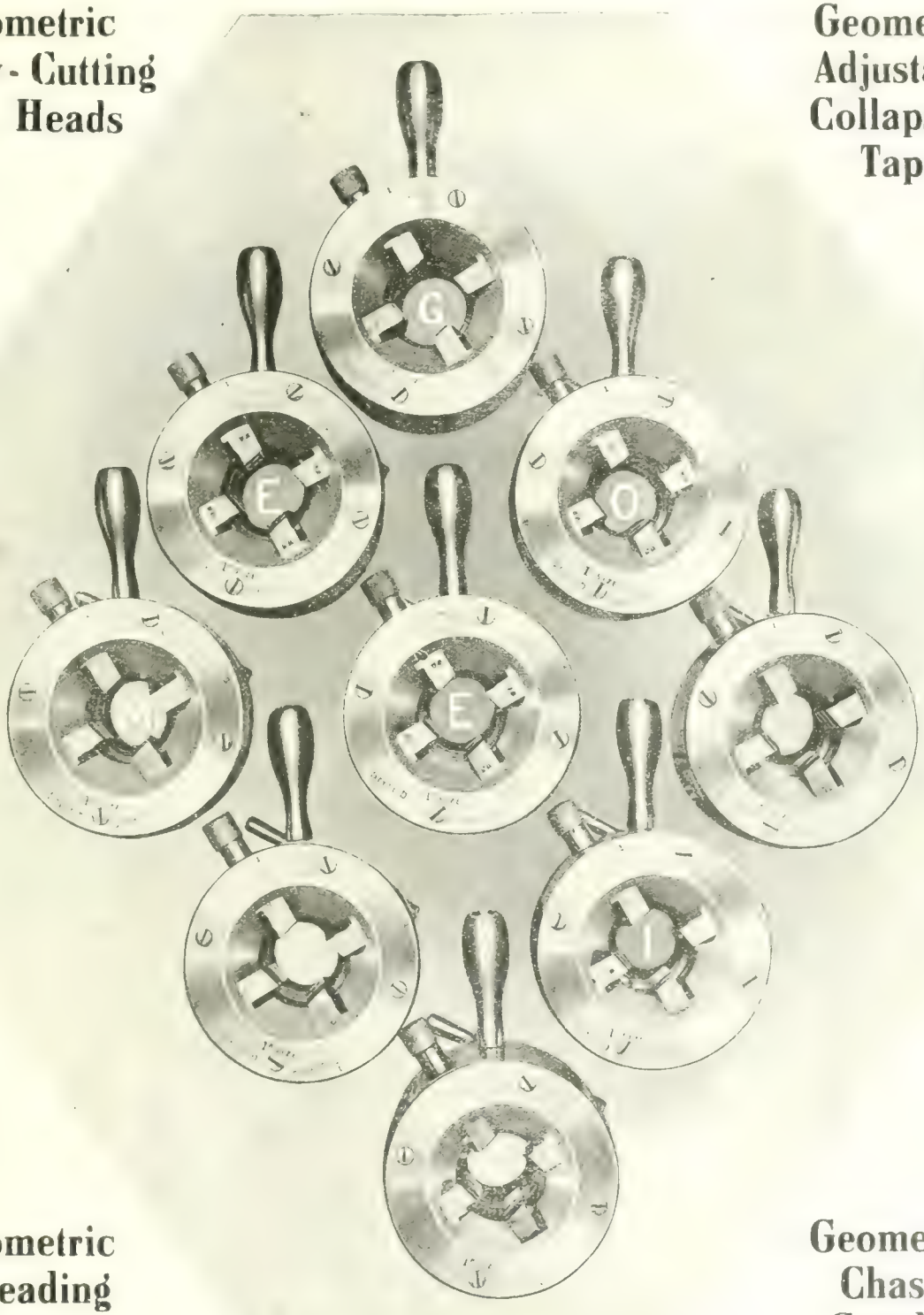
**Ten New Companies.**—Incorporation has been granted to the following joint stock companies: Swan Lake Farm, Limited, Toronto, capital $500,000; Fairfax Forgings, Limited, Montreal, capital $1,500,000; Oppenheimer Casing Com-

# GEOMETRIC

## The Magic Name Among Manufacturers of Screw Threads

**Geometric Screw-Cutting Die Heads**

**Geometric Adjustable Collapsing Taps**




**Geometric Threading Machines**

**Geometric Chaser Grinders**

WE CAN HELP YOU

The Geometric Tool Company, New Haven, Conn., U.S.A.

*CANADIAN AGENTS:*

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co. Ltd., Toronto, Winnipeg, St. John, N.B.

*If any advertisement interests you, tear it out and [illegible]*

[illegible] Toronto, capital [illegible] Chemical Company of Canada, Limited, Toronto, capital $50,000; Saxon Motors Corporation of Canada, Limited, Windsor, capital [illegible]; Alfred & Company, Limited, Montreal, capital $1,000,000; Frank [illegible] & Company of Canada, Limited, Vancouver, capital $50,000; Petroleum & Gas Products, Limited, Toronto, capital $1,000,000; Dillon Crucible Alloys, Limited, Welland, capital $110,000; Canadian Buttons, Limited, Montreal, capital $25,000.

**Big Nickel Plant.**—The contract for the construction of a nickel and copper refining plant at Deschenes, Que., for the British-American Nickel Corporation [illegible] job before the snow falls. The plant will be constructed entirely of concrete. The buildings and machinery will cost over a million dollars. It is understood that both British and Norwegian interests are back of the scheme. The production of refined metal from the completed plant will be very large and on a scale hitherto unknown in Canada. The company operating the plant has mines in the Sudbury district, where the smelters are located, so that the business between there and Deschenes will mean considerable of a melon to the railroads in freight charges on the ore.

## TENDERS

**Ottawa.**—Sealed tenders will be received until 4 p.m., on Monday, May 27, 1918, for the construction of a Dominion Government Office Building, O'Connor St., Ottawa, Ont.

**Ottawa.**—Tenders, marked "Tender for rebuilding lower entrance pier, Lock No. 23," will be received until 12 o'clock noon on Wednesday, June 5, 1918. J. W. Pugsley, secretary. Department of Railways and Canals, Ottawa.

**Amherstburg.**—Plans and specifications can be seen at the office of A. C. Cailleux, Amherstburg, who will receive tenders until 4 p.m., June 15, for the erection of two steel bridges, costing $13 000, over the Canard River, for the Township Council.

**Ottawa.**—Tenders will be received up to noon, Friday, May 31, 1918, for the construction and installation of two coal discharging bridges at Halifax, N.S. Full particulars may be obtained on application to the undersigned or to the Admiral Superintendent, H.M.C. Dockyard, Halifax, N.S. G. J. Desbarats, Deputy Minister of the Naval Service, Ottawa, May 10, 1918.

**Winnipeg.**—Sealed tenders will be received up to 10 a.m. on Friday, May 31st, 1918, for the supply of one combination hose wagon and pumper for the Fire Department of Winnipeg. Specification and form of tender, together with conditions governing tenders as prescribed by by-law, may be obtained at the office of the Chief of the Fire Department, Central Fire Station, Winnipeg. M. Peterson, Secretary, Board of Control Office, Winnipeg, May 10, 1918.

## MARINE

**Toronto.**—The Canada Steamship Lines Ltd. announce the opening of navigation across the lake to Niagara-on-the-Lake, Lewiston and Queenston. The first trips were made on Saturday, the 18th.

**Port Arthur.**—The latest move in the strike situation is the bringing in of some 150 women as strike-breakers. There is some difference concerning the advisability of such a move, some of the citizens offering criticism to the employing of women for such heavy work.

**Thos. Robb and James N. Bales,** of the Royal Commission, appointed to investigate into the pilotage conditions at the various harbors of the Dominion, are leaving for the Pacific Coast about the 11th of the month to complete their work at the different ports in British Columbia. They expect to be away for about a month.

**Ottawa.**—The Cabinet Council, on recommendation of Hon. F. B. Carvell, authorized the transfer to the St. John Drydock and Shipbuilding Company of the contract originally given to the Norton Griffiths Co. for the St. John harbor works. The new company, composed of prominent Canadian shipowners and builders, takes over the contract on the same terms as those granted to the Norton Griffiths Company when Hon. Dr. Pugsley was Minister of Public Works.

**Victoria, B.C.**—Only on the basis of a minimum rate of $6.60 per day for basic trades and a 44-hour week, with the proviso that whatever advance may be granted in the shipyards of the Pacific Coast of the United States by the reason of the increased cost of living be conceded the shipyard workers of British Columbia, will the shipyard and affiliated trades be prepared to sign up a permanent working agreement for the duration of the war, declared labor leaders.

**Vancouver.**—Fire in the J. Coughlin & Sons' shipyard on False Creek did damage on May 15 to the extent of between $1.500.000 and $2.000.000. A fireman was killed. The steel steamer War Chariot, about two-thirds completed, was engulfed in the flames. The ways, which are built on piles, fell through and the hull twisted by the heat, is now half-submerged in the water beneath. The hull of the steamer War Charger on No. 3 ways still stands, but the plates are badly buckled by the heat.

**Toronto.**—The Trojan, a 4,200-ton freighter, built at the foot of Bathurst street by the Thor Ironworks Company and Dominion Shipbuilding Company, for the Great Lakes Transportation Company of Midland, was successfully launched, and was christened by Mrs. Johannas Linvig, wife of the owner. The Trojan is a sister ship to the Angouleme, with 43.6 beam and 28 2 moulded depth, and is valued at $750.000. She was sold while on the stocks to Mr. Linvig for ocean service. Her first trip will be to Kragero, Norway.

**Cleveland.**—Ore is moving at a much faster clip than a year ago. Forty-four ore carriers were loaded at all ports in one day, and thirty-one vessels were waiting and loading the following morning. Boats are getting around pretty fast, as many of the big carriers are going up light on account of scarcity of coal. The coal movement is slipping, if anything, and boats are more plentiful than cargoes all along the line. Many of the regular traders are going up light, and small carriers, which are usually in big demand, are unable to get loads.

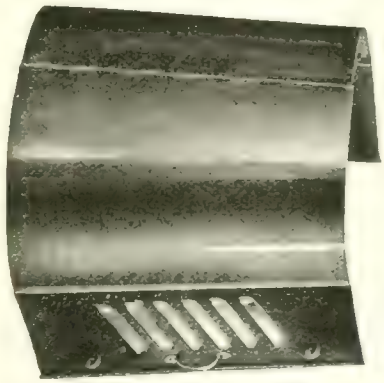
**Washington.**—The proposal to use electric welding in place of rivets in securing the plating of a ship is an attractive proposition if it can be done successfully. Tests which were recently made in the presence of the representatives of the Shipping Board have been so satisfactory that one of the engineers of the Emergency Fleet Corporation has been sent to Newark, where the system is to be tried on a 9,500-ton ship which is about to be built by the Federal Ship Building Corporation of Newark, N. J. According to the despatch, a low voltage is used and the current is applied to the metal through the ends of large forceps which press the sheets firmly together after the metal has become sufficiently heated to effect a weld.

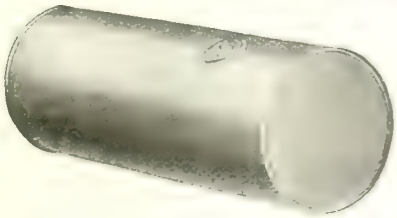
**Not an American Concern.**—A rather erroneous report has found its way into print in connection with a factory that is being erected in the east end of Toronto to handle large war business. It was reported that "an American company represented in Toronto by the Holden-Morgan Company" was undertaking the work. The Holden-Morgan Co. themselves are behind the enterprise, and they have no connection whatever with any American concern in this business. This company has recently taken on large war orders, and the new plant is being erected for the handling of this business. The main building will be 100 x 300 feet, and in addition to this there will be heat-treating plants, shipping houses, etc. Two sidings are being placed on the property, one for the purpose of receiving and the other to ship out goods. Some 3¾ acres of land are being used in the building of the new plant, and it is expected that it will be ready for operation within the next two months.

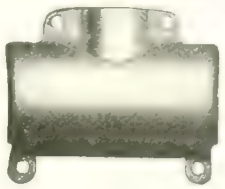
## CATALOGUES

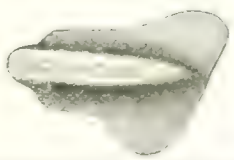
"The Proper Care of Belts," is the title of a booklet gotten out by the Joseph Dixon Crucible Company. We suggest that engineers obtain a copy for their files. As long as the original condition of life and pliability of a belt is preserved it is worth its cost price. To neglect belts will result in a two-fold loss; a waste of power due to the inefficiency of the belts and increased cost due to frequent belt renewals. Just now as never before it is essential that belting be given careful attention. The booklet contains helpful suggestions for getting maximum results from belts and in addition has several pages devoted to useful information of a general character.

# SHEET METAL STAMPINGS









OUR plant is equipped with batteries of heavy presses and hammers to take care of every class of stamped and deep drawn metal work. But that is not all. During the many years we have been developing this department, we have gathered together a staff of mechanics who thoroughly understand every phase of the work.

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*If any advertisement interests you, tear it out now and place with [illegible]*

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| 5 | 5 | 1,800 | Lincoln |
| 1 | 7½ | 1,200 | Lincoln |
| 1 | 7½ | 1,120 | Can. Gen. Elec. |
| 5 | 10 | 1,200 | Lincoln |
| [illegible] | 10 | 1,120 | Can. West. |
| 2 | 20 | 1,200 | Lincoln |
| [illegible] | 20 | 450 | Can. Gen. Elec. |
| 1 | 20 | 900 | Lincoln |
| 1 | 25 | 720 | Can. Gen. Elec. |
| 2 | 25 | 900 | Lincoln |
| [illegible] | 25 | 900 | Wagner |
| 1 | 25 | 850 | Swed. Gen. Elec. |
| 1 | 25 | 900 | Can. Gen. Elec. |
| 1 | 30 | 1,120 | Can. West. |
| 3 | 30 | 850 | Lincoln |
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| [illegible] | 75 | 450 | Can. Gen. Elec. |
| [illegible] | 75 | 900 | Crocker Wheeler. |
| [illegible] | 75 | 1,200 | Gen. Elec. |
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| 3 | 2 | Can. Gen. Elec. |
| 6 | 3 | Packard |
| 6 | 3 | Can. West. |
| 50 | 5 | Rideau |
| 21 | 5 | Can. West. |
| 3 | 5 | Can. Gen. Elec. |
| 4 | 10 | Packard |
| 2 | 10 | Can. Gen. Elec. |
| 8 | 10 | Can. West. |
| 2 | 15 | Can. West. |
| 32 | 20 | Can. Gen. Elec. |
| 1 | 25 | Can. Gen. Elec. |
| 2 | 30 | Can. West. |
| 1 | 40 | Can. West. |
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**ALSO two carloads of condulets, condulet covers, V. V. fittings, fuses, knife switches, porcelain tubes, cutouts, circular loom, flexible steel conduit and couplings, carbons, carriage bolts, braces and R.C.D.B wire.**

# Dominion Iron & Wrecking Co.

## Limited

General Offices: Transportation Building, MONTREAL

**PRODUCTION OF MINERALS IN 1917**

IN a preliminary report on mineral production in Canada during 1917 John McLeish, B.A., chief of the division of mineral resources and statistics, points out that it is customary to express the total mineral production and to make comparison of production in different years in terms of dollars or total values.

On this basis of record and comparison the total value of the metal and mineral production in 1917, as shown in this preliminary report, was $192,982,837. Compared with a production in 1916 valued at $177,201,534, an increase of $15,781,303, or 8.9 per cent., is shown, while compared with a production in 1915, valued at $137,109,171, there is shown an increase of $55,873,666, or 40.8 per cent.

It must not be inferred, however, that because such a large increase is shown in the value of our mineral production, that our mines and quarries have actually increased their tonnage output at the same average rate. In fact, an examination of the record will show that the quantities of many important products were considerably less in 1917 than in 1916, and over two-thirds of the increase in value is to be attributed to coal, gypsum and cement, in which the quantities marketed were less than in the previous year.

The interrelation of industry is shown by the effect of a diminished coal and coke output on the metallurgical production, the falling off in production of copper and gold is in part attributable to this cause. Lead and silver also show much smaller output. As against these decreases there has been an important increase in the production of zinc, and increases also in the production of cobalt, molybdenite, and nickel.

In 1916 the metal production showed a very large increase over that of the previous year, but in 1917 the net result in value has been an increase of only $311,387, making a total value of $106,630,752.

The total value of the non-metallic production, including clay and quarry products in 1917, was $86,352,085, as compared with $70,882,169 in 1916, showing an average increase of $15,469,916, or 26 per cent. Practically every product, with the exception of the stone quarry output, shows an increased value of production; but in the case of coal, graphite, gypsum, and cement, the quantities actually marketed were less, notwithstanding the increased values.

In representing a total valuation of the mineral production as is here given, it should be explained that the production of the metals—copper, gold, lead, nickel, silver, and zinc, is given as far as possible on the basis of the quantities of metal recovered in smelters, and the total quantities in each case are valued at the average market price of the refined metal in a recognized market. There is thus included in some cases the values that have accrued in the smelting or refining of metals outside of Canada.

---

**Owen Sound.**—Sealed tenders will be received up to noon of the 10th day of June, 1918, for the purchase of the steamer "La Canadienne," now lying at Owen Sound, Ont. "La Canadienne" is a single screw steamer of iron construction, built in 1880. Her net registered tonnage is 227 and her displacement is 500; is 154 feet long, with a breadth of 23 feet and a maximum draft of 11 feet. Her maximum speed is approximately 8 knots. Her boilers are in good condition. She is fully equipped for commission, and carries a motor boat and four sail boats, with accommodation for 55 men. She may be seen and inspected at any time upon application to Mr. John Nesbitt, of Owen Sound. The ship will be sold as she lies.


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BLACK DIAMOND OVENS

OVENS

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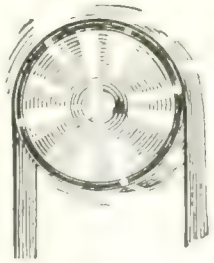

Lanco Balata Belting

is now one of the most expensive belts on the market.

When the cost of raw materials increased the price of this belt to where it is to-day, we were a little afraid that it would result in a diminution of our sales. We have been very agreeably disappointed the sales have not dropped off.

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[illegible] New Haven 32"x14'-0"

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[illegible] and Shapers

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# CANADIAN MACHINERY

## AND MANUFACTURING NEWS

*A weekly newspaper devoted to the machinery and manufacturing interests.*

Vol. XIX. TORONTO, MAY 30, 1918 No. 22


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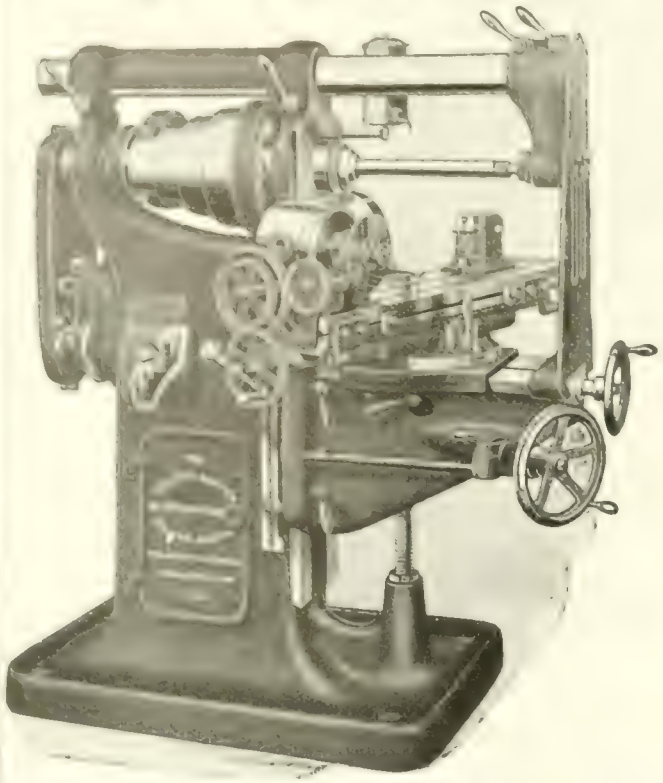

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Skilled mechanics are scarce these days but anyone can run a machine of its simplicity and turn out work accurately and fast without trouble.

All Feeds positive driven through gearings giving 18 changes.

This is the universal type—designed to handle all milling operations performed on machines of this character, either with regular equipment or by aid of attachments, which can be supplied for increasing efficiency and scope of machine.

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CANADIAN MACHINERY
AND MANUFACTURING NEWS

Volume XIX No. 22 May 30 1918

# Making New Locomotive Parts from Scrap Heap Material

By Paul H. Cain *

*Putting old parts into new, much as seems somewhat opposed to the Biblical injunction to put not the new wine in old bottles etc. Circumstances alter cases, however, and where there are no new bottles the old must be made to do. Hence the conservation effort described by the writer. Doubtless similar and equally as economical practices will be suggested in allied lines of engineering.*

OWING to the general abnormal conditions, incidental to war activities, prevailing throughout the country at the present time, the pronounced scarcity of material and labor has been forcibly brought to our attention so that we have had to adapt our available resources to meet the needs of the situation, hence the use of methods for greater conservation by reclamation of material that in normal times would be considered as useless scrap, and converting the same into product of serviceable character and at little expense.

The M. C. R. R. shops at St. Thomas, Ontario, have for a long time been studying and practising conservation in connection with operations where iron and steel enter into construction.

All broken and obsolete parts of locomotives and car equipment, consisting of brake beams, brake rods, levers, chains, bolts, nuts, pins, spring buckles, spring hangers, draw bars, arch bars, axle journals, frames, and any scrap which may accumulate around shops are utilized in this process. These parts are chopped or sheared into pieces not exceeding 12 inches in length, then piled on boards 12 inches by 12 inches, each pile weighing from two hundred to two hundred and fifty pounds. It is then charged into a furnace equipped with Economy combustion chamber and burners, as illustrated in Fig. 1, the capacity of the furnace being sufficient to accommodate twelve piles at one time. It is then heated to a welding heat and conveyed from the furnace to the steam hammer by means of a pair of grab tongs suspended from the crane. It is then forged into slabs 2½ x 14 x 30 inches.

Fig. 2 shows a pile in position on the hammer die ready for forging into slabs; to assist in welding these slabs a porter bar is used. Any number of these slabs are piled together according to size of forging desired and again welded into a billet, after which they are forged into their desired shape. In Fig. 3 is illus-

FIG. 1—PILE OF SCRAPS READY FOR CHARGING [illegible] FURNACES.

which is made from these slabs. In order to get a forging of this size where the overall length is upward of 6 feet it is necessary to pile four of the slabs together, using a porter bar. After the slabs have been heated the centre portion is forged into the oblong shape 5 inches by 3 inches; an extra heat is then taken on each end and the metal forged to the oval shape and the holes punched.

Sketches 5 and 6 show an inside frame patch and also a combination frame patch and driver brake shaft bracket, both of which are now being made from reclaimed scrap iron.

This method of utilizing scrap is very suitable to the construction of the cylinder equalizer illustrated in Fig. 7. This piece, which has a total length of nearly 8 feet, has an approximate weight of nine hundred and sixty pounds.

One of the most efficient tests we have found for this material is that of manufacturing it into locomotive links, as shown in Fig. 8. After carbonizing and heat treatment of the links made from this process the result has been highly satisfactory in every respect. The writer's experience in obtaining the best results in carbonizing these links has been as follows:—After baking in a carbonizing furnace for at least fourteen hours, the box is removed and allowed to cool. The decalescence of iron being about 1650 degrees F., while the decalescence of carbon steel is 1440 degrees F., therefore, in order to get a refined grain iron on the inside of the case, reheat the link to the decalescence of iron and

*[illegible] blacksmith, Motive Power [illegible] R R Shops, St. Thomas, Ont.

[illegible] BEING WELDED UNDER HAMMER

quench in water. In order to get the [illegible] to about 1440 degrees F. and quench, which gives you both the refined grain of the iron and also the steel.

Fig. 9 shows a "T" headed draw bar pin that is forged from this material. This system of reclamation is very adaptable to railroad shops, as it requires no additional or special equipment other than that which is already installed, and its adoption has proven a great saving in this particular plant, the most essential factor being the use of a good furnace and good combustion chambers.

## SMALL ELECTRIC FURNACES AND THEIR USES

My Mark Meredith.

Until quite recently the use of small electric furnaces was restricted to certain special operations in the laboratory. They were constructed of platinum foil wound on a porcelain tube, on the outer side of which an insulating cover was placed. On passing a current of sufficient strength through the foil, a temperature of 1400 deg. Centigrade or more could be obtained in the interior of the tube; and any desired temperature could be maintained below this limit by adjusting an external resistance.

The dimensions of the porcelain tube were commonly about 15 inches long by 1½ inches diameter (internal) and the arrangement proved of great service in [illegible] peratures. The high cost of platinum, together with the fact that careful control and oversight were necessary to protect the winding from fusing, prevented this form of furnace from being widely adopted, and it was seldom found in the workshop. The necessity of a furnace suitable for testing the effect of heat treatment on metals led to trials of nickel windings in the place of platinum, the only gain, however, being diminished cost, as the nickel was more liable to burn out than the platinum.

Both kinds suffered from the further defect that the porcelain tube frequently collapsed when the full current was switched on suddenly, and neither could be used to advantage unless in the hands of a skilled operator. These troubles have now been overcome, the introduction of fused silica and alundum tubes, together with the marketing of nickel-chromium (nichrom) wire and strip having resulted in the production of extremely useful furnaces, which possess none of the drawbacks mentioned, and which are being used in ever-increasing numbers in the workshop and the laboratory. The well-known property of fused silica, which may be thrust into a hot furnace or quenched in water from a white heat without cracking, renders it specially suitable for use in small electric furnaces. Alundum does not resist sudden temperature changes so well as silica, but is superior to porcelain in this respect, and seldom cracks when used in this connection. Moreover, alundum tubes are more regular in shape than those made of silica, and are less readily attacked by metallic oxides; they are, however, more expensive. Nickel-chromium alloys of suitable composition, may be safely heated to 1100 deg. Cent., without noticeable oxidation, and show only a small increase in resistance as the temperature rises, the co-efficient being 0.00016 per deg. Cent.

The limit at which a furnace wound with nichrom may be worked continuously is 1000 deg. Cent., which is 400 deg. less than the safe temperature attainable by the use of a platinum winding; but as a great number of important operations are conducted below 1000 deg. Cent., the smaller range does not detract from the utility of nichrom.

The small change in resistance with temperature is a valuable property in this connection, as a nichrom winding may be switched on to mains with impunity, a cold resistance of 8.6 ohms rising to 10 ohms at 1000 deg. Cent.; and hence, if the current were 10 amps at the higher temperature, it would only be 11.6 amps. when switched on at the cold winding. A platinum winding having a resistance of 10 ohms at 1000 deg. Cent., however, would fall to 2.4 ohms when cold, and if 10 amps. were taken from the mains when hot a current of over 40 amps. would flow through the coils when cold; and any part thinner than the rest would be liable to fusion. Hence for safety the current in a platinum furnace must be controlled by an external resistance, which is gradually cut out as the temperature rises—a process involving a waste of time, labor and current as compared with nichrom windings. A similar objection applies to nickel and all other metals of high temperature co-efficient. Further advantages of nichrom are cheapness and resistance to corrosion by metallic fumes or contact with hot silica or other refractory.

Considering the question of cost of running, a tube 15 inches long and 1 inch internal diameter suitably lagged may be maintained at 1000 deg. Cent.,

FIG. . LOCOMOTIVE FRAME MADE FROM SCRAPS.

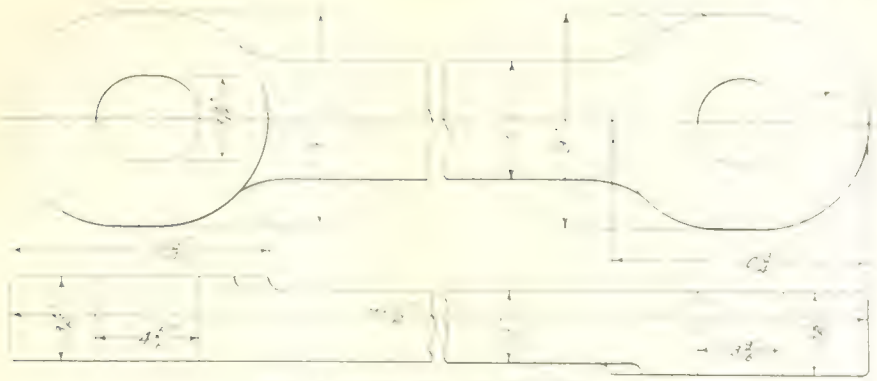


FIG. [illegible] TYPE K-50 DRAW BAR

by the expenditure of electricity at the rate of [illegible] kilowatt, or a cost of one cent per hour, when current at two cents per unit is obtainable. If the same tube were to be heated by gas the cost would be much greater, as in this case the products of combustion must escape at the temperature of the heated object, resulting in a considerable loss of heat. The superior economy of the electric furnace, however, disappears when the size is large enough to permit of internal gas heating. It is not possible to state definitely the maximum size to which an electrical furnace may be made economically, but the limit would probably be reached when the area of the heated furnace was about six feet square. The initial cost of the electric

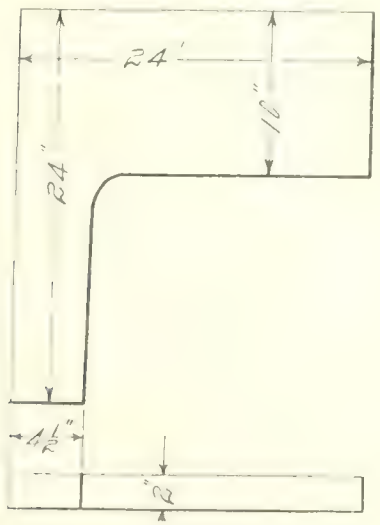



FIG. 5 INSIDE FRAME PATCH.

furnace does not differ greatly from that of a gas furnace of similar capacity, and the present popularity of the former is due to its convenience, cleanliness, and the ease with which temperatures may be exactly controlled by means of an external resistance.

A type of furnace is made with a silica or alundum tube wound with nichrom wire or ribbon and fitted at each end with a sheet of uralite. In order to prevent longitudinal movement, a second piece of uralite, provided with a hole equal in diameter to the inner part of the tube, is fastened to the first piece, and the structure is held together by four iron tie-rods, the two lower of which serve to connect the windings to terminals on the exterior. This heating element is placed in an iron case, lined with magnesia insulating bricks, and the airspace round the tube is then filled in with asbestos or powdered silica. Amongst the advantages of [illegible] of construction is the ease with which the furnace can be dissected when a new winding becomes necessary. The same construction may be applied to furnaces containing several wound tubes in the same case, suitable terminals being provided to enable each tube to be used separately if desired. For many purposes a muffle furnace is preferable to a tube, and may be fitted up in the same manner. Special forms are also made in which crucibles of metal may be melted. In all cases the winding, if not overheated, may be expected to last from 1,500 to 2,000 hours before burning out, although this period may be much shortened if there be any strain on the wire or strip. The sizes manufactured vary from 10 inches long and 1 inch in diameter to 3 feet by 6 inches in the case of tubes; and in muffles from 8 inches by 2½ inches to 14 inches by 7 inches by 5 inches, and when an efficient lagging is used the power consumption is remarkably low. Amongst the numerous commercial uses of these furnaces the following are worthy of notice:

Determination of carbon in steel by combustion. In this case the glass combustion tube is placed inside the furnace tube for heating, instead of using gas heating. When many samples are to be tested a four-tube furnace may be used to advantage.

For determining the critical points of steel or for testing the effect of heat treatment at definite temperatures on specimens of metals.

For checking pyrometer readings against a standard instrument, exact regulation of the temperature by an ex-

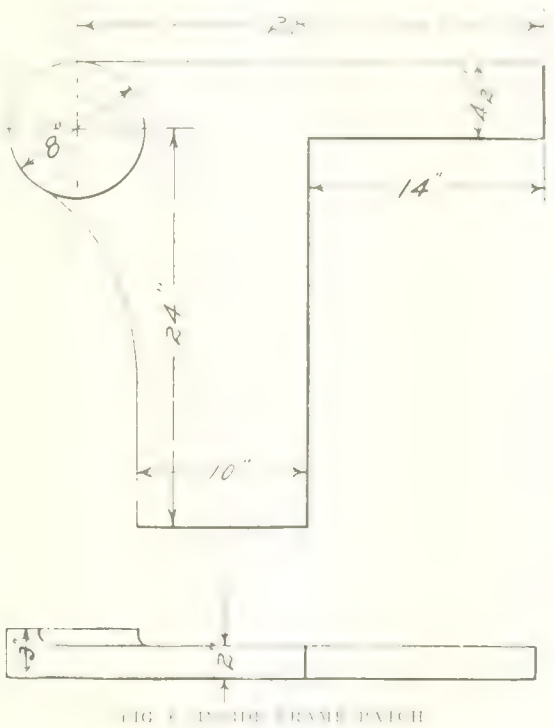



FIG. [illegible] INSIDE FRAME PATCH

FIG. [illegible] CYLINDER EQUALIZER

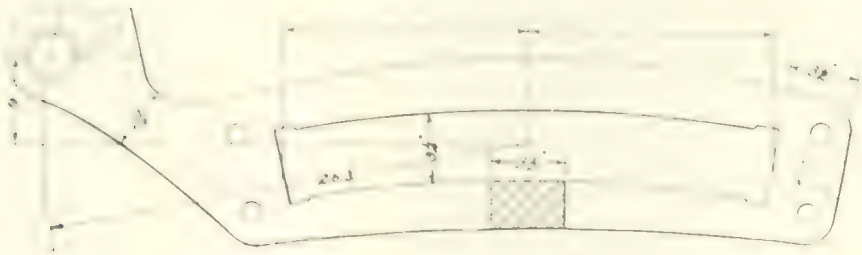


FIG. 8 LOCOMOTIVE SINK.

For general work of this last-mentioned character the muffle form is most convenient, and the clean atmosphere of the furnace together with the precision in temperature obtainable render the electric furnace more suitable for this work than other forms of heating. As an example of modern practice the method of hardening steel articles of a small size at the Packard Company's works at Detroit might be mentioned. A vertical tube furnace, about 2 feet long and of diameter to suit the articles under treatment is raised to the requisite temperature, as shown on the record of a pyrometer inserted amongst the articles. When the assigned temperature has been reached the lower end of the furnace is opened and the contents allowed to fall directly into an oil-bath. This method secures uniformity in result and is clean and economical; and the pyrometer records serve as a check on the work of the operator, besides assisting him in its duties. In British practice the value of the nichrom furnace for work of precision is rapidly being recognized, and under present conditions the demand is much greater than the supply. A satisfactory electric furnace of this type capable of yielding a temperature of 1400 deg. Cent. has yet to be produced.

Such a furnace would prove of great service, particularly in connection with high-speed steels, but at present there is nothing better than an alundum tube wound with platinum. In the hands of a skilled operator such a furnace may give good results, but there is always an element of uncertainty about a platinum winding, and burning out is of common occurrence. Tungsten and molybdenum have been used for special laboratory work, but as these metals oxidize readily provision must be made to maintain an atmosphere of hydrogen round the winding. For special work, graphite or hard carbon tubes may be used through which the current is passed directly, but these also oxidize and could not be used for the heating of steel articles owing to the possibility of chemical action. Refractory tubes, surrounded by granular carbon through which the current passes, have been used for some purposes, but a furnace of this probable that for industrial work of the nature described gas furnaces will still hold the field about 1000 deg. Cent.

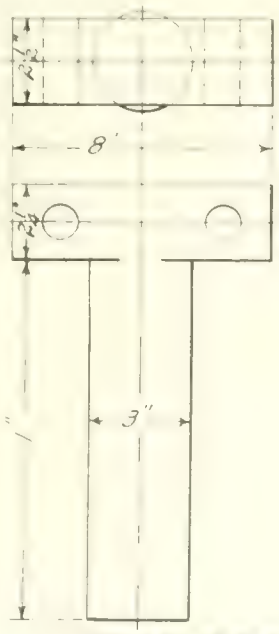



FIG. 9 T-HEAD DRAW BAR

## BRITISH INDUSTRIAL COMMISSION

By Mark Meredith.

The official statement that 267 public commissions and committees to deal with questions arising out of the war have been set up in the British Isles since 1914 indicates to some extent the revolution that the administrative system is undergoing. In itself the practice of administration by committee may be good or bad. It may merely mean gratuitous interference with the work of competent officials; it may mean the effective mobilization of expert knowledge in the service of the State. Of the 267 committees appointed some no doubt have had one effect and some the other, but there is little question that on balance the advantages of the system so extensively adopted have outweighed the evils. Most of the committees are the meeting grounds of the expert, the official and labor, and as such command a confidence which administration by a bureaucracy, however efficient, ca nrarely inspire. Many of them will no doubt cease to be as the particular need they were designed to meet disappears. Some thirty, indeed, have already ceased to exist; but many of them have established a permanent place in the new scheme of things which the war has created and which must outlive the war. But the future of the committee is a comparatively trivial matter compared with the future of the larger machinery of which they form a part.

The great industries of the British Isles—food production, munition, shipping, railways, mines—are to-day in greater degree or less directly controlled by the State and exist only to serve the purposes of the State. The new predominance of public over private interest is an essential in time of war, and few of those who have experienced its benefits will be anxious to revert to the old conditions when peace returns. Changes in the structure of industry may take more shapes than one, and there is no lack in the field of competing doctrines and their prophets. For months, or probably years, after the war, the situation will be largely governed by the necessity for the State control of raw materials, a control that manufacturers and consumers may become increasingly less inclined to abandon. From that path to a system of nationalized production and co-operative distribution is short. That is not a matter to be decided hastily. But decided it must be as a matter of national policy, and it should be now engaging the thoughts of the best brains who are concerned with these problems.

ANTIMONY is extensively employed in the manufacture of ammunition. It is used in the making of chilled shot as well as for most bullet mixtures. Its chief purpose is as a hardening agent. In shrapnel bullets lead is required to give the necessary weight, and antimony is added to make the bullets sufficiently hard to withstand the shock caused by the explosion of the shell. The amount of antimony is from 12 to 25 per cent.

THE Government of Mysore has decided to erect a charcoal blast furnace, according to a recent paper by Mr. H. M. Surtees Tuckwell, and has appointed Mr. Perin as its consulting engineer. He has placed orders for the equipment in America, and the undertaking is to be managed by the Tata Iron and Steel Company. It is proposed to fell and transport timber from the vast forests of Kadur and Shimoga, and convert it into charcoal at Benkipur. Iron ore will be mined at a distance of twenty-five miles, and a high-grade charcoal iron produced. It is also intended that acetate of lime, alcohol and other by-products shall be extracted, and calcium carbide may be manufactured, using the breeze or such portions of the charcoal as cannot be used in the blast-furnace. The plant will be constructed and run by the Tata Iron and Steel Company.

# MANUFACTURE OF THE No. 101 PERCUSSION FUSE

*That the Russell Motor Car Company of Toronto has been largely engaged in munitions manufacture is common knowledge to thousands of people acquainted with the ... thousand employees, or others engaged in trade with the company. The interest of the ... and the varied extent of operations has been such that the directors considered some permanent record desirable, and an official publication "Our Achievement," was accordingly prepared and dedicated to the men and women of the Second Line of Offence. The following article is one of several contained therein, and is reprinted by permission of the company. Illustrations are by courtesy of Southam Press Limited, Toronto.*

THE No. 101 fuse is percussion only, and hence its construction is simpler and it contains fewer parts than the No. 80. The body, cap and adapter—it has no rings—are made of bar steel, and the firing elements of brass. Its operation is as follows: When the shell is fired its forward force causes the detent spring to compress and the detent and detent socket to drop into the detent hole, and catch there. This action frees the centrifugal bolt which is thrown against the centrifugal bolt plug by the rotation of the shell, thus unlocking the percussion, or graze pellet. Hence during the remainder of the flight the pellet is held away from the needle by the creep spring alone. At contact the creep spring is compressed and the burst follows.

### Material

The steel for the body is received in the form of bars 8 feet in length and 2 13/32 inches in diameter. In the manufacture of the 4,500,000 No. 101 fuses by the company over four hundred and twenty-five miles of bar steel were used.

Men do the first operation on the bodies. The steel bars, four at a time, are machined in a multiple spindle automatic screw machine. These rough shape the body, drill the pellet hole and cut the body off to the proper length, a set of operations taking 70 seconds.

After machining, the bodies are washed and inspected, and the burr caused by the boring of the pellet hole is removed by a hand operation. The second machining operation, done by women, on single spindle automatics, is reaming the graze pellet hole and facing the seating surface for the cap. This machine finishes the work on the pellet hole with the exception of cutting the thread for the cap. Time, 50 seconds.

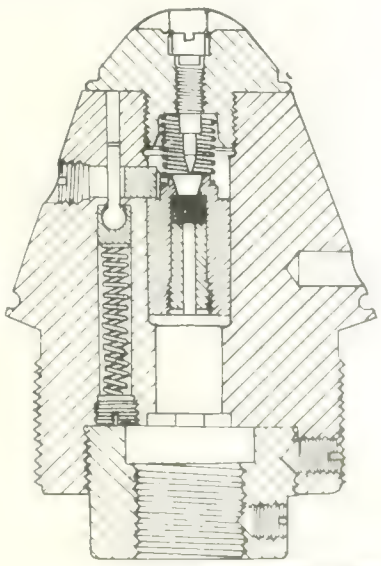
At the completion of the work on the pellet hole the body passes to a battery of turret lathes where the outside tapering surface undergoes three finishing operations. These lathes cut the groove at the base of the taper, shave the surface to absolute size, and cut the knurl. The twenty lathes working on this job have a combined capacity of 35 a minute. The tapping of the thread for the cap, which is a six-second job, finishes the stem end of the body.

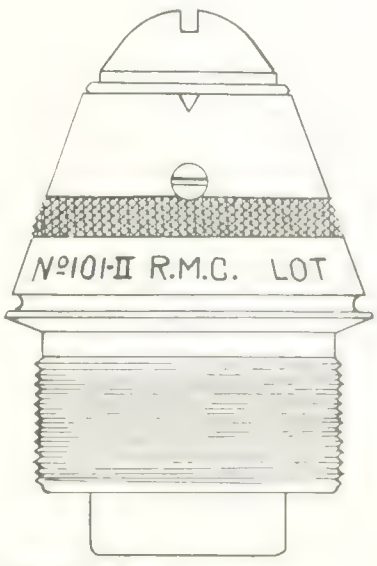
### Drilling Operations

At this point the drilling commences. These operations cover the detent socket hole; the detent hole, a smaller sized extension of the first; the centrifugal bolt hole; a wrench hole, which is used when the fuse is screwed into the shell; and a set screw hole. The drilling of the detent hole is a very delicate operation; until the present method used in the company's shops was devised the results were often unsatisfactory. The difficulty arose from the fact that the detent hole—very narrow and long in proportion—had to be drilled absolutely straight in order for the detent to function properly. After considerable experimentation it was found that the only certain way to drill this hole straight was to use three drills to go a distance of ¾ inch. These operations, shown in the illustration, are similar except for the section of the hole drilled. These drilling and tapping operations teake 6 to 12 seconds each, giving a total time of 2½ minutes a fuse.

There are twenty-one machines doing this work, each with a capacity of three every two minutes.

After the drilling operations a complete shop inspection is made in this department. As in the case of the No. 80





BURRING AND FINISHING BODIES BEFORE PLATING

fuse, there are inspectors overseeing every operation as it is finished. This inspection is carried on the same way as that of the time fuse; and "go" "no go" gauges are used in addition to a visual inspection.

### Thread Milling

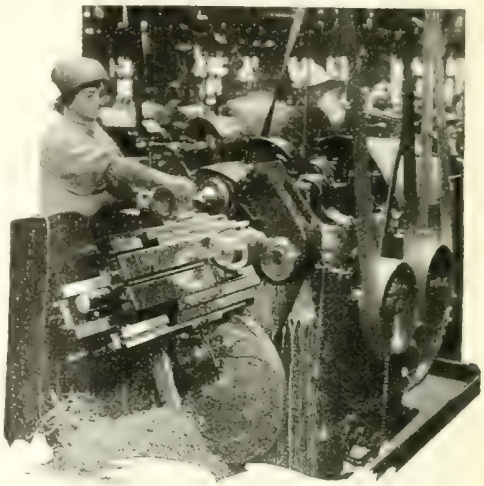
One illustration shows the thread milling operations carried on in this department. These thread millers cut off the thread on the outside of the fuse body which fits into the nose of the shell. The method is similar to that used in thread milling the nose and base of the 9.2 shell. The milling of the outside thread takes 50 seconds and of the inside, which is the same sort of a process, 45 seconds. There are fifty women on each shift employed on these two operations.

Every fuse is stamped with its number, lot, and the initials of the company which made it. The machine stamps everything except the lot, which is determined and stamped on later. Three operators are required to handle this stamping machine, one to feed, one to handle, and one to unload. The skilled workers on this machine are a fine sample of scientific teamwork, and are able to average 1800 every eight hours on each machine with little or no difficulty.

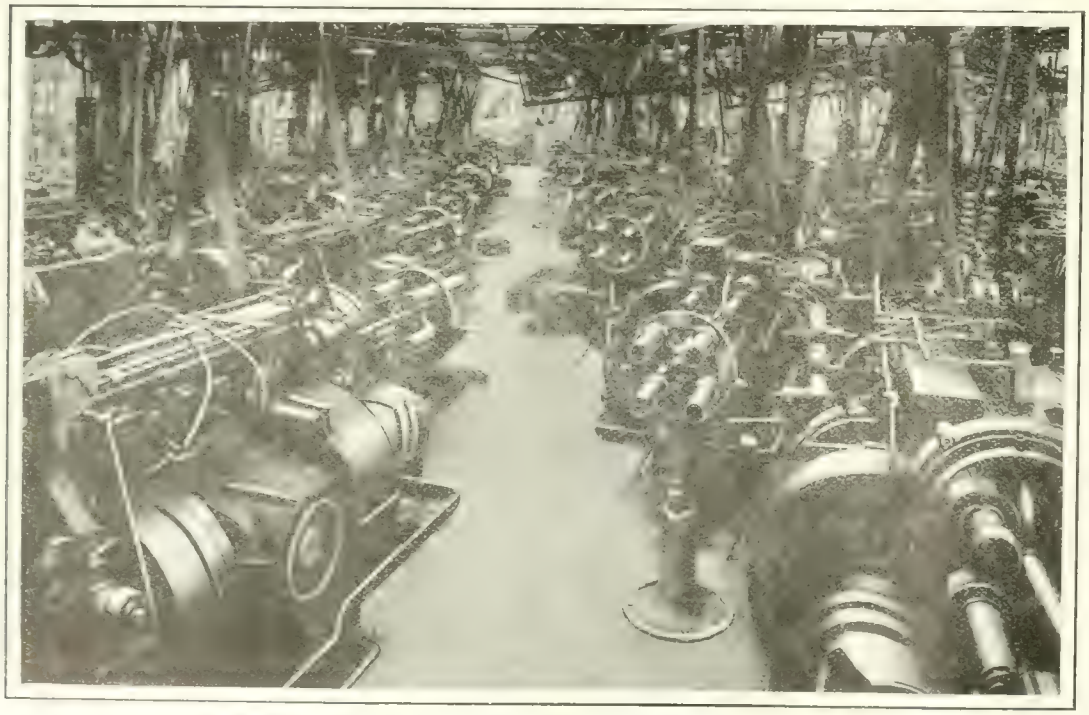
Following the stamping, a large department of finishers take the product in hand and carefully go over it for imperfections. This is the final operation before the plating, and hence the last opportunity for the inevitable inspectors to look for trouble. In this instance the trouble takes mostly the form of rough edges thrown up by the machines, and these are all burred and finished off here.

### Electroplating

As the bodies arrive in the electroplating room they are mechanically perfect, but questionable from the standpoint of cleanliness, due to their passage from oil hands, through oily machines, to other oily hands, to have a "go" in another oily machine. And off this oil must come, and off it does come, for in the company's plant they have very ingenious chemists, who change the oil to soap, and thus make the fuses wash themselves. After they have thus washed off the oil by changing it to soap, they wash off the soap with acid, and then the acid with water.



MACHINING GRAZE AND PELLET HOLES



GENERAL VIEW OF MACHINES FOR BODY MAKING

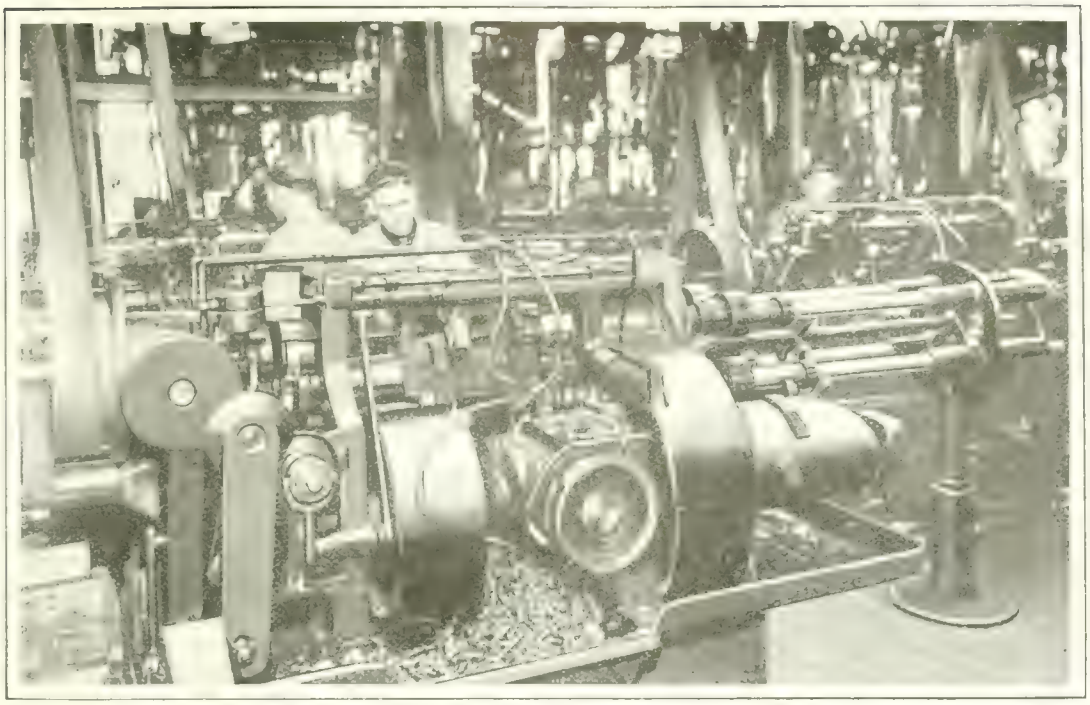
The plating itself consists of hanging racks of fuses in a cyanide of copper solution until sufficient copper is deposited to coast the surface thoroughly. Then they are washed again, first in hot water, then in cold water, then in chemicals, and finally the whole business is blown off clean with an air blast; 26 000 fuses are so cared for each day, as well as nearly 90,000 screws and needles.

One of the noteworthy things about the electroplating establishment is

the manner in which the workmen are protected from the fumes of cyanide. This method, forehanded, like most of the company's methods, instead of drawing off the fumes after they reach air, draws them away as soon as they reach the surface of the solution, so that they never get into the air at all.

### The Adapter

A coupling-pin carries no freight, yet there are few indeed, if any, would disparage its usefulness in the make-up of a freight train. The adapter, the manufacture of which is shown in the two illustrations accompanying, is another one of these bits of apparatus which are more useful for what they get others to do than for what they do themselves.



MACHINING BODIES ON MULTIPLE SPINDLE AUTOMATIC SCREW MACHINES

The purpose of the adapter is to carry the flash which is brought about by so much skill and hard work in the fuse down into the charge in the shell where it causes the explosion. To some extent the work on the adapter, which with the exception of the first operation, is carried on by women, is similar to that on the fuse body.

For the first process, a one and three-quarter inch multiple spindle Gridley automatic forms, drills, reams, bores and counter-bores and then cuts the adapter from the steel rod. This machine operates at the rate of 70 adapters an hour.

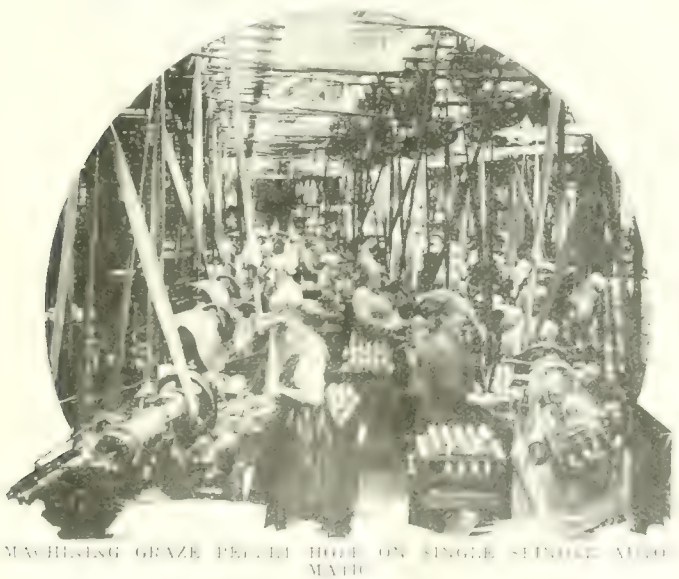
In the facing process the women operators can turn out 3,500 adapters a day. They face the adapter to length and chamfer the bevel on the gaine end of the hole. The remaining operations on the adapter are threading the inside, drilling and tapping the set screw hole, and drilling wrench hole. The illustration above shows the tapping of the inside or gaine hole thread of the adapter. This tap is put on at the rate of one every twenty seconds. A later process re-taps and trues this thread.

### The Cap

The cap, or nose, of the fuse contains the needle which causes the detonation of the charge in the graze pellet. The rough machining and the cutting of the outside thread are done on an Acme automatic multiple spindle machine, with a capacity of 1,400 per twenty-four hour day. Subsequent operations finish form the head and drill and counter-bore the needle hole, a semi-automatic hand screw machine being used; mill the screw driver slot in the head, tap a thread for the needle and burr.

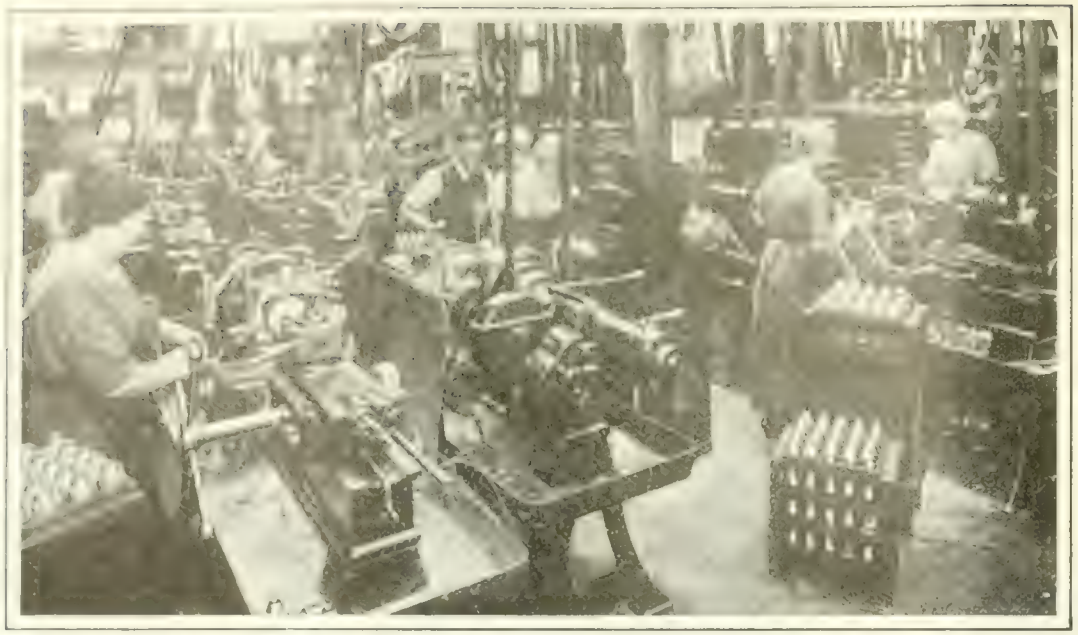
The screw driver slot is milled on a hand feed machine at the rate of approximately 600 per hour. By far the most important operation on the cap is the assembling of the needle. A specially designed semi-automatic is used in this work, and great care is taken that the needle, which is not only threaded into the cap, but permanently affixed with cement, is screwed down firmly and to the proper distance. Its length is gauged from the face of the cap to the end of the needle and only .02 inch is allowed for variation in this measurement.

On the machines shown above are made the numerous small parts that make up the firing elements of the fuses. The automatics on these processes work with as near human intelligence as it is possible for machinery to have. About all that they seem to require is an occa-



MACHINING GRAZE PELLET HOLE ON SINGLE SPINDLE AUTOMATIC

DRILLING CENTRE SOCKET HOLE



GENERAL VIEW SHAVING GROOVIN[illegible] AND KNURLING END OF BODY

sional feeding with another rod or two of brass. Beyond that they work alone. Some of them will do as many as seven or eight different operations. A certain thread is to be tapped, requiring perhaps two seconds. An amusing steel finger jumps into position with a dignified little jerk; it has finished the thread and jumps out of position with an equally dignified little jerk. Two seconds exactly. Another finger, just as prim and methodical, takes its place. This one may mill a slot or ream a drill hole, or machine a tiny surface. Its time allowance may only be five seconds, or perhaps as many as forty. In either case it does its work and goes on its way, while the rest wait patiently their proper turn. And as each unit is finished an uncanny metallic arm reaches down and removes it. Plenty of oil they require, and plenty of material—but of human attention or interference they are more independent than a cat. The automatic shown in the above picture is making graze pellets. It does seven different jobs on each pellet, in fact finishing the pellet except for cutting a slot in the base end, and turns out [illegible] a day.

DRILLING CENTRIFUGAL BOLT HOLE.

### Assembling Detent and Socket

The detent and detent socket are assembled by means of a ball and socket joint — an arrangement which allows the detent to move about freely and thus to catch in the detent socket hole as the spring is compressed. Two girls operate the assembling machine [illegible] press indexing die. One feeds the socket, the other operates the machine with her foot and feeds the detent. They can turn out eight to nine thousand a shift.

The remaining small parts that make up the detent section of the fuse are all assembled by hand, the centrifugal bolt plug, the detent, detent spring, and detent plug screw. The girls working on this can assemble about two hundred fuses per hour. The exact significance of this figure can better be appreciated after you have tried to do the same thing, your temper and your thumb nail in so doing.

### Packing Fuses for Shipment

On account of the long journey the fuses have to make and the hard knocks they are apt to receive before they get where they can give a few themselves, it is necessary that each one be packed in a [illegible] ying room where approximately 25,000 fuses are packed and shipped every day, houses one of the busiest departments of the company's organization.

### FACTORY HYGIENE

By M. L.

It is not possible with any degree of exactness to calculate the influence that hygienic conditions exercise on output. That they have a great influence is generally acknowledged and there is a growing consciousness that the hours of labor and the rate of wages paid are not the only factors that determine the amount of production. More things than food and rest are necessary to make the worker physically healthy, and unless he is healthy in body his thinking capacity will be diminished, and he will be a less valuable asset to his employer than he ought to be. The amount of lost time is usually attributable, in a lesser or greater degree, to the effect of working in a germ-laden atmosphere,

[illegible]G THREAD ON OUTSIDE OF BODY.

and it is to the mutual benefit of both master and man if the factory is wholesome.

It is obviously unfair, as is sometimes done, to blame the factory owner altogether for the conditions of the shop. The workman must share the blame. Mose men are dual personalities. It is a curious psychological fact that men spend about equal time at work and at home, yet, except in rare cases, the habits of the one life do not influence the other. The customs that are considered common decency at home are not observed in the works. The laws of cleanliness are neglected. Workmen expectorate freely on the shop floor or wherever is most convenient, tea dregs are thrown about, oil is spilt carelessly, and dirt of all kinds is left lying about the machine or bench. Of course, the habits of the men are influenced to a

considerable extent by the conditions for which the employer is responsible.

A new factory may be always healthier than an old one, and a great many works want rebuilding, but a clean old building is preferable to a dirty new one. If floors are not swept daily, or several times a day, depending upon the operations performed, it seems futile to be careful of them. There is always a greater inducement to be clean in a parlor than a stable. A great deal depends upon shop discipline. It is a fact that many foremen are so much interested in the skilled workers' efforts that they have not the time to look after the laborers. The laborers are thus allowed to have a free hand and it appears to be human that, unless a man is subject to supervision, he gets lazy. Dust is allowed to accumulate in corners and girders for a twelvemonth. The annual shop-cleaning is [illegible] a custom-

SCRAPING DAY AND NUMBER ON THE JOB

ary affair, but in some cases the dust and filth of all kinds are allowed to lie for years. It is admittedly difficult in machine shops with continually revolving shafts to clean in working hours. Some provision ought, however, to be made for having it done after ordinary

many shops the windows get literally blocked up with dirt, and are never opened either in summer or winter. The work is carried on in a nauseous, un-

close of the day there is a general state of fatigue and work slackens. Good ventilation is necessary to big output.

Many workmen do not leave the shop even during meal hours. They sit on dirty benches or on machine tables and eat their meals. It is quite a common

round a smithy fire, or in a foundry [illegible] drinking black tea out of still blacker cans. Even when dining halls are provided they are not universally used. One cause of this is probably that there is not the same privacy sitting at a long table in a crowded dining hall; but the chief cause, perhaps, is that the workman cannot be bothered with going out of his shop. It is an attitude of mind based on habit and not easily broken. The majority of people are conservative at heart, and do not like to be deprived of what they have [illegible] rights and not privileges. The only way to get workmen into the dining hall habit is to close the shops during meal hours. It would [illegible] employers to have dining rooms, where the workers could either have meals at a nominal price or have their own food cooked. It is a pity that some workmen so often spoil a beneficent employer's endeavors by loitering, and in other ways slacking. In many indutsries wash-

[illegible]

law, and drinking fountains as well, and employers generally would, no doubt, provide better facilities for washing and dressing if it were not for the precautions they find it necessary to take against the unprincipled workmen. These are not in the majority, however, and the man and the master ought to recognize a mutual interest in raising the level of the factory to that of the home.

## TRADE INQUIRIES

THE following inquiries have been received by the Department of Trade and Commerce, Ottawa. Further particulars may be obtained from the Inquiries Branch of the Department:

420. **Machinery and engineers' supplies.**—A South African importing and commission house, specializing in machinery and engineers' supplies, asks for catalogues and full details from Canadian manufacturers of sugar cane trucks, mining, electrical, manufacturing, agricultural and general machinery, technical appliances, lock nuts, tube cleaners, rotary pumps, railway supplies, including rails, track points and crossings, acetylene hand lamps, lathes, drilling machines, machine tools tractors, packings, lubricating oils, and other specialties in connection with the engineering trade.

[illegible]

catalogues and latest [illegible]

general machinery, mining machinery, pumps concrete silo pattern, agricultural [illegible]

other lines suitable for [illegible]

[illegible]

A Durban firm of merchants desires samples when possible, catalogues and price lists on all classes of goods

GENERAL VIEW [illegible]

## THE NEW 320 MM. FRENCH SHELL

By Frank C. Perkins.

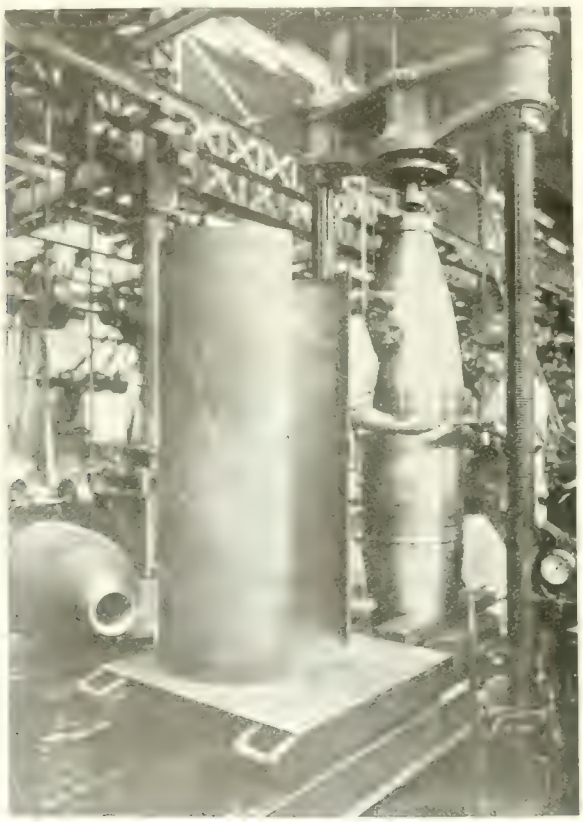
[illegible] at the [illegible] in the works of Schneider & Co. of Le Creusot, France, some of the plants of this steel company being located at Le Havre, Harfleur, and others at Chalon, France. Enormous hydraulic presses ranging up to and more than 1,000 tons are used in producing the [illegible] shells by hundreds of cranes of various sizes, the machining and the tempering equipment and the finishing of the shells and testing them after their completion, are all of the greatest interest. The specification requirements of munition material are very exacting. In France, Great Britain, Canada and the United States, there has been very great appreciation of the benefits to be derived from proper heat treatment of metals going into these shells.

The specifications of the large and [illegible] ridge cases, fuses and pellets are such that very careful tests have to be made of the raw materials and the finished product by the most powerful, as well as the most delicate instruments.

If the brass cartridge cases vary much in the zinc content from 70 copper, 30 zinc, difficulties will be experienced in manufacture and the product will not permit of being loaded three times as specified. The French military specifications considered uniformity so important that they went so far as to specify where the spelter and copper should come from. The reason for this is doubtless the fact that the analysis must be corrected to give a minimum of scrap during manufacture.

TURNING 320 MM. SHELLS IN THE PLANT OF SCHNEIDER ET CIE. FRANCE

The great loads to which this material is put during manufacture under 500 and 800-ton presses, for indenting and heading, necessitates punches made of the best of steel, capable of withstanding approximately 160,000 pounds per square inch. Carbon steel of about 1.25 per cent. carbon was used for the first two sections, as the punches were built up of water quenched sections, heating to 1475 deg. F. and drawing at 430 deg. F. The remaining portion of punches was .90 to .95 per cent. carbon steel.



[illegible] AT THE CREUSOT WORKS OF SCHNEIDER ET CIE., FRANCE.

In determining the capacity of presses required, crushers of brass were made and tested on a Riehle 100-ton testing machine, and from these results the power of presses required was calculated. The pressures required for the operations of cupping and drawing was found to be about 1,500 to 40,000 pounds and 20,000 pounds, while the pressure for stripping after first operation, second operation, and stripping after heading was 3,000 pounds, 11,000 pounds and 16,000 pounds respectively. Scleroscope tests are made from day to day on the material, and the results compared with analyses, and only the raw material which comes within the scleroscope hardness desired are accepted, the others being rejected.

The effect of annealing which is done at 1,200 deg. F. for 30 minutes is remarkable, the hardness increasing as the thickness of the metal decreases.

The specifications for shell steel have close limits. It is possible to use steel of high tensile strength but having good elongation, getting the physical properties by heat treatment. If the steel is hard and brittle, when the shell bursts the pieces break into many small parts, whereas, if the steel is tough, the pieces are larger and the edges are rougher, tending to tear instead of cut, thereby doing more damage.

Attention is called to the fact that the shrapnel shell, while opposing the bursting charge due to its own inertia and being subjected to compressive stress, is also subject to tensile stress, due to the shrapnel bullets inside. In order that these bullets may be thrown forward the shell is designed with a thick wall at the base and this wall gradually tapers off to a thin point near the socket in nose. When the fuse explodes the charge, this thin wall bursts or spreads open, or the fuse threads are stripped. In case the steel is too hard the shock of the explosion in the cartridge case will cause fracture with damage to the gun, and if the cartridge case is too hard, due to excessive zinc, permanent deformation will cause it to stick in the gun and prohibit its use over again after being refilled.

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**Have Taken Agency.**—Charles P. Archibald & Co., of Montreal, have obtained the Ontario and Quebec agency for the Holyoke Truck Company, of Holyoke, Mass.

# Notes on the Design and Testing of Air Lift Pumps-II.

By A. W. Purchas*

*The air-lift pump has become one of the most economical methods of raising water, the simplicity of construction and the almost entire absence of moving parts giving reliability in operation and avoiding the necessity for skilled supervision. The design of these pumps being subject to more or less development the subject matter of the following article is of more than passing interest.*

### Operation of the Pump as a Whole

THERE are different methods of approaching this question, one of which was given by Dr. H. Lorens. This takes account of friction and slip, but starts off with a "constant" which the tests of Messrs. Davis and Weidner showed to be as variable as any quantity can be. This theory is not reproduced here as it is cumbersome, and does not bring out the features of operation of the pump.

Another method of approaching the subject brings out better than either of the foregoing the details of operation of the process, and may be called the Displacement Theory. Fig. 7 represents the pump prior to the injection of any air. Since the base of the eduction-pipe is open, the pressures on both sides of the horizontal plane X—X are equal, and the liquid stands at the same height inside the pipe as outside.

Fig. 8 represents the conditions after a single bubble of air has been injected. The weight of this bubble of air is negligible when compared with an equal volume of liquid, and the bottom of the eduction-pipe being open the pressure on the two sides of the plane X—X will remain balanced; therefore there must remain in the eduction-pipe after the injection of the air the same volume of liquid as before. The liquid displaced by the air must therefore move upwards, raising the surface of the liquid inside the eduction-pipe above that outside.

Let H be the amount of the rise.

V be the volume of the air bubble,

and A be the cross-sectional area of the eduction-pipe. Then

$$H = \frac{V}{A}$$

The injection of the volume V of air has done work equal to ½VH due to displacement alone, but the bubble will rise through the column of liquid, expanding as it does so and thereby increasing H. Neglecting friction, none of the energy originally contained in the air-bubble is lost until the bubble breaks the surface of the liquid and escapes into the atmosphere. When the air has finally escaped, then it may be said that the energy has been wasted in slip; but not before.

Supposing the air to be injected into the eduction-pipe at such rate that before the first bubble escapes to the atmosphere the total volume accumulated in the eduction-pipe, say $V^t$ is such that the head $\frac{V}{A}$ is greater than the lift L.

Then the pump will discharge a volume of liquid equal to A (H—L). This is the volume that is violently discharged when an air-lift pump is started up. The loss of this volume from the eduction-pipe produces an unbalanced head, equal to H—L, on the plane X—X, which will force more water into the base of the pump. From this point onwards the operation of the pump may be regarded as a head H—L forcing liquid into that area of the eduction-pipe, which is not already filled with air. Analysis of the published results of tests seems to show that the great loss in the pump is not by slip, but of this head H—L due to entry losses.

Tests yielding high efficiency always show either one or both of the following features: low velocity of the rising mixture through the foot-piece, or else a low ratio by volume of air to liquid at this point which is the result of great submersion. The effects of great relative submersion may, however, be offset in many existing wells by the relative high velocities of the mixture leaving the eduction-pipe with consequent high friction losses. All of which suggests that the eduction-pipe should be of as great cross-sectional area as the well permits from its base to at least the level from which the liquid is being raised. The loss by slip of this length is negligible, as we have seen, and the larger the pipe the less will be the loss of the head H—L. Above this point, however, the velocity of the rising mixture must lie between certain definite limits, otherwise the loss by slip will be excessive; therefore the area of the eduction-pipe must bear a definite ratio to the volume of mixture flowing through it. What this ratio should be cannot definitely be stated on the data at present available, but it is hoped that the ideas here put forward may lead to more thorough tests being made of pumps in the future, and the publication of the results.

If the velocity with which the air-bubbles will rise through the liquid can be calculated, then the total volume of air in the eduction-pipe at any instant of time can be found from the known rate of ejection. If this volume produces a head less than the lift, then with the submergence fixed, a greater rate of air-supply must be used for the pump to deliver any liquid. If the rate of air-supply is fixed, then a greater submergence must be provided, in which sufficient air can accumulate to produce the necessary head. A definite volume of air must be accumulated below the water surface inside the eduction-pipe for the pump to work at all.

At the other extreme it is conceivable that the air could be injected at such high rate as to entirely hold back all liquid from entering the base of the eduction-pipe, once the original contents were discharged. Such a state could hardly be obtained in any pump installation, but probably could be brought about with a 2-inch eduction-pipe, 12-inch air-pipe, and high rate of air supply. Experiments bear out these statements, for a series of tests on a pump at increasing rates of air supply show that below a certain rate there is no discharge. Above this point the discharge of liquid increases with the rate of air supply, and then begins to grow less as the rate of air supply is still further increased, Figs. 9, 10, 11.

This Displacement Theory also shows that the volume of air required to raise a given quantity of liquid is independent of the density of the liquid, if we neglect losses from friction and slip. However, the pressure equivalent to the required submersion, and therefore the energy contained in the air injected, varies as the density of the liquid.

### Submersion of the Air Injection Foot-Piece

There is no rational formula known that will determine the most efficient value for the submersion, and only a few published tests touch on the point. Messrs. Davis and Weidner made many small scale laboratory tests which are very inconclusive. Mr. Edmund Ivens also records some tests on a large scale in his book, "Pumping by Compresed Air."

The Displacement Theory, already outlined, shows that the submerged portion of the eduction-pipe is primarily necessary as an accumulator for the air. As will be seen later (pages 25 and 26), there is no such thing as a definite volume of air required to raise a given quantity of liquid to a given height, as the volume of air varies according to the submersion adopted. This conception of an accumulator for the air suggests that greater proportionate submersion is required for low lifts than for high, and that rather than bear a fixed ratio to the lift, the most efficient value will bear a definite relation to the rate of air supply and cross-sectional area of the eduction-pipe.

Current practice favors greater ra-

*Read before the Institute of Electrical Engineers, November, 1917.

as the percentage of submergence increases for all rates of input, and all practical percentages of submersion." It seems quite possible that a rational formula for determining the most efficient submergence may in time be developed from the Displacement Theory.

A Method of Designing Air-Lift Pumps

The writer has taken the data which the larger manufacturers have accumulated, the following method is suggested:

Let L be the lift in feet.

S be the submersion in feet.

$V^w$ be the volume of water to be pumped per minute in cubic feet.

$V^a$ be the volume of air required per minute measured at atmospheric pressure and a temperature equal to that of the water to be pumped.

$P^a$ be the absolute pressure per square inch of the atmosphere.

$P^s$ be the absolute pressure per square inch of the air under the submersion head S.

Then the energy supplied by the air to the water is:

$$144\ P^a\ V^a \log \frac{P^s}{P^a} \text{ foot-pounds,}$$

and the work done on the water is 62.5 $V^w$L foot-pounds.

Then, if the efficiency of the pump were 100 per cent., these two quantities would be equal. In order to apply this method, two assumptions must now be made, namely, the submersion and the efficiency of the pump.

Submersion.—A guide to the probable best value for this has been given already, and these values may be taken, though it will be seen later that they may need modification as the design proceeds.

Assuming these values, then—

$$P^s = P^a + 0.434\ S.$$

Efficiency of the Pump.—This at first seems a very rash assumption, but it is the author's belief that a careful study of this and other papers will show that it is not so. The following test figures stand out as the best so far reported, and analysis of other published tests shows no reason why they cannot always

(1) With the reverse process of compressing air by entanglement with falling water, an efficiency of 81 per cent. has been obtained in Germany, and 71 per cent. at the plant of the Dominion Cotton Mills Co. at Magog, P.Q., Canada. This latter plant was the first installation designed on this principle.

(2) Series D of tests at Oilfields show that an efficiency of 72 per cent. can be obtained with an air-lift pump on lifts of 300 feet, and an analysis of other published tests suggests that in each case higher efficiencies could have been obtained at other rates of working, or by modification of the designs along the lines already outlined. Furthermore, most writers on the subject have in the past conceded that higher efficiencies are obtainable on low lifts than on high lifts.

There is good ground, therefore, for assuming an efficiency of 70 per cent. for all lifts up to 300 feet. This may not be obtained with the first eduction-pipe installed, but in the majority of cases the first eduction-pipe is not the final one, but is installed to find the service pumping level and the capacity of the well. A series of tests made on the first pipe at varying rates of pumping should enable the above efficiency to be obtained with the final one.

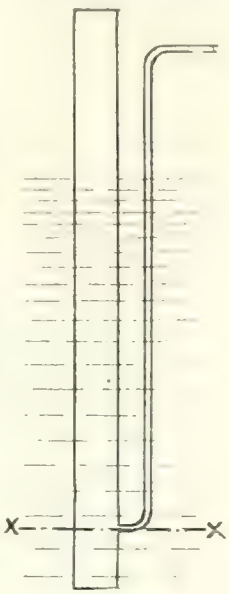


FIG. 7

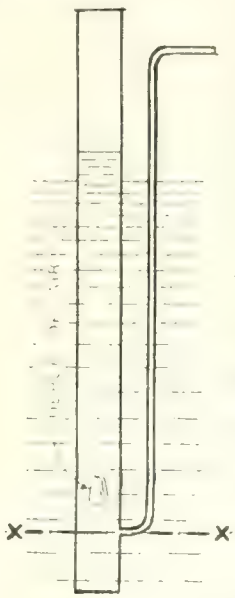


FIG. 8

These two assumptions being made, the volume of air and its initial pressure can be found from the formula:

$$0.7 \times 144\ P^a\ V^a \log \frac{P^s}{P^a} = 62.5\ V^w L.$$

It must be borne in mind that the above volume of air is not the same as the displacement of the compressor-piston. It is usually wise to have a reserve capacity in the compressor to cover such factors as encrusted eduction-pipe, a demand for greater output of water, and wear of the compressor itself. The manufacturers should therefore be given the fullest details, since the power required to deliver any volume of air varies very widely with the speed of the compressor, and the ratio of the desired output to the full capacity of the machine. It may be noted here that high volumetric efficiency alone is not the desirable feature of a compressor, nor high mechanical efficiency alone, but the highest combination of the two. The best machine is that which will deliver the required volume of air at the given pressure with the least expenditure of energy in the prime mover. Some of the latest designs of air-valves obtainable do not promise high volumetric efficiencies, but they conduce to high over-all efficiency.

Reference to the tests in the tables will show that 40 per cent. of the energy generated by the prime mover may be wasted in the compressor itself, and therefore that as much attention should be paid to the choice of the air-compressor as to the design of the eduction-pipe and foot-piece.

Having finally determined the best value for the air-pressure, submersion and volume of air required, the air piping, foot-piece and eduction-pipe can be designed. In proportioning the air-pipe, allowance should be made for the temperature of the air leaving the compressor being high, and the volume therefore greater than would otherwise be the case. After making this allowance, the velocity of the air in the pipes should not be over 20 feet per second. The design of a foot-piece has already been discussed, and will not be repeated here, neither the design of an eduction-pipe along the lines suggested by the Displacement Theory. But to enable others to reproduce the design, of which series D of tests in the tables show the capabilities, the original calculations for this pump are here given:

**Assumptions and Conditions Based on Previous Tests of the Same Well**

Volume water to be raised per second. 0.50 cb. ft.
Volume of air measured at atmospheric pressure and 70° F. required per sec. 3.30 cb. ft.
Lift ..... 300 ft.
Total length of eduction pipe..... 625 ft.
Velocity of rising mixture to be maintained, between .... .... 8 and 15 ft. per sec.
Air pipe to be kept outside eduction pipe.

Available pipe of suitable dimensions:

| Nominal Size | Actual I.D. | Cross-Sect. Area |
|---|---|---|
| | inches | sq. ft. |
| 4-inch line pipe ..... | 4 | 0.087 |
| 5 " 16-inch casing ..... | 5 | 0.136 |
| 6¾-inch casing ..... | 6¼ | 0.210 |

**Calculations**

Pressure of air on leaving foot-piece —141 lb. gauge—3.30 cub. ft. of air at atmospheric pressure, and 70° F., will be 0.308 cub. ft. at 141 lb. per sq. in. gauge pressure, and 70° F.

The increase in volume of the air is 3.30-0.308 cub. ft. in a length of 625 ft. of eduction pipe, equivalent to 0.0048 cub. ft. per foot-length of pipe.

For a velocity of 15 ft. per second in 4-inch pipe, the volume flowing must be 1.305 cub. ft., which in this particular case will consist of 0.5 cub. ft. of water and 0.305 cub. ft. of air. If L be the feet of 4-inch pipe required between the foot-piece and its junction with the next larger size, then:

$$0.805 = 0.308 + 0.0048\ L,$$

whence $L = 103$ feet.

In the next proposed size—5 3-16-inch casing—a velocity of 15 feet per second will require a volume of 2.10 cub. ft., which will be composed of 0.5 cub. ft.

of water, and 1.60 cub. ft. of air. Calling the required length of 4-inch and 5 3-16 inch pipe combined $L_1$, then:

$$1.60 = 0.308 + 0.0048\ L_1,$$

whence $L_1 = 270$ feet,

and the length of 5 3-16-inch required is 167 feet.

At bottom of 6⅝-inch pipe ..... 10.0

Among the more important conclusions to be drawn, which have not been previously emphasized, are the following:

(1) The apparent lack of agreement of different tests with any definite laws is due to two main causes: one, that the volume of air stated to have been used is too often the displacement of compressor-piston, or too high a percentage of this, which introduces an error of 10 to 60 per cent.; the other is the lack of segregation of the losses. For scientific purposes it is obviously useless to lump together the losses in the compression process and those in the eduction-pipe. The former are fairly well understood, but the latter are quite unknown, and will remain so, as long as only tests of the over-all efficiency of installations are made. If the laws governing the losses in the pump proper are to be studied, then a test must give the energy contained in the air immediately after passing through the injection foot-piece.

(2) That the greatest loss in an air-lift pumping installation is in the air-compressor, and therefore that the best compressor is none too good for a permanent installation.

(3) That the next greatest loss is the loss of head at entry.

(4) That any formula for calculating the submersion required would be better stated in the terms of "the volume of air used per second, at a pressure equivalent to the head of submersion," rather than in terms of the lift. This is suggested by the displacement theory conception of the submerged portion of the eduction-pipe as a space for the air to accumulate and raise the water by displacement.

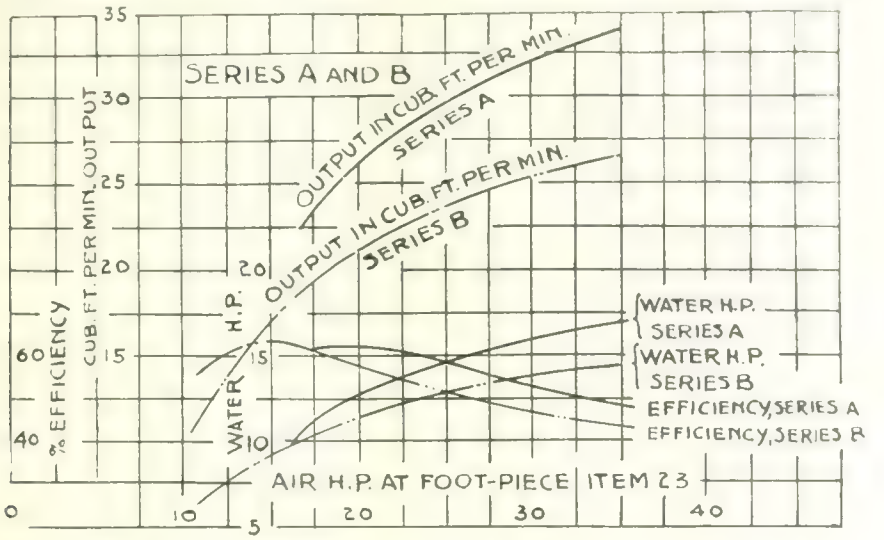
(5) That every ounce of compression which the air is compressed above that pressure, which is equivalent to the submersion head, is so much energy wasted, and that attention should be paid to the design of the foot-piece and the air-pipe with the object of reducing those losses to a minimum.

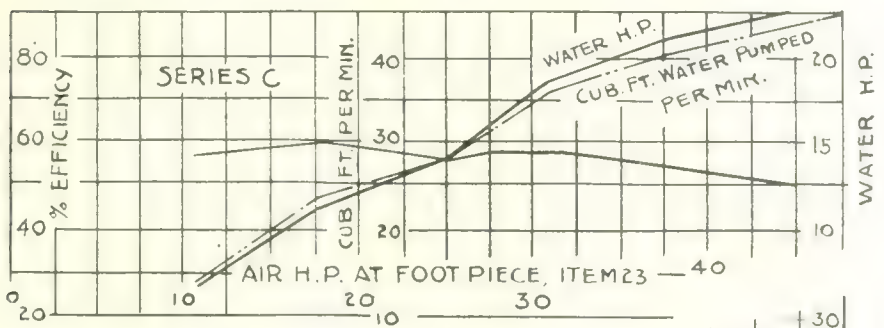
(6) That a valuable item of information to include in the report of any test is the ratio of the volume of air to water at a point immediately above the foot-piece, and that the ratio by volume of air to water at the outlet of the pump is of little comparative value, since the volume of air is not a measure of the energy contained therein, unless the initial pressure is included in some form.

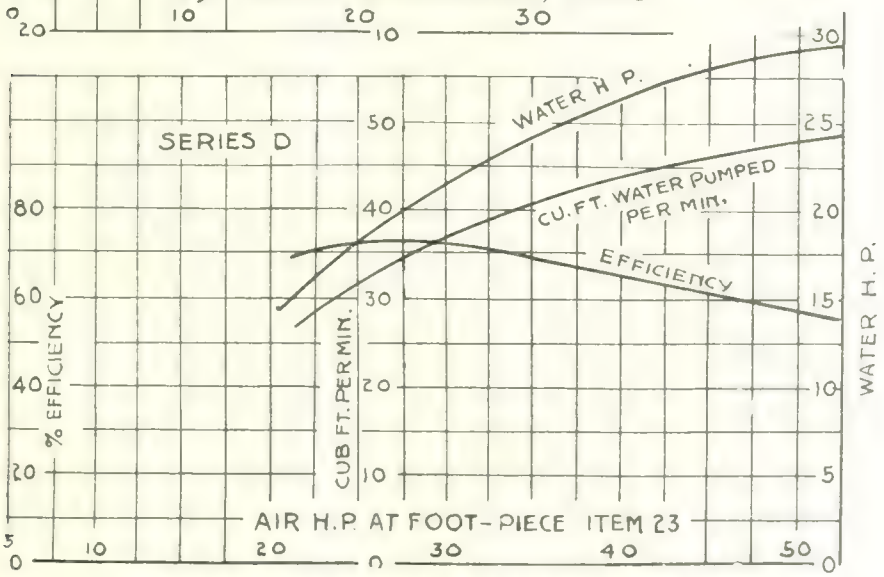
(7) That the hotter the liquid to be pumped, the higher will be the efficiency of the pump. It has been shown by Professor Randall that an efficiency of 100 per cent. is possible under certain conditions when pumping water at 200° F.

(8) That many flowing oil-wells are in reality "air-lift" pumps, using natural gas in place of air. Mr. A. T. Beazley, A.M.I.C.E., has obtained very encouraging success in making wells flow which had previously to be pumped, by applying to them the principles of the air-lift pump. The great obstacle to be overcome is the lack of control both of the quantity of gas and oil, and of the point of mingling of the two.

(9) That considering the different forms of steam-engine usually used in conjunction with different types of pumps, that the fuel consumption of an air-lift installation can be made to compare very favorably with that of any other type for raising liquid more than 75 feet from a well. For shallow wells centrifugal pumps will probably prove more economical.


SERIES A AND B
OUTPUT IN CUB. FT. PER MIN. SERIES A
OUTPUT IN CUB. FT. PER MIN. SERIES B
WATER H.P. SERIES A
WATER H.P. SERIES B
EFFICIENCY, SERIES A
EFFICIENCY, SERIES B
% EFFICIENCY
CUB. FT. PER MIN. OUTPUT
WATER H.P.
AIR H.P. AT FOOT-PIECE ITEM 23




FIGS. 9, 10, AND 11. SERIES A, B, C AND D. WATER PUMPED [illegible]

Hence pipe desired is composed of: :

[illegible] feet of 4-inch line pipe
167 feet of [illegible] 3-16-inch casing, and
375 feet of 6⅝-inch casing—a total length of 825 feet.

[Note. 6⅝-inch casing is the largest size pipe available which can be inserted alongside the air-pipe in the well.]

Using the above lengths of pipe, the average velocity of the rising mixture will be:

## DEPRECIATION AND MACHINERY ACCOUNTS

By E. P. L.

WHEN a new machine is installed the purchaser usually has a pretty clear idea of the period for which it will last—the "life" of the machine. Obviously if its value will be reduced to zero in ten years it will be necessary to write off the book value during that period. But writing off a fixed percentage from the machinery account every year will by no means meet the case. Suppose for the sake of illustration that all the machines in use have an estimated life of ten years. To write off 10 per cent. from diminishing balances would not extinguish the book value in that period, as the following figures clearly show:

| | | |
|---|---|---|
| [illegible] | [illegible] | First year |
| | 900 | |
| [illegible] | [illegible] | Second year |
| [illegible] | [illegible] | Third year |
| [illegible] | [illegible] | Fourth year |
| | 656.1 | |
| [illegible] | [illegible] | Fifth year |
| | 590.49 | |
| [illegible] | [illegible] | Sixth year |
| | 531.44 | |
| [illegible] | [illegible] | Seventh year |
| Less 10 per cent. ..... | 47.83 | Eighth year |
| | 430.47 | |
| [illegible] | [illegible] | Ninth year |
| | 387.42 | |
| [illegible] | [illegible] | Tenth year |
| | $348.68 | |

Instead of extinguishing the original $1,000, only about two-thirds has been written off, leaving $348.68 still standing as an asset.

The satisfactory handling of depreciation off plant and machinery demands the use of a special inventory. This may be ruled to provide for insertion of the following particulars:

Date acquired.
Description of machine.
New or second-hand.
Purchase price.
Estimated life.
Annual depreciation.
To be written off by (——)
How disposed of.
Value extinguished.

The last two columns are, of course, only used after the period representing the life of the machine has expired. A tick placed in the last column—"value extinguished"—shows that nothing more has to be written off in respect of this machine. To ascertain the total amount of depreciation to be written off at the close of the financial year the separate amounts shown in the inventory are tabulated and added together.

If preferred the tabulation can be made at the same time as the entry. In this case a rather wider book is needed, the particulars quoted above being recorded on the left-hand side of a double page, and the right-hand page being ruled with a series of cash columns to be headed with successive years. Thus, if the book value of a machine purchased at the beginning of 1917 is to be extinguished in five years, one-fifth of the purchase price is extended into each of the columns headed 1917, 1918, 1919 and 1920, and 1921. The accuracy of the analysis is proved by the totals, the sum of analysis columns on each page being equal to the purchase total on the corresponding half of the sheet. A summary of the page totals gives the amount to be written off each year.

## RECLAIMING PACKING AND OIL

By C. T.

In these days of waste elimination, some attention should be given to the renovation of packing in axle-boxes, and the reclaiming of oil, and investigation and experiment suggest two distinct processes by which this can be done, whilst in practice it has been found that a scheme can be made a success.

In the first of these processes the packing as it is taken from the journal boxes of cars of any description should be placed in a cylindrical drum, the outer surface of which is made up of wooden slats, with internally projecting spikes of great sharpness between 5 in and 6 in. in length. The rotation of this drum with the packing inside serves to pick it thoroughly apart, and allows the short strands of waste, particles of dust and dirt, odd bits of metal, and other foreign material to be sifted out between the slats and to fall into a receptacle underneath the drum.

When this operation has been carried on for some time, the waste is removed from the drum and is placed on an inclined table having a slatted bottom. The picking is continued further with a fork until the mass is entirely free from lumps and such foreign substances as may not have been sifted out in the picking machine. The lower end of this inclined table rests on the edge of a steam-heated oil vat about 3 feet wide and 8 feet or 10 feet long. The picked waste is placed in the oil, which is maintained at a temperature of approximately 100 degrees, and the whole mass is agitated by forking for an hour. This operation serves to wash the waste thoroughly, freeing it from dirt and congealed oil or grease and restoring it to its original resiliency. At the opposite end of the vat there is an air-operated compression strainer. The waste, after being forked in the vat, is put through the strainer, which is arranged to press out only such a quantity of oil as to leave the waste of the right consistency for use in packing journals.

The reclamation of oil presents greater difficulties, as the ordinary forms of oil filter do not adapt themselves to the extraction of the usable oil from the residue pressed out of the waste, and the secret of the trouble may be found to lie in the specific gravity of the material brought in for reclamation. As this material is usually full of dirt and other foreign substances it is usually heavier than the water employed in the filters, and those filters which depended upon flotation on water to separate the oil from the dirt prove to be inadequate for the work. In place of this method it will be found that distillation will give good results. The residue from the picking machine is first put through an air press similar to that employed for conditioning the renovated waste. This residue consists of dirt, granules of babbitt metal, short fibres of waste, etc., and is treated to free the oil thoroughly of foreign substances. No satisfactory method has as yet been devised for reclaiming the babbitt. After a sufficient quantity of oil has drained from the press it is thinned by the addition of ordinary kerosene or signal oil. The still used is heated by steam and the condenser is water-cooled. When the still is put in operation the first material to come off is the kerosene or signal oil used as a solvent, and this is followed by the lubricating oil, which is in perfect condition ready for use. The still is then cleaned of any remaining residue and is ready for the next batch of oil. After about one week's operation the oil in the washing vat becomes too heavy with dirt to act satisfactorily in treating the waste; it is therefore thinned in the same manner as the residue and distilled, this process fully restoring it to its original value for waste washing purposes. A saving of $2,000 per annum can be effected by the use of these two methods.

## SHIPBUILDING IN AUSTRALIA

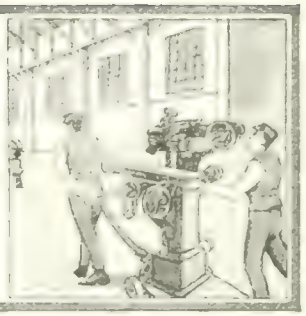
RECENTLY the expert engaged in England to supervise the Commonwealth Government's shipbuilding scheme arrived in Australia and is now completing his examination of the various federal, state, and privately-owned plants and yards. It is anticipated that an early start will be made with shipbuilding within the Commonwealth.

The Commonwealth Government has extensive yards at Sydney; the State Government of New South Wales has a plant at Newcastle, and the State Government of Victoria has extensive yards at Melbourne, all of which (independent of the federal shipping adviser) are managed by competent steel shipbuilders with practical experience in British yards.

It is announced that there will be sufficient steel in Australia to build seven steamers. At the outset some imported materials will be used, but the bulk of the steel will be supplied by the Broken Hill Company's steel works at Newcastle, N.S.W., which, with subsidiary or associated companies, will ultimately be in a position to furnish all the structural steel for the framing and plates required for the construction of steamers in Australia.

The work will be apportioned to the yards in the several states, and, while no authoritative statement has yet been made as to the size and class of the steamers, it is considered by experts having knowledge of the facilities available that the initial vessels will be about 330 feet long by 48 feet beam, with a carrying capacity of about 3,500 tons.

# DEVELOPMENTS IN SHOP EQUIPMENT



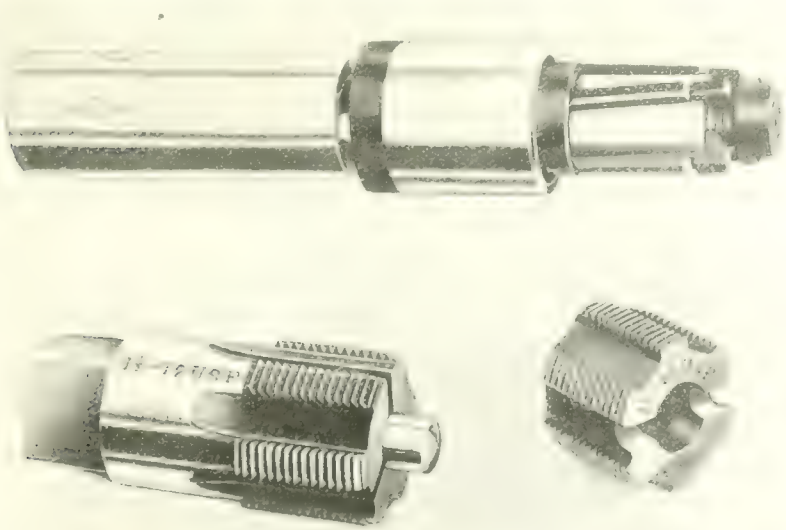
*Makers of equipment and devices for use in machine shop and metal working plants should submit descriptions and illustrations to Editorial Department for review in this section.*

## NEW DEVELOPMENT IN SIZING AND CUTTING TOOLS USED IN MAKING BRITISH SHELLS

IN the making of special tools, such as tapes, reamers, and gauges used in munition production, there have been more developments during the past few years than in the previous century.

The accompanying illustrations show a number of taps and an expanding reamer of the floating type for finish sizing of fuse holes of shells, which represent additions to the Wetmore line of products, made by the Wetmore Mechanical Laboratory Co., of Milwaukee, Wis., and handled through its Canadian agent, H. E. Streeter, New Birks Building, Montreal. In the design of these taps experience gained through the making of taps since the first munition contracts were brought to Canada was drawn upon, and thread shapes chosen which have given longest life and accuracy.

The expanding reamer is of the floating type, the one shown made to fit a 2 in. turret hole and designed for finish sizing fuse holes of British high-explosive shells. This reamer floats freely in its socket, is self-centering, and insures the reaming of a true round hole. The blades are set on a left hand angle to eliminate liability of chatter. To take up the wear of blades they are expanded by means of two ground nuts. The blades may be removed and replaced without taking the tool apart, and a true center in end of reamer makes it possible to grind the blades in place if desired. Expanding reamers of this type are shipped with the blades ground to dimensions required by manufacturers.

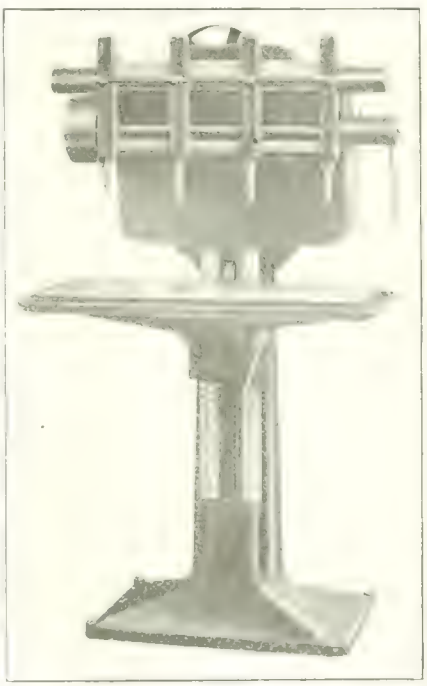


TAPS AND FLOATING REAMER FOR FINISHING SHELL FUSE HOLES

## VALVE GRINDING MACHINE

The valve grinding machine illustrated herewith is a recent product of the Defiance Machine Works, Defiance, Ohio. This machine will grind all the valve seats in a gas engine cylinder block, of various types, at one time, and is made with four, six, or eight spindles. Special heads can be furnished to grind the seats of the staggered type of valve. All that is required of the operator during the grinding operation is to press lightly on a lever to hold the valve head drivers down against a regulated spring tension. This, however, may be accomplished automatically by making provision in the cylinder holding fixture. The oscillating motion of the spindles, together with lifting and returning the valve head drivers, is entirely automatic. It rapidly grinds valve seats to a perfect bearing.

The table, to which fixtures for holding cylinders are clamped, is rigidly gibbed to the base column. It is provided with a binder screw for clamping at any position on the column. The weight of the table, when raising or lowering, is relieved by counterbalance concealed in the core of column. Sufficient weight and strength has been properly distributed to withstand severe strain and maintain perfect alignment during a long period of use.

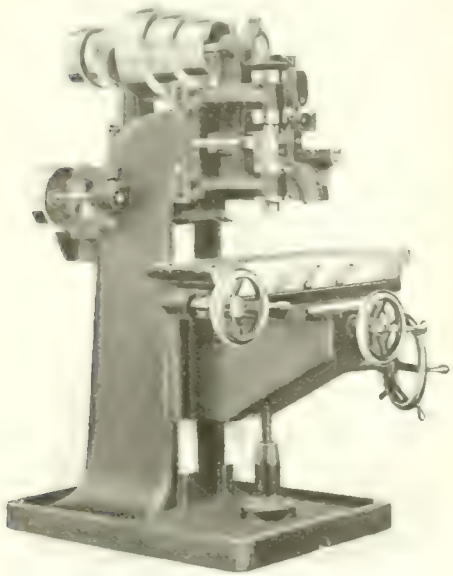


DEFIANCE VALVE GRINDING MACHINE

The spindles are ground true and fitted in sleeves. They ride on a race of ball bearings at both top and bottom ends. This arrangement effects a free and easy oscillating movement to the spindles. The spindle heads are securely gibbed to the top frame. Adjustments are obtained by a screw leading through the head; each head is moved independent of the other, and provided with jam nuts on each side to hold them in

ting movement to the spindles in this machine is a new departure from other methods used heretofore and an exclusive feature. This movement is obtained motion to the drive rack, and eliminate These parts are encased in a tight housparts of this machine are enclosed to protect the operator from injury.

Fixtures for holding cylinders to the table and drivers for oscillating the are furnished only at extra cost. The drivers are made with tension to beat The driving points are made special to engage the valve heads as provided for. A two-horse-power motor is sufficient for the operation of either the four, six or eight spindle machines.



DIE SINKING MACHINE

## DIE SINKING MACHINE

A die sinking machine of wide adaptability and usefulness, made by the Jackson Machine Tool Co., Jackson, Mich., is described herewith. The machine was primarily designed to reduce the cost of drop forging dies and to thus extend the use of drop forgings to embrace many pieces made of iron or steel castings. Any die with one or more circular impressions can readily be routed out on this machine with considerable saving in time and with resulting economy.

Dies, such as crank and cam shafts, knuckle joints, can be machined in one setting, and all typing on semi-circular impressions is entirely eliminated.

In general design and range the die-sinking machine resembles a vertical miller, but is provided with an additional head for cutting semi-circular impressions in drop forge dies.

to take up wear. The thrust is taken up on upper bearing, thus equalizing the friction. The spindle is provided with No. 11 Brown and Sharpe taper. It is mounted in a housing which swings on hinges. When it is in use, the housing is bolted securely to head by two large bolts, and the nuts on bolts in hinges are tightened, thus making it part of the headstock. The power is transmitted from cone shaft through mitre gears as shown. When the secondary head is not in use, these bolts are removed, and the entire spindle housing is swung out of

The secondary c cherrying head is a segment of a gear operated by rack shown in above illustration which carries a cutter shown herewith. The centre of cutter is the true centre of segment. The segment oscillates 40 degrees each side of centre, and on the return stroke the housing is raised three-sixteenths of an inch, thus clearing the cutter. The segment is provided with circular ways and the wear on same is taken up by circular tapered gibs. The oscillating motion is obtained through a rocker arm and crank shaft, and the raising or relieving motion is obtained by a cam on the end of the crank shaft through levers and links.

The working surface of the table on the No. 5 machine is 13 x 40 in., the longitudinal travel is 32 in., the cross travel 12½ in., and the vertical adjustment 17 in.

The table on the No. 6 machine is 13 x 48 in., the longitudinal feed 40 in., the cross feed 13 in., and the vertical feed 21 in. Both machines have three 11/16 in. tee slots in the work table.

The hand wheels are so located that an operator can reach them all from one position. Each wheel is provided with a micrometer dial reading in one-thousandths of an inch.

The vertical spindle is of large diameter. The lower bearing is 2⅝ in. x 5¼ in.,; the upper bearing 2⅛ in. x 4 in. Taper bronze bearings are provided to take up wear. The thrust is taken up on upper bearing, thus equalizing the friction. The spindle is provided with No. 11 Brown & Sharpe taper. It is mounted in a housing which swings on hinges. When it is in use, the housing is bolted securely to head by two large bolts, and the nuts on bolts in hinges

CUTTER USED IN SECONDARY HEAD

are tightened, thus making the housing part of the machine frame.

Cutters are furnished in sizes from ¼ in. to 4 in. diameter.

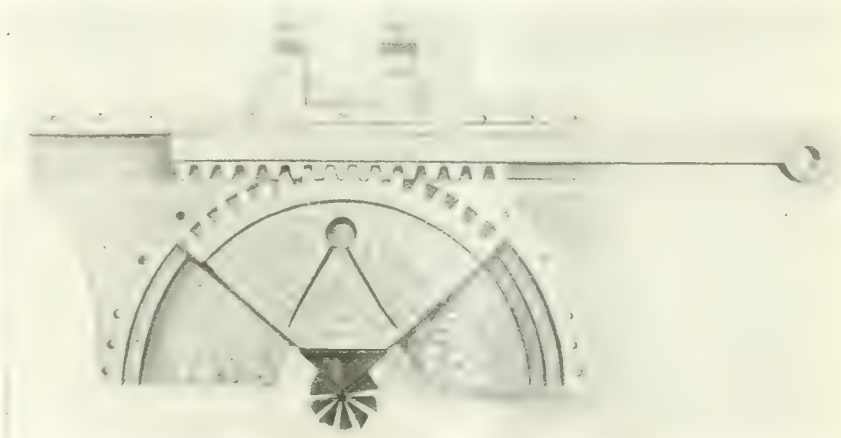
## THE DRAWING OFFICE AND OUTPUT

By Mark Meredith.

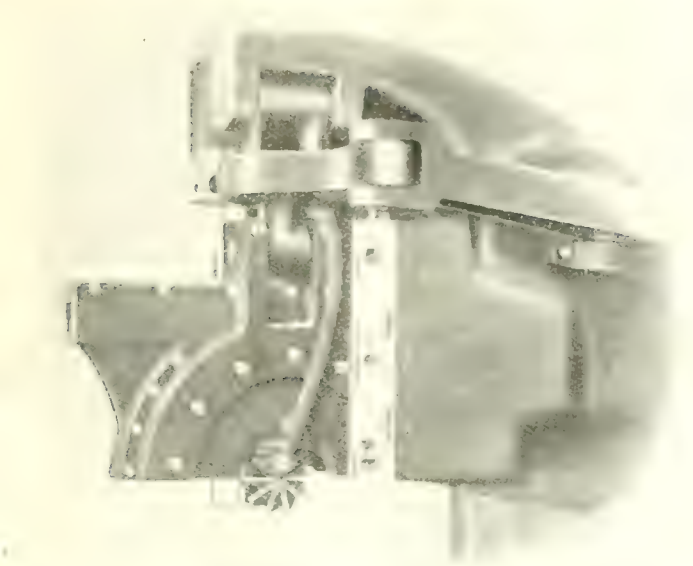
The great factor to-day is output, and output will be of the utmost importance for some time after the war, and any suggestions to help output are worth consideration.

The drawing office plays a very important part in output. The machine or structure is dealt with first in the drawing office, and every detail should be thought out with the ideas of rapid production. It is well known that production in quantities means cheapness and quick output, so that the standardization of parts should be carried out to its fullest extent. It is the drawing office that must see to this standardization.

This standardization should be carried



SECONDARY OSCILLATING HEAD WITH CUTTER IN POSITION.

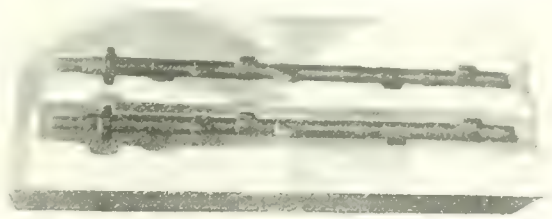


CLOSE UP VIEW OF SECONDARY HEAD

[illegible] office should adopt a distinctive type of drawing and adhere strictly to it; for this, although seemingly a small matter, tells in the end. The drawings should be made in specified sizes, and a smaller size to suit the general type of work for smaller details.

Adopt as far as possible certain scales only—say, full size, 3 inches and 1½ inches for details, and 1½ inches and ¾ inches for arrangements. Each drawing should bear a title, drawer number, and note of the scale to which it is drawn. All these particulars should be most clearly marked on the drawing in one particular place—say, bottom right or left-hand corner, the best position being the bottom right-hand corner, as this is convenient when turning over drawings in a drawer. The type of marking title, etc., should always be the same, and for this reason and distinctness a stencilled title is much better than one printed by hand. The letters should be bold, of block type not less than a ¼-inch high. The drawing number should be larger if anything—say ⅝ inches high. The denominations of the various views should also be stencilled on in preference to printing. The various views should also bear the same relation to each other on every drawing—that is to say, the plan should always be either above the side view on every drawing or below the side view on every drawing. The correct position for the plan, on the principle of hinged planes, is below the elevation, and an end view, looking from the left end of the side view, should be drawn on the right-hand side of the right view. In some offices the reverse view method is used, namely, the end view is drawn at the end of the side view from which it is projected. Whichever method is employed, it must be strictly adhered to; this point is most important, saving many mistakes and much time.

Views must be so arranged that they do not overlap. It is not usual now to send tracings into the shops, blue or other prints being used, so that the actual finish of the drawing itself is not particular. When prints are used, the tracing becomes the drawing office record, and for this reason and also for the benefit of the shops it is essential that the tracing be most carefully made. [illegible] the draughtsman makes his own [illegible] others tracers [illegible] tracings he need not be so particular in the finish of his drawing. He need not dot lines or stop them off exactly as required, as he can easily do this when tracing. If a tracer is employed the drawing needs more elaboration, and time is often taken up in explaining the drawing or making alterations and corrections afterwards, so that the advantage is with the draughtsman who makes his own tracings. Again, in the tracing a distinctive style must be followed. Good black lines, with dotted lines of uniform thickness, should be used, and dots as equal as possible in length; centre lines somewhat thinner and broken, not dotted. By using broken lines for centre lines there is not the possibility of confusing them with the dotted lines. Projection lines for dimensions should be also thinner than the main lines, and in long and short lines distinct from dotted and centre line. Dimension lines should be thinner than the main lines and continuous, with just a break about the middle. In the break the figures should be placed, not above the dimension line. In putting the figures in the line there is no doubt as to which dimension the figures refer to.



DIE MADE WITH DIE SINKING MACHINE

The figures must be very distinct and bold, especially on any drawing which has to be used in the smithy. In some offices the practice is to put all dimensions up to 24 inches in inches and parts or decimals; but as fitters generally use a 12-inch rule or straightedge, the better practice is to put dimensions in feet, inches and parts or decimals. If the decimal system is used the dimensions look and read better in inches and decimal parts. All parts that require machining should be distinctly marked, the best method being by putting a red line along the surfaces to be machined. This red line is put on the print after printing, of course, but care must be taken that the tracing is marked exactly as the print, so that the record in the office agrees with the shop drawing.

Some "fit" and allowance system must be adopted to suit the class of work done, and the drawings must be marked to show which fit has to be worked to. These fits may be to the British standards system or a private system, but the shops must know exactly what fit is required. Allowances must not be left to [illegible] much time is saved when a standard system of fits is used; the workman knows exactly what to work to, and has not to consult the foreman, draughtsman or anyone else. Each drawing should also bear a schedule giving the various parts covered by the drawing and showing the number of each part, the material of which the part has to be made, and a reference letter being stencilled on the particular detail referred to. Sectional parts should be cross-hatched by continous or broken lines, or by brush lines on the tracing. There is no need to use different kinds of hatching to denote the material of which the detail is made, as this is specified on the schedule. All tracings should bear a consecutive drawing number and drawing number. Tracings should be classified in some suitable manner, according to the classes of work, and put into drawers accordingly. The tracings should be placed in the drawers in consecutive order, and when one is taken out a card should be left in its place stating who has taken the tracing and the date on which it was taken. In every drawing office there should be charts giving the maximum capacities of the different machines, furnaces, stock sizes of milling cutters and other articles.

Just a word of advice to draughtsman. Never be too proud to ask advice from a foreman in the shops—you do not know everything.

## DARING DORA

The Defence of the Realms Act, or D.O.R.A., as it is familiary termed, is the subject of judicious jest on occasion by British journals. The lady is extremely sensitive, however, as indicated by a contemporary who understands that a well-known service journal in England is to be proceeded against for publishing news calculated to convey information to the enemy, the said news being important details of the plans for perfecting the carrier pigeon service, by crossing pigeons with parrots, to enable verbal messages to be carried.

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## ARE THERE TO BE WOMEN MECHANICS?

THE question as to how far women have permanently replaced men in industrial pursuits is a problem which recurs with increasing frequency, and will probably not be finally settled until factories have settled down to after-war conditions.

Until conditions become normal, that is when munitions and other essential military work cease to occupy any great proportion of the world's activities and most of the armies have been demobilized, a larger number of women will be employed in engineering shops than are likely to be retained permanently. This is so, not only because men will some day be returning for whom work must be found, but because present conditions are not really competitive.

As long as a certain fixed price obtains at which more or less continuous contracts for very similar articles, such as shells can be had, and where patriotic considerations render the question of profit secondary to that of delivery, to which must be added an occasional real dearth of male help, women will continue to be given employment.

In endeavoring to forecast the future accurately, let cognizance be taken of the fact that few women have taken the place of really skilled mechanics whose duties involve a knowledge and understanding of machinery which cannot be given through intensive tuition for a short period.

A description of fuse manufacture, in which women figure largely, appears in this issue, and the very fact that they have been so successfully employed at once raises the query as to how much other work they could do as well. As machine operators and semi-skilled mechanics they would have a field later, provided quantity output enabled suitable equipment to be used, but at present their appearance is due to both extraordinary expansion of business and the peculiar fitness of the product.

Work involving the performance of rough and heavy duties by women means that special labor-saving devices would have to be supplied, and just how many smaller shops would be willing to do so when a supply of male help was available which did not require such equipment is problematical. Add to this the competitive feature and the probable variety of work to be handled and the necessity for experienced men with apprenticeship training becomes at once apparent.

No amount of cramming or parrot-like operation of handles, levers and belts will ever make mechanics out of women. The path is long and onerous and many fall by the way, even though they should be men.

## SOME FEATURES OF RECONSTRUCTION

CANADIAN students of reconstruction problems and possibilities are doubtless aware of the activities of the British Ministry of Reconstruction, but to the layman whose interests confine his attention more to home products it may be surprising to learn that the various commissions and committees appointed in England since the war began now number 87 and form 15 groups.

The extent of the control exercised by the Ministry will be gathered from the group names: trade development; finance; raw materials; coal and power; intelligence; scientific and industrial research; demobilization and disposal of stores; labor and employment; housing; education; aliens; legal; miscellaneous.

A feature of such work is that while nominally organized for reconstruction, much of the work now being accomplished is of direct value to the conduct of the war. Trade conditions are, of course, subject to war influence and cannot be altered pending the outcome of the struggle, but much national effort which comes under one or other of the groups has been of marked assistance in hostilities.

The development of cotton growing; coal conservation; fuel and coal storage research; engineering, metallurgy, mining and glass and optical instruments; abrasives; lubricants and lubrication; civil aerial transport; all of these sub-divisions have produced results of value to date.

The question of abrasives is of interest to Canadian manufacturers because the supply and preparation of these materials for the output of lenses and prisms for optical instruments for war purposes has been of great importance.

Possible developments in civil aerial transport loom large in the future of this land of long distances, and the intentions of the British Government in this respect are of prime interest in view of the large proportion of Canadians in the flying forces. The committee under the Air Ministry is to consider (1) the steps which should be taken with a view to the development and regulation after the war of aviation for civil and commercial purposes from a domestic and Imperial and an international standpoint; (2) the extent to which it will be possible to utilize for this purpose the trained personnel and the aircraft which the conclusion of peace may leave surplus to the requirements of the naval and military air services of the United Kingdom and overseas dominions.

## PRIVATE INTERESTS TAKE SECOND PLACE

IT has been rumored and denied that the War Industries Board may take over all of the steel plants in the United States and operate them under government control.

Such a scheme would be a not unnatural development of the government's experience with railways and shipbuilding, and may have been suggested by the recent decisions regarding national arsenals; a second plant is to be established by the Midvale Steel & Ordnance Company, similar to the Neville Island plant of the Steel Corporation. This latest plant will be located at Nicetown, Pa., and may run to $50,000,000 before being fully operated.

The close interest in the steel industry thus acquired by the government may have brought the final development much nearer, and in the event of such taking place, the industry is expected to undergo some degree of stabilizing which cannot be expected with private ownership.

The desire to earn the approval of shareholders by conducting operations so as to avoid too large excess profits taxes has not been conducive to production, consequently the necessity of getting the most good for the most people may compel private interests to subside for the period of the war.

Few people are really aware of the exact meaning of efficiency: something for nothing is a well-defined term for the idea in the minds of some people—many people figure their own efficiency in direct proportion to how much they can get for how little they can do. The converse of course applies to some employers, and the continued existence of such sentiments has resulted in a sinister reputation for the word efficiency when applied to human endeavor.

# HOLDS PATENTS ON MANY IDEAS HE HAS PERFECTED

**L. A. Desy, Consulting Engineer at Lymburner's Ltd., Montreal, Has Had an Interesting And Varied Career**

"WHEN you ask me about some of the special work that I have successfully completed, and the inventions that I have been interested in, you are requesting something that, if told in full, would fill many pages." Thus spoke Louis Arsene Desy, Consulting Engineer with Lymburners Limited, of Montreal, Quebec, when speaking to a representative of CANADIAN MACHINERY some few days ago.

LOUIS ARSENE DESY.

He has been applying his inventive abilities to the science of engineering ever since his early school days. Born in 1856 in the Quebec town of St. Cuthbert, county of Berthier, of French - Canadian parents, the "boy" received his early training in the Normal School and the Joliette College. After a short period of practical experience in architectural offices in Montreal, Mr. Desy, at the age of 24, decided to go West, accepting and filling the position of architectural and mechanical engineer in several offices in St. Paul, Minn. In 1882 he opened an office of his own in the City of Winnipeg, acting as architect for the C.P.R. and also the Hudson Bay Company, and during part of the five years he was located there he also filled the position of City Engineer for the town of St. Boniface, across the Red River from Winnipeg.

The lure of the West, however, was not sufficiently strong to hold him, so that in 1888 he returned to Montreal, opening an office as a consulting engineer. In the year 1896 he accepted a position as assistant engineer at the Harbor of Montreal. Speaking of his work in this connection, Mr. Desy said: "For several years they had been having trouble with some of the construction work and I had been consulted on different occasions. After serving one year in the junior capacity I was appointed Mechanical Superintendent of the harbor dredging and construction, occupying this position until 1902. Much of the modern construction of the harbor piers and channel dredging was performed under my personal supervision."

About this time his abilities as a resourceful and successful engineer were recognized by the authorities at Ottawa, and he was induced to accept a position as consulting and construction engineer with the Public Works Department. Successful effort seldom goes unrewarded and on the recommendation of the heads of the Department he was selected by the British Government and engaged in 1905, for four years, to carry out an engineering undertaking in the central portion of Northern India. The work required was the dredging of a considerable portion of the Jhelum River in the Valley of Kashmir. The actual operation of deepening the channel was not an unusual undertaking but the construction of the dredges, under the existing conditions, was anything but an easy problem. During the four years occupied in this work, he made three trips to India, the first time to study the situation and design the necessary dredges, leaving his assistants and the natives to construct the wooden hulls and framework while he returned to America to obtain the necessary equipment and machinery.

The mechanical equipment was made by Bucyrus Co., of South Milwaukee. In citing some of the difficulties of transportation Mr. Desy said, "The machinery for the entire five dredges was taken from Milwaukee to New York, to England, transferred to another steamer and thence to Karacchi, India, placed on cars and taken inland to Rawal Pindi, a distance of about 1,500 miles. From here we had to use bull-carts to transfer the machinery across the Himalaya Mountains for nearly 180 miles to Baramusla, this last portion of the journey occupying over three weeks. No serious hitch occurred throughout the entire trip; it required 120 days from the time the equipment left Milwaukee until it was unloaded in the Kashmir Valley."

The five dredges were all operated by electrical equipment, the power being generated at a station ten miles below the scene of operations. The dredging work included the removal of about 10,000,000 yards of earth, and the five dredges were capable of taking care of 10,000 cubic yards per day, 15,000 h.p. being utilized in the operation of the machinery. The designing, construction, transportation and operation, was personally supervised by Mr. Desy during the four years of his engagement. A year or two after his return to Canada he received a letter from the engineer in charge, Major A. J. de Lotbiniere, R.E., commending him for the efficient manner in which he had successfully carried out this engineering achievement.

On his return to Montreal he became associated with G. W. Harris in the manufacture of excavators, these machines being designed and patented by Mr. Desy. Many of these are now working along the St. Lawrence River and other water ways.

At the outbreak of the war he became interested in the development of machines for shell making, designing, constructing and patenting many tools that have proven their exceptional efficiency for rapid and economic operation. After making shells on his own account for about two years, he associated himself with Lymburner's, Limited, or as he put it himself "Lymburners bought out my entire equipment, machinery and man, I being retained as a consulting and designing engineer." For the past two years he has devoted his energies to the developing and improving of various special machines for the different types of shells. These machines include cutting-off, facing, turning, boring, profiling, multiple saw, billet breaking machine, and various others.

Mr. Desy has been interested in many inventions, his first patent received being for a caterpillar tractor ditching machine, obtained in 1885. He has also obtained patents on dredges, steam shovels, and many types of metal working machinery. He is now 62 years of age and still hale and hearty, has three children, two sons and one daughter, one of the boys being attached to the Royal Flying Corps.

He is a great believer of technical study for the young and old mechanic. "To keep pace with the rapid developments that are constantly taking place in the field of engineering," he said, "it is essential that the ambitious workman or engineer keep in continual touch with the advancements that are daily taking place in the mechanical world. To do this effectively it is imperative that he not only study the problem of his own line of activity but that he should become familiar, either by observation or by the medium of a reliable trade or mechanical paper, of the general problems and difficulties of other mechanics and engineers. Very often an article in a technical publication has been the source of many an inspiration."

Mr. Desy is a member of the C.S.C.E.

# MARKET DEVELOPMENTS

## Outlook Poor for Non-War Industries

### Plants That Cannot Line Up With the War Group Have Little Chance in the Iron and Steel Market—Plate Prices Take Advance and Are Once More on the Old High Level Basis

THE future is not promising for the shop that cannot qualify as a war industry, but which still finds it necessary to have supplies of iron and steel. In some cases these factories have already reached the stage where they must simply mark time until the war appetite for these things has been satisfied. In other cases they have been able to sub-let from war contractors, and in this way line up with the war group. The war standard is being more rigidly applied than ever to every order that comes into the market, and Canadian firms are showing a commendable desire to co-operate with the War Board in seeing to it that the priority order is made completely and effectively operative.

The production of coke at American points is regarded as highly satisfactory, also the output of steel ingots and of pig iron. In fact capacity production is almost the rule now at all points and the logical step of increasing capacity is now being undertaken on a large scale. The situation in United States parallels that in Canada as far as the commercial use of steel is concerned. The firm that is counting on coming into direct competition with the war group for a supply of raw material is going to have poor skidding for some time to come.

Makers of machine tools for war purposes report business as being very brisk. The placing of new orders continues, and in many cases the shops handling these are in the market for new equipment, in others it is simply a case of tooling for another size of work. Demand is brisk for all classes of high speed and carbon goods—in fact everything that enters into the equipment of munitions plants is sought after.

Scrap metal yards are well filled, but with a class of goods in many cases that are not much sought after at the moment, viz., of the non-ferrous sort. Cuttings and scrap that can be turned over to munitions plants, in fact anything in the nature of low phosphorous metal is needed, but very scarce. Much the same condition prevails in United States where prices for some lines are much higher than in Canada, but the embargo on scrap holds all the stock in this country that is originated here.

Prices for steel plates took a $20 per ton advance this week, coming back to the high level on which they have been based for some weeks past. For a few weeks they were quoted at nine cents per pound, but the recent order forbidding purchases for warehouse purposes has brought the price sharply to the ten cent per pound mark, and there are very few indications of it receding.

The metal market is rather uninteresting, the only point about which there was any discussion being the price of copper, and the action of the War Industries Board in the United States makes it plain that they intend to continue the 23½c price for another three months. The high-cost mines have apparently failed in trying to bring pressure on the government to induce them to increase the price to their level of production costs. The low cost mines are apparently doing very well at the 23½c mark.

## REVIVAL OF MUNITIONS BUSINESS MAKES BRISK DEMAND IN MONTREAL

Special to CANADIAN MACHINERY.

MONTREAL, Que., May 28, 1918.—The feature of the week is undoubtedly the revival of the munitions industry. This had been on the wane after the general withdrawal of the British shell orders, especially those of the heavier calibre, but the recent activity has been additionally emphasized as a result of fare new orders. To handle this business many Canadian plants have commenced operations to enlarge their present capacity. Lvalls of Montreal have already started the erection of a new plant for the production of the 155 m.m. shell, and within a very short time the firm of Caron Bros. are expected to start operation on a new plant for the same size shell. It has been intimated that the Canada Cement Co. will do their own forging on their contract for the 9.2 inch shell. Machine tool business has been stimulated by the announcement of recent and further shell activity, and the demand for shell machinery has become quite heavy. It has been announced that little passenger traffic will be carried on from the Port of Montreal this summer and that all activity will be confined to the transportation of freight and other essential supplies for overseas purposes; this only applies to transatlantic traffic.

### Steel

An undercurrent of uncertainty appears to pervade the local situation in connection with the possibility that the near future may see some sort of arrangement leading to price control of steel and other commodities. For this to be put into force it will be necessary that the co-operation of the American Government and the producers be effective with the authorities at Ottawa, in order that the same may be placed upon a working basis, owing to the fact that the bulk of steel now used in war preparations must be brought in from the States. The tendency has been to create an unsettled market. The requirements of Canadian shipbuilders have been arranged for through the joint action of the Canadian and American Governments. Shell steel requirements have been greatly increased owing to the heavy additional orders placed and Canadian producers of shell steel are working to capacity. Much of the steel required for the shells to be made for the American Government will be brought in from the

States. While the present demand for steel virtually excludes the buying for ordinary purposes, it is anticipated that after the bulk of the building of munitions and shipbuilding plants has been completed there will be sufficient material available for considerable domestic activity, although the high cost under existing conditions may prevent other than absolute essential enterprise from bein proceeded with. Dealers here report a quiet market with the situation confined to war activities exclusively.

### Metals

Aside from the recent announcement regarding the renewal of the copper price, the market has not been featured with any special development. Production in some instances has been interfered with owing to the inability of maintaining sufficient labor at the mines and refineries, but this condition has had little effect as yet on the consuming market. Little complaint is offered as to transportation and delivery under the existing conditions is almost normal. Copper has become steadier following the decision to maintain the previous fixed price. Tin is still very scarce and supply uncertain. Spelter is quiet on poor demand. Lead is inclined to weaken under decline of demand. Antimony and aluminum are quiet and unchaned.

**Copper**—Although some disappointment has been expressed over the attitude of the American Government in reaffirming the price that has ruled for the past several months, the general opinion appears to be that the decision to carry on at the old price is very satisfactory to the majority of the trade, both as respects producers, dealers and consumers. The time effective for the renewed price will expire about the middle of August so that those advocating a higher price will have an opportunity to advance further claims before that date. As a result of the recent announcement the market has become steadier here and increased activity has been shown, but little business is being carried on outside of war requirements. Local dealers report a quiet market with prices unchanged at 29 and 30 cents per pound.

**Tin.**—This metal continues to hold the center of interest owing to the uncertainty that prevails in the situation both here and abroad. Some relief has apparently been given to the London market as indicated by the most recent quotations but the change has, as yet, not been reflected in the transactions here or in the States, where the situation is still exceptionally strong, with nominal quotations holding. The scarcity here is still marked and the demand is active, but dealers are unable to supply the metal, the result being a very strong market. The market is a nominal one and the general price asked by local dealers is approximately $1.35 per pound, an advance over last week of 10 cents per pound.

**Spelter.**—The situation has not improved and the existing demand is very light, although slight interest has developed over the report that considerable buying has taken place on the other side for government requirements; this, however, has not stimulated outside buying, and the tendency is for an easier market. Dealers here are still asking last week's price of 10 cents per pound.

## POINTS IN WEEK'S MARKETING NOTES

**Firms in non-war lines requiring steel and iron are finding it increasingly hard to keep in operation.**

**The demand in Canada is still very pronounced for machine tools for the equipping of new war order shops.**

**Canadian agents for British high-speed steel find it hard to secure anything like definite delivery of orders.**

**Carnegie Steel Corporation is now operating 51 of its 59 stacks. Last winter the number was down to as low a figure as 29.**

**The scarcity of coke in the United States is now regarded as being almost at an end. Recovery ovens are being gradually added to in many districts.**

**There is no improvement at U.S. points in supplies of steel for ordinary commercial purposes, nor does there promise to be any improvement in the future.**

**Every week tends to add to the amount of steel that U.S. War Board and allies are calling for.**

**Rumor that U.S. would soon commandeer all steel plants in U.S. is promptly denied at Washington.**

**Copper prices in United States will very likely remain at the present standard of 23½c according to announcement by the War Industries Board.**

**An increase is noted this week in plates, tanks and heads of $20 per ton, due to difficulty in replenishing stock.**

**There is a good market for low phosphorous scrap, but there is little offering at the moment either in United States or Canada.**

### Machine Tools and Supplies

Present indications point to a renewal of considerable activity in the machine tool industry as a result of the increased business that has followed the placing of large shell orders in Canada; these contracts call for a range of munitions variety. Dealers report a heavy demand for all classes of shell equipment, particularly those required for the production of shrapnel; inquiry is also quite heavy for the 155 m.m. shell and likewise the larger sizes. A feature of the present demand is the marked activity in connection with the buying of used machinery. Quite a brisk business is being done in general equipment. Inquiry for electrical machinery has developed to a large extent owing to the changes that are contemplated by many firms in changing over from steam to electric power for the conservation of fuel. The revival of the munitions industry has also renewed the demand for all classes of supplies; this is very noticeable in connection with the cutting tools required for the different makes of shells. Manufacturers and dealers in carbon and high-speed tools report a heavy demand during the past few weeks and anticipate still further activity. Delivery in some instances is somewhat uncertain but this applies to those steels that are required to be imported; local manufacturers are in a position to take care of the demand on very good delivery. Prices in all lines are well maintained, and in some quarters the tendency is to higher levels.

### Scrap

The quiet tone of the [illegible] situation is still maintained and dealers report little activity of a general character. The apparent scarcity of pig iron has resulted in the absorption of greater quantities of cast iron scrap, and the market in this material is very strong and active; local quotations are now $34.00 per ton, an advance over last week of $3.00 per ton. The demand for wrouht iron scrap has been heavy and the price offered for scrap pipe has been advanced to $22.00 per ton. Zinc and lead is in less demand, and this has been followed by a decline in the price of scrap metal, both of these have fallen off [illegible] cent, and the respective quotations are 6 cents and 7 cents per pound. A steady business is done in heavy melting steel [illegible]

### PATENTS ISSUED

The following is a list of Canadian patents recently issued through the agency of Messrs. Ridout & Maybee, 59 Yonge Street, Toronto, from whom further particulars may be obtained:—Frank Garrett and Harry K. Pratt, safety controlling gears for electrically propelled vehicles; Wm. M. Brownell, apparatus for drying and similarly treating materials; Robert Donald, method of storing micro-scopic slides; James C. Doust, potato-planting attachment for plows; Isaac L. Leo, pneumatic tires; Harry A. Matear, shock absorbers for boots or shoes; Dunlop Tire & Rubber Goods Co., Limited, liners for pneumatic tires; Edward J. Wild, collapsible boxes; C. N. Garner, collapsible boxes; Thos. G. Gilbertson, boot trees.

# HARD SKIDDING FOR NON-WAR INDUSTRY

**Simply Has to Mark Time While Steel Output Goes to War Industries**

TORONTO.—The extent to which the steel plants in Canada are endeavoring to co-operate with the authorities in seeing that war needs have priority over all else is evidenced in several ways. A circular has been issued by several concerns to their customers calling attention to the absolute necessity of the strictest observance of the decrees calling for the entire output of steel for war purposes. One of these sent out to-day has this clause: "Under the circumstances it will be necessary that you state in your orders whether this material is needed for government use, advising government order number and stating also under which of the following classifications the work comes: Ships, aircraft, military or naval supplies and operations, or for buildings directly connected with the above. If the material is not for government use, give us accurate and detailed information as to its ultimate use, as there are many other essential industries, fuel, food, clothing, etc., necessary to the welfare of the country, whose requirements should be given every consideration after the needs of the government."

And in the same course of events, there is a number of war industries that are feeling the pinch now as they have not before. They have not been able to whip their business over into a war essential, and therefore the securing of supplies has been made well nigh impossible. Many of these shops have been able to keep going on the strength of certain sub-contracts secured from the men who have war contracts. In many cases, though, the outlay necessary to do this is larger than the firm can stand or the sub-contract will warrant, and there is nothing to be done except to pass under the war shears for the time being and mark time until the day when commercial requirements in the steel and metal markets will have a respectable chance of being filled again.

Brantford and London seem to be centres that are attracting considerable attention just now by reason of the large war contracts that have been secured by firms in these centres. As in several of the Toronto and Montreal contracts there are some shops in these places that will need entire equipment, their plant not being convertible to the big shells that they are going to turn out, previous runs having been made on the 4.5 and 5.2. The demand continues very brisk for big machine tools, and in proportion the supply business is prosperous.

As was to be expected the order from the War Board forbidding the purchasing of plate for warehousing has had the effect of making prices for stock in hand firmer, and to-day several advances are quoted in plate, ¼ to ½, also heads and tanks. The increase works out at $20 per ton, and puts the price back to the figure where it has been for some time with the exception of a few weeks, when the selling was on the lower level.

Scrap markets are not active. Dealers in some cases keep on purchasing non-ferrous metals in order to protect their credit, not because they want to stock up any more with these lines. There is very little scrap reaching the dealers that can be turned over to the war order shops, and of course that is where the great demand is at the moment.

**Plate Prices Up**

There is a very firm tendency in the steel market regarding the trend of prices. As was predicted in these columns some days ago the prices for plates have advanced, the quotation to-day being back at the $10 mark, against a $9 figure which local dealers have been accepting for some time. This works out at $20 per ton. "Some weeks ago," stated a dealer to-day, "we were getting shipments through in very good time, and the quantities were quite satisfactory. On that ground there was a tendency on the part of dealers to go out after business a little more aggressively and to put prices on a lower level as the stock coming in had been secured on a better price than the old. When the order from the War Board came through a week or two ago that put an end to all that, and it was only a matter of time until there would be a rise in prices. We are simply stepping back to the old figure."

It is out of the question that the same volume of business should be done this year as last. Dealers don't expect it, as there is not the field to do business in.

**Scrap Metals**

The dealers in scrap metals find their yards increasingly stocked with lines that are not particularly in demand at the instant. The cuttings from war work generally pass back at once to the control of the War Board, and little of this is ever dealt with in the open market through the yards. The prices being paid in U. S. points, where there is also an acute shortage of desirable scrap, are higher than the Canadian figure. For instance shell ends across the line are quoted now at $40, the figure here standing at $24, being a spread of $16 on that item between the two markets. The embargo on scrap prevents the shipment of any stock here to American points. There are no price changes this week.

**Machine Tools Wanted**

War work is still behind the demand for machine tools, especially of the heavier order, and local dealers are sharing freely in the new business that has been originated on that score. The Dominion Steel Products in Brantford, and the Motor Trucks, of the same place, are both in receipt of orders of very large proportions, and are busy putting in the necessary equipment. London orders are also creating considerable new business. Along with the installation of new plants there is the increasing volume of trade for supplies and sundries for plants already in existence, and trade in all lines of equipment is very satisfactory. Prices are firm, very few changes showing either way in the lists this week.

**The Price of Copper**

The belief expressed in these columns some weeks ago by a well known Toronto dealer that copper prices in United States would not be fixed beyond the present figures on June first seems to have been well founded. Indications

# DEVELOPMENTS ON LARGE SCALE ARE PROCEEDING AROUND WINDSOR

Special to CANADIAN MACHINERY.

WINDSOR, May 27.—Good progress is being made by the Great Lakes Dredging Co. on the docks for the Canadian Steel Corporation at Ojibway, near Windsor, Ont. The contract for the dock and dredging alone involves an expenditure of about $2,000,000. The contractors are employing about 160 men. P. J. Harrity, superintendent for the contractors, told CANADIAN MACHINERY that he hoped the work would be completed before the freeze-up, but this would depend upon the schedule arrival of piles and other material.

Considerable piling has already been done, piles from Georgia and British Columbia being used on the work. When the piling has been completed, the concrete work will be started and the docks dredged out. A large steam shovel is already excavating at one section of the property. The dock will be 2,100 feet long.

No work has yet been started on the steel plant proper, but plans have been prepared and work on the foundations will be commenced this summer. Considerable preliminary work has been done in regard to laying out the site and construction of roadways.

**Building Extension**

The Swedish Crucible Steel Co., of Windsor, Ont., is building an extension to the foundry, 100 x 100 feet, and also a new machine shop, 75 x 100 feet. Both buildings will be of brick, steel and concrete construction, and steel sash. The company is specializing in cast steel tractor wheels and other tractor castings for the General Motor Corporation of Pontiac, Mich., and Stockton, Cal. The new foundry will be used exclusively for this class of work, and the latest equipment is being installed for the purpose. The wheels will be moulded in three large Pridmore machines and the two International moulding machines will be used for making the cores. The capacity of the plant will be greatly augmented by the installation of the new equipment and will enable the company to meet the increasing demand for its product.

have yet to make their appearance that would lead one to look for higher fixed prices than those now prevailing. The group of high-cost mines were behind the pressure for the raising of the limit, but it does not seem likely that they will be able to sufficiently impress their views on the War Industries Board to raise the limit. The War Industries Board, in advance of June 1, has already indicated its intention of retaining the 23½c limit for a period of another three months. The government has not made any move to fall in with the suggestion of paying a differential rate. There are too many obstacles in the way of such a course. It would mean paying a high cost mine perhaps a thirty cent rate; one operating under better conditions about 25 or 26, and one producing under favorable circumstances the minimum of 23½c. It is easy to see that such a plan would create a heap of trouble and an immense amount of discrimination that the authorities are not inviting in the present instance. There has been a feeling all along that there is no good reason why the small producer or the high cost mine should set the pace for the purchaser of copper.

Other lines in the non-ferrous market remain stationary in price, and a fair volume of trading is being done.

## RAILROAD PRESIDENTS FALL BY THE WAYSIDE

**Policy of United States is Being Put Into Effect Without Fear or Favor**

Special to CANADIAN MACHINERY.

WASHINGTON, May 28.—The United States has gone over the top in an industrial way. From the reports coming from all of the government departments interested in the production of war materials it is shown that for the first time since the war came to the United States production is assuming proportions which are comparable to the vast resources of the nation.

Ship production is progressing rapidly now. An announcement from the Shipping Board shows that one wooden ship a day has been turned out for the past few weeks. Steel vessels are being delivered almost as rapidly. One of the great drawbacks in the shipbuilding program has been obviated and that is the lack of transportation. Reports of the Railroad Administration and the Shipping Board show that there has been a great speeding up in the delivery of cars for the use of transportation of shipbuilding materials.

Production of ordnance is also coming along better now than ever before, although the ordnance program is admittedly far behind what most of the leaders would desire. Steel supplies have been gathered and the entire steel resources of the nation have been directed to war purposes and there is every reason to believe that production of ordnance will soon reach a point where there will be less need for drawing upon the ordnance manufacturing facilities of France and England.

### Control of Steel?

There is a persistent rumor, coming [illegible] that the War Industries Board is about to take over all of the steel plants of the United States and operate them under government control. It is known that this plan appeals to Bernard Baruch, chairman of the War Industries Board, and it is understood that he is strongly in favor of such an act. President Wilson, however, holds the power to do this and there has been no indication from the White House whether or not the President would approve of such a plan. It is argued by many of the industrial leaders in the government that such action is necessary in order that the greatest production of steel may be attained. Already the steel manufacturers are in a voluntary agreement to divert their entire products to the uses of the government, but it is held that there are many difficulties arising which private owners can not cope with as the government could. The matter of labor is one which the government might better be able to handle than the private owners. The matter of profits is also a stumbling block to production, some close to the head of the industrial leadership declare. They point out that the desire of manufacturers to produce in such a manner that they will not be compelled to pay too large excess profits taxes has in some degre affected production. This is not considered a matter of greed, but merely a matter of good business and an attempt to make the best showing possible to the stockholders.

### New Revenue Bill

Business men throughout the entire United States are already beginning to adjust their business to meet the proposed new revenue bill. Secretary of the Treasury McAdoo has given notice that there will be a need for an addi-

## BELIEVES THERE IS A GREAT FUTURE AHEAD OF STEEL BUSINESS AFTER WAR

W. D. Ross, vice-president of the Nova Scotia Steel and Coal Co., has returned to Toronto after spending some time at the properties in the East. In referring to the talk of a deal whereby the Scotia and Dominion companies would come together in a merger, Mr. Ross stated very definitely that the proposal was out of the question now. "It is absolutely off," was the way he stated the case to CANADIAN MACHINERY.

The development of the property of the company at Wabana is progressing in a very satisfactory manner. Slopes have been driven through to the iron ore deposits in such a way as to insure the maximum amount of production, and it is contemplated that these beds will be delivering ore in the month of September.

### The Future of Steel

"I have no two opinions in regard to the future of the steel business in Canada," stated Mr. Ross. "My contention is that for almost four years the steel companies of the world have produced very little of a real or permanent nature. You may argue that the plants are all running to capacity, but what is being done with the capacity production? It is being largely sent to the bottom of the ocean or shot off in the air. We are living in a period of destruction, and it must of necessity be followed by one of construction. The railways of this continent are not being kept up to the mark of efficiency by any means. Many of them are using equipment right now that in ordinary times would be well on to the road to scrap. It is being kept in use because it cannot be replaced because of the pressure of war business. Commercial lines have been cut off almost entirely for a long time. There is practically no structural work being carried on, no bridge building, and none of the ordinary lines that use commercial steel are operating to any extent. It will take years to get the world back to the normal point again. One has only to stop and think for a few moments of the amount of reconstruction work that will have to be done in the countries of Europe where the war is raging, to see what a demand there will be for steel and steel products for years to come. There may be a lull after the war for a short time, and it looks to me that in that period the steel interests would be well advised if they put their house in order to meet the tremendous expansion that is bound to take place afterward."

### The Coal Situation

Mr. Ross went on to state that the operation of the Military Service Act was making it a difficult matter for the coal producing companies in Nova Scotia to keep up their output. "The best miners we can secure," said Mr. Ross, "are the natives of that province, who come to the mines when they are young and learn the business thoroughly. A real coal cutter is no man of a few days' training. It takes a long time for them to learn the mining, and it is the men who know it well who keep up the production end of the business. When a miner is drafted it means that production is going to suffer to the extent of that man's ability to produce, because he can't be replaced from the present labor market. The taking out of iron ore is another matter, because the men there are not up against the dangers of mine gas, and it does not require the training that it does to make a good coal miner."

The coal for shipment will likely be the first item to suffer, as the first call on the coal will probably be for coking purposes to keep pace with the production of iron ore.

[illegible] ness. It is believed that the bill will [illegible] amount will be taken in the form of [illegible]

[illegible] German railroad presidents are now being replaced in favor of regional railroad administrators. These administrators will assume full control of railroad affairs in their respective districts.

[illegible] and Loss

Reports of coal production for the [illegible] were 11,806,000 net tons of bituminous coal produced against 11,554,000 net tons the previous week. The production [illegible] however. This was due largely to a coal shortage. Various mines reported that their production was cut on account of [illegible] shortages reported to the Fuel Administration ran from 14 per cent. to as high as 59 per cent. The week of June 3 has been designated as Coal Week and during that week every effort will be made to produce the maximum amount of coal and to move as much coal as possible. Householders will be asked to have their winter stores in by that time. The Canadian Fuel Administration will be asked to co-operate. The Fuel Administration has given notice that supplies of anthracite coal will be reserved for domestic uses and that it can be used only for industrial purposes after the domestic needs have been filled.

The Bureau of Supplies, Navy Department, Washington, D.C., announces that it will call for bids for bolts, nuts, gauges, pipes, and other miscellaneous hardware and machine parts. Those desiring to offer bids may secure specifications by writing for schedules 1813, 1806, 1812, 1808, and 1817.

Supplies of oil and gasolene are being more carefully hoarded in the United States now than ever before. It is expected that before the summer is over the Fuel Administration will take drastic steps to restrict the use of fuel oils of all kinds. Already yacht and private boat owners have been warned that the Fuel Administration expects to issue an order preventing the burning of fuel oils on pleasure craft.

Appointment of a mineral administrator, to control the supply of industrial minerals, is being urged in Washington now. The Senate has already been informed that it may be expected to act [illegible]

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THE Sahara has been crossed by aeroplane, according to the "Echo de Paris." Half of the trip had formerly been accomplished, but three machines have now completed the entire distance in seven hours without landing.

# RAISING THE LIMIT EVERY MONTH NOW

## Ingot Steel and Pig Iron Production Are Reaching Enormous Totals

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., May 28—Production continues to increase in both pig iron and steel. The Carnegie Steel Company, easily the largest single producing company, has put one more blast furnace in operation in the week and is now operating 54 of its 59 stacks. For a few days last winter it was down to 29 furnaces actually in operation, many being entirely out of blast while a number were banked. The company's pig iron [illegible] is now running at 91 per cent. of capacity and its steel ingot capacity at 93 per cent. of capacity. The fact that these percentages are so close together indicates that the company is fairly well supplied with scrap, despite the extreme scarcity of most grades of scrap in the open market. Without a full supply of scrap the steel production could not make as good a showing in proportion to the pig iron supply. It may be surmised that, as is the case with many steel producers, much shell discard steel and other material is being melted up for scrap by reason of the requirement of the government that there be maximum production of war steel. Otherwise the shell discards could in large measure be rolled into various merchantable products, including light rails, concrete reinforcing bars, bedstead angles, etc.

### By-Product Coke

The scarcity of coke is now almost completely ended. While shipments of Connellsville coke are running at only about 340,000 to 350,000 tons a week, that is a gain of about 100,000 tons a week over the average in the early weeks of the year, and there is aid from some by-product ovens that have been completed and put in operation. The beehive coke produced, moreover, is of better quality. When car supplies were so irregular coke frequently had to be held in ovens 96 hours and longer, at the expense of quality.

New by-product coke ovens completed since the first of the year represent about 1,600,000 net tons of coke a year. Ovens to be completed in the next two or three months represent about 4,750,000 tons a year. Three additional contracts have just been let, involving ovens that will be rushed to completion as rapidly as possible, the three projects being 128 ovens at Clairton, in addition to the 640 ovens now almost completed, and which will begin making coke next month; 300 ovens for the Jones & Laughlin Steel Sompany, Pittsburgh, and 110 ovens for a merchant plant at Fairmont, W. Va., the three plants having a total capacity of about 2,150,000 tons a year.

These and the other by-product coking plants can be counted upon to operate practically full next winter. Interruptions to coke supply last year were a matter of transportation, chiefly of [illegible] coke from beehive ovens. Two points are in favor of the by-product ovens, that the government is vitally interested in getting the by-products, and that the by-product plants can store coal in large quantities while with few exceptions they are located adjacent to the blast furnaces they serve. Thus it looks as though restriction in iron and steel production from shortage of coke is about ended and is not going to return. There has been very little restriction in output from any other cause.

### New Price Regulations

Within the past few days changes have been announced by the Institute committee in charge of iron and steel prices. These relate chiefly to differentials for charcoal iron and silicon irons, and to extras for certain descriptions of tin plate and formed sheets. One important thing, however, is strictly new, and that is the adjusement of the band situation, which the hoop and band mills have claimed right along was very badly handled in the original price fixing. Bands had formerly been sold, as a rule, at the same base price as merchant steel bars, having of course their own list of extras. Hoops were sold at a separate base price, with their own extras, running from 13 gauge up, while the band card ran from 12 gauge down. The original prices fixed were 2.90c for both bars and bands, and 3.50c for hoops. This made it that 12-gauge bands were placed very much lower than 13-gauge hoops, and for a time at least the mills practically refused to sell bands. There is some reason to believe that they sold a material not visually distinguishable from bands, but designated by a different name and with a price that was derived from the hoop base price.

Under the new ruling hoops and bands are both put at the base price of 3.50c, with a new card covering all gauges. From 13-gauge up this card is practically identical with the old hoop card, while 12-gauge down it is practically identical with the old band card, minus 20 cents per 100 pounds, or $14 a ton. Thus, in substance, the base price of bands has been advanced $12 a ton and the extras reduced $4 a ton, making an advance of $8 a ton. There are some slight divergences, but in general these figures represent what has occurred.

### Steel Supplies

There is no improvement in supplies of steel for ordinary commercial purposes. One cannot place new orders for steel, or secure deliveries of steel already on order, unless there is involved either a war order or an activity that will clearly aid very materially in prosecuting the war. There is quite a free distribution to industries that have already been given a clear preference, including the oil trade generally and the agricultural implement makers.

The joint committee appointed May 17, representing the government and the steel makers, is hard at work endeavoring to improve the situation and in particular to secure the fullest information

Continued on page 64.

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago | 37 50 |
| Standard low phos., Philadelphia | ..... |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 32 00 |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | | ..... |
| Victoria | | 50 00 |

## FINISHED IRON AND STEEL

| Per lb. to Large Buyers. | Cents |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 5 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 5 75 |
| Chequered floor plate, 3-16 in. | 12 20 |
| Chequered floor plate, ¼ in. | 12 00 |
| Staybolt iron | 8 50 |
| Bessemer rails, heavy, at mill | .... |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | *3 50 |
| F.O.B., Toronto Warehouse | |
| Steel bars | 5 50 |
| Small shapes | 5 75 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

## FREIGHT RATES

Pittsburgh to Following Points

| | Per 100 lbs. C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 38.1 | 50.5 |
| Halifax | 39.1 | 51.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

## METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $30 00 | $28 50 |
| Electro copper | 30 00 | 28 50 |
| Castings, copper | 29 00 | 28 00 |
| Tin | 135 00 | 125 00 |
| Spelter | 10 00 | 9 50 |
| Lead | 9 50 | 8 50 |
| Antimony | 15 00 | 16 00 |
| Aluminum | 50 00 | 50 00 |

Prices per 100 lbs.

## PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¼ to ½ | $ 9 00 | $10 00 |
| Heads | 9 65 | 10 25 |
| Tank plates, 3-16 in. | 9 50 | 10 10 |

## WROUGHT PIPE

Effective Feb. 5, 1918.

| | Black | Galvanized |
|---|---|---|
| Standard Buttweld | Per 100 feet | |
| ⅛ in. | $ 6 00 | $ 8 00 |
| ¼ in. | 5 16 | 7 29 |
| ⅜ in. | 5 16 | 7 29 |
| ½ in. | 6 55 | 8 12 |
| ¾ in. | 8 28 | 10 41 |
| 1 in. | 12 24 | 15 39 |
| 1¼ in. | 16 56 | 20 82 |
| 1½ in. | 19 80 | 24 89 |
| 2 in. | 26 64 | 33 49 |
| 2½ in. | 42 72 | 53 53 |
| 3 in. | 55 85 | 70 00 |
| 3½ in. | 70 84 | 87 86 |
| 4 in. | 83 93 | 104 10 |
| Standard Lapweld | | |
| 2 in. | $ 29 60 | $ 36 08 |
| 2½ in. | 44 46 | 54 70 |
| 3 in. | 58 14 | 71 53 |
| 3½ in. | 72 68 | 90 62 |
| 4 in. | 86 11 | 107 37 |
| 4½ in. | 97 79 | 122 56 |
| 5 in. | 114 00 | 142 82 |
| 6 in. | 147 80 | 185 28 |
| 7 in. | 192 80 | 241 57 |
| 8 L in. | 202 50 | 253 75 |
| 8 in. | 233 30 | 292 32 |
| 9 in. | 279 50 | 350 18 |
| 10 L in. | 259 20 | 324 80 |
| 10 in. | 333 70 | 418 18 |

Prices—Ontario, Quebec and Maritime Provinces.

## WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

## OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 22 50 |
| Copper, heavy | 22 50 | 22 50 |
| Copper wire | 22 50 | 22 50 |
| No. 1 machine composition | 22 00 | 21 50 |
| New brass cuttings | 16 00 | 14 00 |
| Red brass turnings | 18 00 | 17 00 |
| Yellow brass turnings | 12 50 | 12 50 |
| Light brass | 10 00 | 9 50 |
| Medium brass | 12 00 | 12 00 |
| Heavy brass | 15 00 | 14 00 |
| Heavy melting steel | 24 00 | 21 00 |
| Steel turnings | 12 00 | 12 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 27 00 | 20 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 23 00 |
| No. 1 machine cast iron | 34 00 | 30 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 22 00 | 17 00 |
| Car wheels, iron | 26 00 | 30 00 |
| Steel axles | 38 00 | 35 00 |
| Mach. shop turn'gs | 9 00 | 8 50 |
| Cast borings | 12 00 | 12 00 |
| Stove plate | 19 00 | 19 00 |
| Scrap zinc | 6 00 | 6 50 |
| Heavy lead | 7 00 | 7 00 |
| Tea lead | 5 00 | 5 75 |
| Aluminum | 21 00 | 20 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, ⅝" and less | 10 |
| Carriage bolts, 7-16 and up | net |
| Coach and lag screws | 25 |
| Stove bolts | 55 |
| Plate washers | List plus 20 |
| Elevator bolts | 5 |
| Machine bolts, 7-16 and over | net |
| Machine bolts, ⅝ and less | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | 10 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | add 25 |
| Nuts, square blank | add $1 50 |
| Nuts, square, tapped | add 1 75 |
| Nuts, hex., blank | add 1 75 |
| Nuts, hex., tapped | add 2 00 |
| Copper rivets and burrs, list plus | 30 |
| Burrs only, list plus | 50 |
| Iron rivets and burrs | 25 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 57½ |
| Wood screws, O. & R., brass | 32½ |
| Wood screws, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

## MILLED PRODUCTS

| | Per Cent. |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil. Head Cap Screws | net |
| Flat But. Hd. Cap Screws | plus net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. & Semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2 in. | plus 10 |
| Studs | net |
| Taper pins | 40 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | list plus 20 |
| Collar screws | list plus 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | 65 |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add 7 00 |

## BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $47 50 |
| Open-hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.

F.O.B. Pittsburgh.

## NAILS AND SPIKES

| | | |
|---|---|---|
| Wire nails | $5 25 | $5 20 |
| Cut nails | 5 70 | 5 65 |
| Miscellaneous wire nails | | 60% |
| Spikes, ⅜ in. and larger | | $7 50 |
| Spikes, ¼ and 5-16 in. | | 8 00 |

## ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 41 |
| Plumbers' oakum, per lb. | 8½ |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila rope | 0 33 |
| New Zealand hemp | 0 33 |
| Transmission rope, Manila | 0 45 |
| Cotton rope, ¼-in. and up | 62¼ |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | net |

### MISCELLANEOUS

| | |
|---|---|
| Solder, [illegible] | 0 50 |
| Solder, [illegible] | 0 58 |
| Babbitt metals | 18 to 70 |
| Soldering coppers, lb | 0 58 |
| Lead wool per lb | 0 16 |
| Putty, 100-lb. drums | 4 75 |
| White lead, [illegible] cwt | 16 05 |
| Red dry lead, 500-lb. kegs, per cwt. | 15 50 |
| Glue, English | 0 35 |
| Tarred slater's paper, roll | 0 95 |
| Gasoline, per gal., bulk | 0 33 |
| Gasoline, per gal., bbls | 0 32 |
| Pure turpentine, single bbls., gal. | 0 71 |
| Linseed oil, raw, single bbls | 1 95 |
| Linseed oil, boiled, single bbls | 1 98 |
| Plaster of Paris, per bbl. | 2 50 |
| Sandpaper, B & A | list plus 20 |
| Emery cloth | list plus 20 |
| Sal Soda | 0 03½ |
| Sulphur, rolls | 0 05 |
| Sulphur, commercial | 0 04½ |
| Rosin "D," per lb. | 0 03 |
| Rosin "G," per lb. | 0 03½ |
| Borax crystal and granular | 0 12 |
| Wood alcohol, per gallon | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

### CARBON DRILLS AND REAMERS

| | Per Cent. |
|---|---|
| S.S. drills, wire sizes up to 52 | 40 |
| S.S. drills, wire sizes, No. 53 to 80 | 40 |
| Standard drills to 1½ in. | 40 |
| Standard drills, over 1½ in. | 40 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 |
| Bit stock | 40 |
| Ratchet drills | 15 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 40 |
| Screws | 40 |
| Taper pin reamers | net |
| Drills and countersinks...list plus | 40 |
| Bridge reamers | 50 |
| Centre reamers | 10 |
| Chucking reamers | net |
| Hand reamers | 10 |
| High speed drills, list plus | 75 |
| High speed cutters, list plus | 40 |

### COLD ROLLED SHAFTING

| | |
|---|---|
| At mill | list plus 40% |
| At warehouse | list plus 50% |

**Discounts off new list. Warehouse price at Montreal and Toronto**

### IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 8 00 | $ 7 75 |
| Sheets, black, No. 10 | 10 00 | 9 50 |
| Canada plates, dull, 52 sheets | 9 00 | 8 65 |
| Can. plates, all bright. | 9 50 | 9 50 |
| Apollo brand, 10¾ oz. galvanized | ..... | ..... |
| Queen's Head, 28 B.W.G. | ..... | ..... |
| Fleur-de-Lis, 28 B.W.G. | ..... | ..... |
| Gorbal's Best, No. 28 | ..... | ..... |
| Colborne Crown, No. 28 | ..... | ..... |
| Premier, No. 28 U.S. | ..... | 8 70 |
| Premier, [illegible] oz. | ..... | 9 00 |
| Zinc sheets | 20 00 | 20 00 |

### PROOF COIL CHAIN

B

¼ in., $12.35; 5-16 in., $11.85; ⅜ in., $11.50; 7-16 in., $10.90; ½ in., $11.20; $11.00; ⅝ in., $10.90; 1 inch, $10.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $15.50; 3-16 in., $11.70; ¼ in., $8.40; 5-16 in., $7.40; ⅜ in., $6.35; 7-16 in., $6.35; ½ in., $6.35; ⅝ in., $6.35; ¾ in., $6.35.

Prices per 100 lbs.

### FILES AND RASPS.

| | Per cent. |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 40 |
| Black Diamond | 40 |
| J. Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 37½ |
| Disston | 50 |
| Whitman & Barnes | 50 |

### BOILER TUBES.

| Size | Seamless | Lapwelded |
|---|---|---|
| 1 in. | $36 00 | $..... |
| 1¼ in. | 40 00 | ..... |
| 1½ in. | 43 00 | 36 00 |
| 1¾ in. | 43 00 | 36 00 |
| 2 in. | 50 00 | 36 00 |
| 2¼ in. | 53 00 | 38 00 |
| 2½ in. | 55 00 | 42 00 |
| 3 in. | 64 00 | 50 00 |
| 3¼ in. | ..... | 58 00 |
| 3½ in. | 77 00 | 60 00 |
| 4 in. | 90 00 | 75 00 |

Prices per 100 ft., Montreal and Toronto.

### OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | |
| Royalite, per gal., bulk | 18 |
| Palacine | 21 |
| Machine oil, per gal. | 26½ |
| Black oil, per gal. | 15 |
| Cylinder oil, Capital | 49½ |
| Cylinder oil, Acme | 39½ |
| Standard cutting compound, per lb. | 0 06 |
| Lard oil, per gal. | $2 60 |
| Union thread cutting oil antiseptic | 88 |
| Acme cutting oil, antiseptic | 37½ |
| Imperial quenching oil | 39½ |
| Petroleum fuel oil | 13½ |

### BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30-5% |
| Standard | 40% |
| Cut leather lacing, No. 1 | 1 95 |
| Leather in sides | 1 75 |

### TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 06 |
| Emery glue | 15 to 20 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 35 |

Prices Per Lb.

### ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | .08½ |
| Grits, 80 and finer | .06 |

### BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 38 |
| Brass sheets, 24 gauge and heavier, base | 0 43 |
| Brass tubing, seamless | 0 46 |
| Copper tubing, seamless | 0 48 |

### WASTE.

| White. | | | Cts. per lb. |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 18½ |
| Peerless | 21 | X Empire | 17¼ |
| Grand | 19¾ | Ideal | 17¼ |
| Superior | 19¾ | X press | 16 |
| X L C R | 18½ | | |

**Colored.**

| | | | |
|---|---|---|---|
| Lion | 15 | Popular | 12 |
| Standard | 13½ | Keen | 10½ |
| No. 1 | 13½ | | |

**Wool Packing.**

| | | | |
|---|---|---|---|
| Arrow | 25 | Anvil | 15 |
| Axle | 20 | Anchor | 11 |

**Washed Wipers.**

| | | | |
|---|---|---|---|
| Select White. | 11 | Dark colored. | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING.

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

### ANODES.

| | |
|---|---|
| Nickel | .50 to .54 |
| Cobalt | 1.75 to 2.00 |
| Copper | .44 to .46 |
| Tin | .49 to .56 |
| Zinc | .23 to .25 |

Prices Per Lb.

### COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | 42 50 | 43 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 46 00 | 44 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 48 00 | 48 00 |
| Copper sheet, planished, 16 oz. base | 57 00 | 45 00 |
| Braziers,' in sheets, 6x4 base | 45 00 | 44 00 |

### LEAD SHEETS.

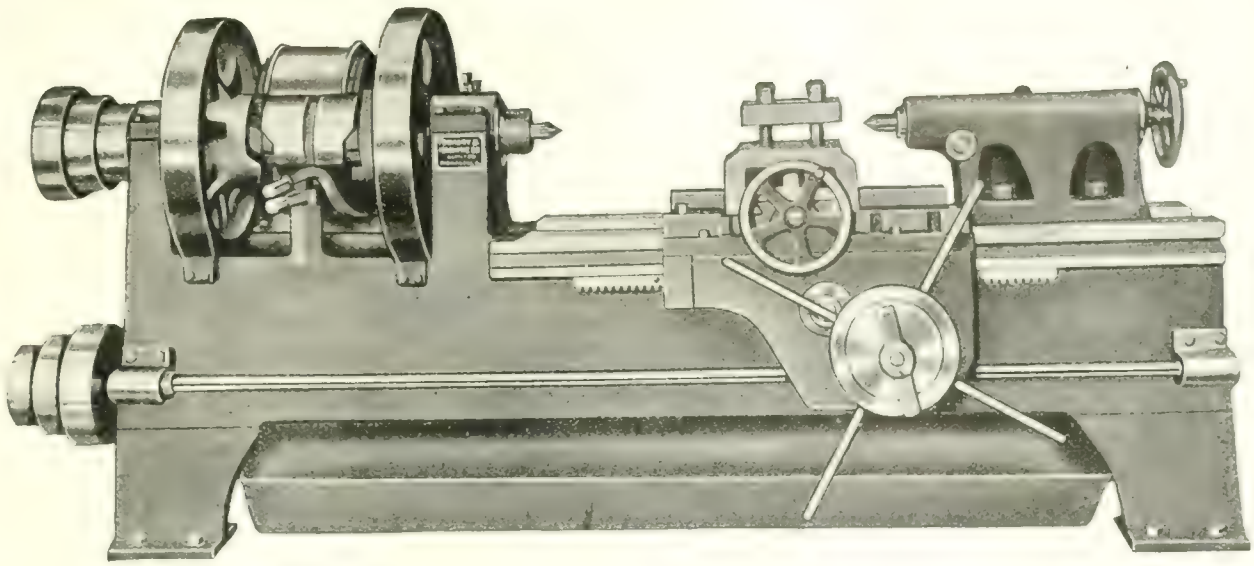
| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $13 25 | $13 25 |
| Sheets, 3½ lbs. sq. ft. | 13 25 | 13 25 |
| Sheets, 4 to 6 lbs. sq. ft. | 12 50 | 12 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS.

| | |
|---|---|
| Acid, boracic | $ .15 |
| Acid, hydrochloric | .05 |
| Acid, hydrofluoric | .14½ |
| Acid, nitric | .10 |
| Acid, sulphuric | .05 |
| Ammonia, aqua | .08 |
| Ammonium carbonate | .15 |
| Ammonium, chloride | .11 |
| Ammonium hydrosulphuret | .40 |
| Ammonium sulphate | .07 |
| Arsenic, white | .12 |
| Copper, carbonate, anhy | .35 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .70 |
| Iron perchloride | .20 |
| Lead acetate | .16 |
| Nickel ammonium sulphate | .12 |
| Nickel carbonate | .35 |
| Nickel sulphate | .15 |
| Potassium carbonate | .75 |
| Potassium sulphide (substitute) | .20 |
| Silver chloride (per oz.) | .65 |
| Silver nitrate (per oz.) | .55 |
| Sodium bisulphite | .10 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .41 |
| Sodium hydrate | .04 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | .14 |
| Tin chloride | .60 |
| Zinc chloride | .60 |
| Zinc sulphate | .09 |

**Prices per lb. unless otherwise stated.**



# *Speed Up Production*

## *with the*

# MONTREAL LATHE

for the economical production of 4.5", 6" and 155 MM. shells. If you are interested in obtaining maximum production at minimum labor expense, investigate the records of the MONTREAL lathe in plants of the largest producers of shells in Canada.

The MONTREAL lathe is wonderfully simple in operation and construction, yet every worth while improvement has been embodied in the design.

A powerful machine—designed to transmit all the power that the cutting tools will stand—with large broad ways, liberal wearing surfaces and unbreakable apron. The MONTREAL lathe comes to you equipped as you need it—with carriage for rough turning —with rigid single bar for boring, or with swivelling bar for inside profiling.

***Write Now for Prices and Delivery.***

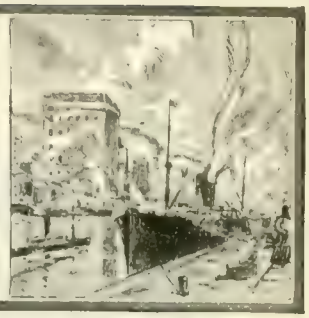
## The A. R. Williams Machinery Co.

LIMITED

**64 Front Street West - . - TORONTO**

# INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES



## ENGINEERING

Chatham, Ont.—W. H. Westman, of this city, has recently purchased the Exeter Mfg. Co., of Exeter, Ont., and [illegible] parts of the plant to Chatham. He will sell the balance of the machinery. The equipment that will be moved to Chatham will be installed at the Chatham Malleable & Steel Co.'s factory, of which Mr. Westman is the proprietor.

## MARINE

**Washington.**—Prohobition of the use of fuel oil for private yachts for the duration of the war is under consideration by the fuel administration.

**Port Arthur.**—Workmen at the Port Arthur Shipbuilding Company's plant broke the Canadian record for keel laying. Exactly two minutes after the rope was cut which launched the Osiris, three plates of the keel of an ocean-going freighter had been put in place on the blocks vacated by the other vessel.

**Washington.**—Ten steel ships of 58,850 aggregate tonnage were completed and delivered to the Emergency Fleet Corporation durin the past week and fourteen others, some wood and some steel, of 43,000 tons, were launched. On Saturday four wooden ships left the ways, the third time during the present month when four vessels of this type were launched in a single day. The total number of wooden ships launched in May to date is 22.

**Vancouver.**—In obedience to the order of the Metal Trades' Council, the shipyard workers, said by union officials to number nearly ten thousand, quit work in British Columbia shipyards. The purpose of the strike, the union officials announced, is to compel the Imperial Munitions Board to grant a scale of wages equal to that in effect in the United States and a forty-four-hour week. A payroll estimated at from $40,000 to $60,000 a day is cut off.

**Sarnia.**—An order was received by MacKenzie, Milne & Co., from the Canadian Government for 100 life rafts to be used on transports out of Montreal. The rafts are now being manufactured at their new premises near the ferry dock and a number of extra men are employed in the work. The concern is also [illegible] lifeboats for the French Government and Canadian shipbuilding concerns.

**Victoria.**—At a meeting of the metal trades council here it was decided to continue the strike in the shipyards until a satisfactory settlement between the workers and the employers in reached. Leaders of the returned soldiers of the city offered the services of returned men to carry on work in the shipyards of Victoria. They stipulated they were willing to work at the existing rate of wages, and as many of them as were available and qualified for the different trades would be ready to report at the yards on Monday morning. As the yards are to be thrown open on Monday and on all the government work an open shop prevails, these returned soldiers who report for duty will be given employment if they are fitted for the work. Last night armed guards patrolled the assembly plant at Ogden Point, where five ships are having their machinery installed.

## MUNICIPAL

**Halifax.**—At a special meeting of the City Council, it was decided to purchase from Watson, Jack and Company, Ltd., of Montreal, a 900-gallon combined flusher and sprinkler, to be used on the streets of the city, in an endeavor to overcome the dust nuisance.

**Chatham, Ont.**—W. H. Westman, chairman of the Industrial Committee of the Board of Trade, reports that there are one or two buildings available in this city, at low prices, suitable for manufacturing purposes. Mr. Westman says that there is a good opening here for a foundry.

**Dunnville.**—A vote is being taken of the ratepayers on the question of fixing the assessment of the Monarch Knitting Co., Ltd., at $100,000 for a period of ten years. Ground has been broken by this company for a new smoke stack, 150 feet high and 20 feet across the base. The Foundation Co. will do the work.

**Brantford.**—A variety of matters occupied the attention of the Brantford City Council. The monarch Tractor Co., Ltd., received a ten year's fixed assessment of $18,000, exclusive of business assessment, and the Waddell Preserving Co. one of $10,425, subject to their completing improvements now under way.

**Ottawa.**—The "Journal Press says: "A serious situation has arisen in connection with the city's effort to obtain a supply of slab or mill-wood. Practically all the available mill-wood in the Ottawa district has been bought up by private wood dealers, the majority of whom, it is reported, will not sell to the citizens now, but are holding it until it is dry, when it will command a higher price.

As a result of this state of affairs the city is taking upon itself the responsibility of asking the government to institute an order whereby the control of the supply and price of mill-wood will be placed in the hands of the Dominion Fuel Controller.

## PERSONAL

**Ashmore Kennedy,** of Winnipeg, was re-elected assistant grand chief of the Brotherhood of Locomotive Engineers for a six-years' term.

**Capt. Sidney M. Johnson,** late of the 110th Battalion, was appointed as acting city engineer of Stratford during the absence of A. B. Manson on military duty.

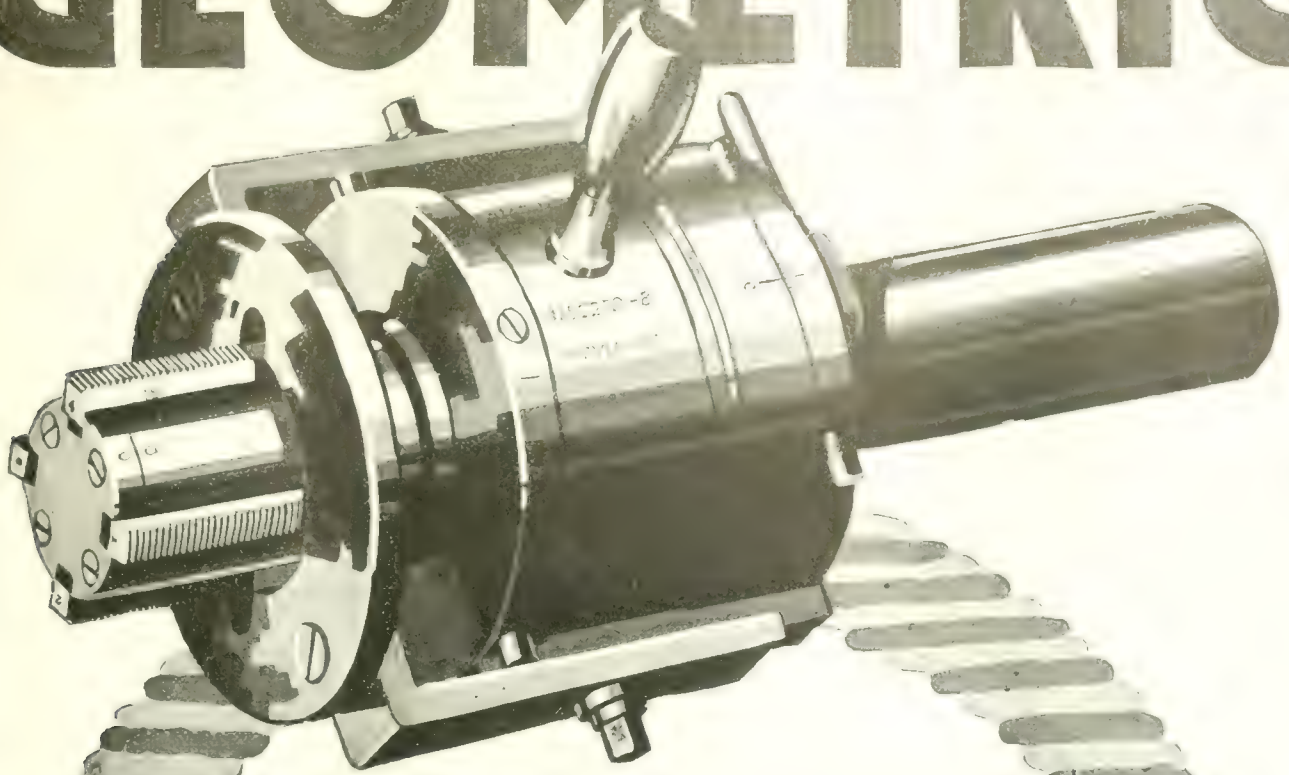
**Chas. Watt,** formerly superintendent of the shell department of the Canada Stove and Foundry Company, has accepted a position as salesman with the Foss Machinery and Supply Co. of Montreal.

**P. O. D. Burke** has been appointed inspector for the New Brunswick board of fire underwriters and will inspect sprinkler equipment and electrical installations throughout the province. He was formerly in the employ of the Nova Scotia Steel Company at Sydney Mines and came to New Brunswick as successor to Simon Skidmore, who was employed by the underwriters to inspect sprinkler installations, and who resigned to take up a position in Montreal on May 1. Mr. Burke, who is an expert electrician, will look after all special risks. Eventually he will inspect electrical wiring in the towns in the province.

**T. A. Summerskill,** one of the best known railway mechanical engineers in Canada passed away after a brief illness on Thursday, at his residence in Westmount.

Mr. Summerskill was born in Great Grimsby, England, and came to Canada when a young boy, entering the service of the Grand Trunk Railway in 1872. After serving his apprenticeship in the mechanical department he spent some years with the company, engaged in the production of a new type of locomotive then being developed. Later he became

# GEOMETRIC



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Geometric Collapsing Taps share the popularity of Geometric Die Heads. They have the same good reputation for tapping inside threads that the Die Heads have for cutting outside threads. All objections of a solid tap are overcome in the Geometric Collapsing Tap. They are as rigid as solid taps while cutting, but collapse the chasers automatically when the required depth of thread has been cut. Are adaptable to Screw Machine, Turret Lathe or Live Spindle. Made in sizes suited to any diameter above ¾-inch in straight threads or standard pipe thread sizes.

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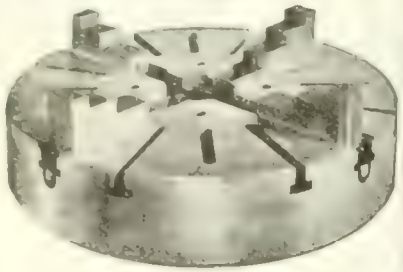

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connected with the Canadian Pacific Railway, then nearing completion, first at Carleton Place and then at Westward, organizing the mechanical departments and water supplies at different points along the line. Mr. Summerskill then became mechanical superintendent of the Manitoba and Northwestern, which position he held for a number of years, and again returned to the Grand Trunk as mechanical superintendent of the Central Vermont Railway at St. Albans, Vermont. After spending several years in this capacity he severed his connection with railway work and became a general mechanical expert, and as such gained an enviable reputation in Canada as well as in the United States. At the time of his death Mr. Summerskill was connected in an advisory capacity with the Canadian Car and Foundry Co., Limited.

## RADE GOSSIP

**Will Erect Foundry.**—Darling Bros., of Montreal, have broken ground for their new foundry, which will be located on the site of their old building on Ottawa Street.

**To Make Pumps.**—Peacock Bros., of Montreal, have acquired a two-storey brick building on Delorimer Avenue, and are installing equipment for the manufacture of various types of Weir pumps.

**Wants Market for Fire Bricks.**—A Scotch firm, manufacturing fire bricks, desires to get into touch with Canadian users of these products. (Address British Trade Commissioner in Canada, 367 Beaver Hall Square, Montreal, referring to British Trade Inquiry No. 2989.)

**Gauge glasses, lubricators, etc.**—An English firm of manufacturers wishes to communicate with Canadian importers of gauge glasses and lubricators. (Address British Trade Commissioner in Canada, 367 Beaver Hall Square, Montreal, referring to British Trade Inquiry No. 2990.)

**Can Ship Now.**—Messrs. B. Enushevsky & Son, 536 Queen street E., Toronto, announce that they are now in a position to make prompt shipments on the various sizes of steel and iron shafting, of which they carry a large and miscellaneous stock.

**Increase Capacity.**—The St. Lawrence Welding Co. of Montreal have taken over the adjoining property on Inspector Street, which will treble the capacity of their previous plant. In addition to their regular activities in oxy-acetylene and electric welding, they have recently installed a thermit welding plant.

**Building Addition.**—An addition is being erected to the plant of the Gray Mfg. & Machine Co., at 686 St. Clarens Avenue, Toronto, of two-storey steel and brick construction, 37 ft. x 72 ft., at a cost of $15,000. A travelling crane is being installed and the firm will be better equipped to manufacture their lines of lathes, thread millers, shell blasts, etc. The building is to be finished in five weeks' time.

**Will Wind Up Contracts.**—Having been engaged, since the fire, in a temporory plant in the rear of the destroyed buildings, on finishing up shells rescued from the fire, and also on the unfinished material from the plant of the Western Machinery Company, of Port Arthur, which company assigned the Copp Company expects to finish all work by the end of June, after which there will be no shell manufacturing plant in either Port Arthur or Fort William.

**Big Shell Orders.**—Announcement was made by the Motor Trucks Company, of Brantford, of the acceptance of an order for the manufacture of 9.5 and 4.7 high-explosive shells. The contract approximates an outlay of $7,000,000, and necessitates new buildings and equipment at a cost of $1,000,000. The buildings have to be completed in 45 days The firm will employ 800 men and women on the completion of the contract, the time limit for which has been set for January, 1920. The company is just finishing up a big contract for the manufacture of 4.5 shells.

**Knotty Point Settled.**—A very important judgment and order has been issued by the Dominion Railway Commission, whereby the inter-switching order has been extended to cover team track deliveries on the various railways. The order, which covers the entire Dominion, becomes effective July 1 next. Heretofore deliveries under the order have been confined to industrial and private sidings. The additional charge for the inter-switching service remains, as at present, in so far as the industrial and private sidings are concerned, but an additional charge will be made for service for team track deliveries. The matter has been hanging fire for several years. There has been more or less trouble with respect to the interpretation of the "inter-switching order," but there is no doubt as to the interpretation of the new order, every clause of which is laid out in detail. Provision is also made for the future at all points where inter-switching tracks may be installed.

**Red Tape Abolished.**—An unusually interesting order-in-council was recently passed at Ottawa; interesting in that it eliminates a lot of unnecessary red tape, and does away with an apparent discrimination against the Canadian machinery maker. Since early in November, 1916, all shipbuilders have been granted a drawback of ninety-nine per cent. of the customs' duty allowed on imported materials used in the construction of ships. This worked very well for the shipbuilder, but the man who sold him machinery in Canada could not get a draw-back until the shipbuilder had completed his boat, delivered it, received the money and then made an application

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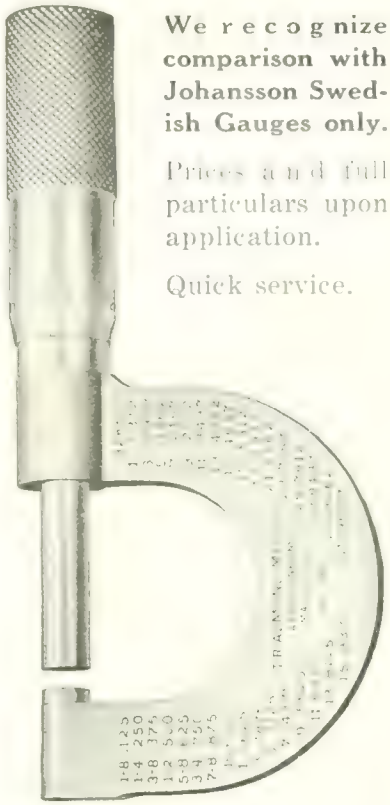
If you want reliable, high quality micrometers specify "Almond." We can suit any requirement and are exceptionally well equipped to make prompt deliveries.

Almond Micrometers are made English measurements 1, 2 and 3-inch by thousands and ten thousands; metric measurements 25-50 and 75 m m by 1 000 m m. With or without Ratchet Stop.

ALMOND MICROMETER HEADS — For attaching to machines and tools where fine adjustments are necessary.



**We recognize comparison with Johansson Swedish Gauges only.**

Prices and full particulars upon application.

Quick service.

**T. R. Almond Manufacturing Co.**

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## *For Rapid Production and Accurate Work*

USE THE

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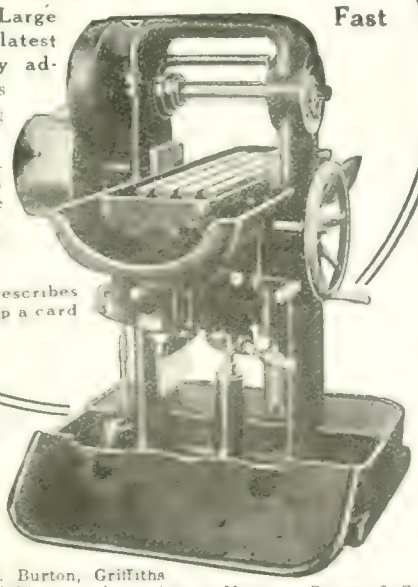
**The Briggs Miller handles work no other machine of its size can touch.** It is a manufacturing machine. On account of its rigid construction it will produce accurate work when running at a high rate of speed and feed.

**The Base Tank and Large Gear Pump is the latest addition to its many advantages.** Tank holds 20 gallons of cutting lubricant

Pump never requires priming and will deliver ten gallons per minute to the cutters, keeping them cool when running at very high speed.

Our booklet describes fully. Drop a card for it.



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Great savings in man-power and money can be effected by the use of small cars for the rapid and easy handling of materials around factory, warehouse or yard.

We manufacture a large range of these small cars for moving any kind of commodity.

We make these cars to order only, and to the customer's specifications, to suit his shop and the class of material he desires to move. We make them for any gauge of track, or for running on a floor.

We offer in these cars a choice of

Steel Frame or Wood Frame.
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ed for heavy duty, or unchilled for light work.

We also make TURNTABLES to suit custom-

**Marsh Engineering Works, Ltd.**

Established 1846

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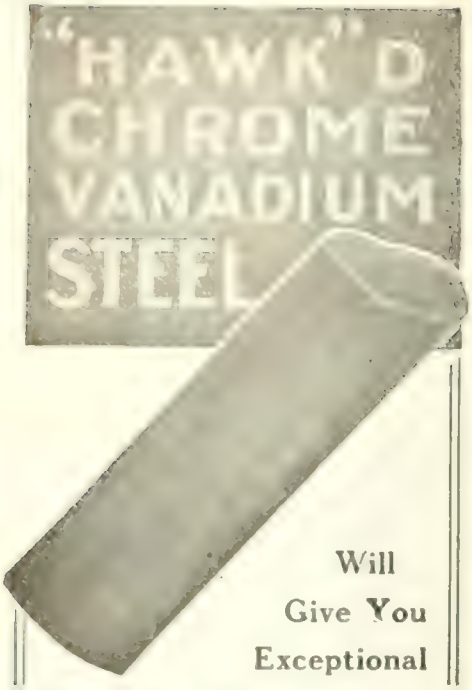


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**Shell Forging Production**

WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat treated and ready for use.

It does not stick to the work.

There are many cases where each punch has turned out over 2,000 shells.

It means more shells, per machine per day.

STEEL OF EVERY DESCRIPTION.

**Hawkridge Brothers Company**

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Owen Sound Iron Works
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Engineers
Boiler-makers
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Tank Work
Smoke Stacks,
Grey Iron and
Brass Castings,
Special
Machinery
Made to
Order


bersome and costly, that the shipbuilder found it far easier to buy machinery direct from the United States and take the Canadian machinery man had, apparently of necessity, to charge the full price, including duty.

## CATALOGUES

**Hydraulic Valves and Fittings.**—A new catalogue of hydraulic valves and fittings has just been issued by the Hydraulic Press Mfg. Co., of Mount Gilead, Ohio. The book is quite elaborate in make up and presents the complete H.P.M. line very attractively. The four general classes of hydraulic valves are clearly illustrated and described. These are operating, check, knock-out and safety. Every standard type of hydraulic fitting is also listed, also accumulator controls, pressure gauges, hydraulic pipes, etc. Many of these hydraulic devices are of improved design and are here published for the first time. Interested parties may obtain copies from the above address.

THE initial flights of the French Government's aerial postal service will be between Marseilles and Nice and Ajaccio, and that there will be daily flights in both directions. Later a service between Paris and London is to be considered.

### MARKET DEVELOPMENTS

Continued from page 580.

bearing on steel supplies and requirements. It is considering the various war requirements, which hitherto have been stated chiefly in terms of the total tonnage required, and the kind of steel it will require to consume each batch of steel and thus it is hoped to arrive at an idea of how much steel per month will be required for the direct war activities. With a study likewise of probable supplies, it will be shown in a measure how much steel will likely be left and it will then be possible to determine how far it will be necessary to go in regulating the distribution of steel, whether it will be necessary to allocate all the remainder to industries that are helpful in winning the war, in the order of their helpfulness.

The steel trade continues to entertain expectations that in the long run there will be enough steel for most of the commercial industries, and certainly for all that can show that they are distinctly helpful in an indirect way to the war work. The jobbers, who were getting somewhat better supplies a month or two ago, have lately been practically shut off, but they are likely to have much better service in the near future, as it is recognized that they have in large part depleted their stocks through furnishing material used in filling war orders, but without getting credit for such steel, by way of priorities for fresh deliveries from the mills.

## DENY REPORT OF TAKING OVER PLANTS

**Steel Output is Increasing Rapidly and Results Are Satisfactory**

Special to CANADIAN MACHINERY.

NEW YORK, May 28th.—As a result mittee of the War Industries Board and representatives of the steel manufacturers held last Monday, practically all shipments of the output of the steel mills have been shipped on government contracts. It had been shown by the Director of Steel Supplies that approximately 2,000,000 tons had been added to the needs of the U. S. and its Allies since April 26th, when Mr. Replogle estimated that war requirements would take up capacity of the steel plants during the last eight months of this year based upon production equal to the average output during first quarter of this year.

In the last two months, as previously noted, output of both pig iron and steel has increased so that to-day the plants are operating at the rate of nearly 44,000,000 tons of ingots, 33,000,000 tons of rolled steel products and 42,000,000 tons of pig iron a year. Upon this basis, the steel companies will produce approximately 22,000,000 tons of rolled steel products from May to December, inclusive.

**The Priority Plan**

The government insists that war needs will absorb the entire output of the plants whatever it may be this year. Steel manufacturers, while accepting the government view that it will need 22,000,000 tons of rolled steel believe that if shipments can be made in definite tonnages on a monthly basis that all the war requirements can be satisfactorily met and still leave a moderate tonnage applicable to commercial consumers' contracts and that deliveries can be extended well into 1919.

Word was received from Washington last Wednesday that an official statement had been made at a war council that the government would take over all of the steel and would regulate the distribution of such tonnages as were not required for war purposes. This statement was interpreted to mean that the government was about to commandeer all of the steel plants, but this was promptly denied by Washington authorities.

**Another Arsenal**

Arrangements are being completed for the construction of another government arsenal to be located at Nicetown, Pa., to be constructed, equipped and operated by the Midvale Steel and Ordnance Co., similar to the Neville Island plant to be constructed by the U. S. Steel Corporation. According to trade estimates $50,000,000 will be expended by the government for construction and equipment and about 30,000 tons of steel will be required. For the two plants, at Neville Island and at Nicetown, it is estimated that at least $30,000,000 will be expended on machinery and this will probably be increased by $20,000,000 before the plants are in full operation.

The constant operation of manufacturing plants at full capacity and at high pressure with extra shifts of labor requires the active purchasing of machine tools for replacements as well as [illegible] the continued expansion of war plants calls for the purchase of new tools in large numbers in the aggregate. The Wright-Martin Aircraft Corp., referred to last week, has already purchased $1,500 000 worth of machinery for its Long Island City plant and it is still in the market, having obtained an order from the government for an unlimited number of airplane motors.

Orders for about 400.000 tons of steel, of the 1.000 000 tons required for the building of railroad cars for the government, have been allocated and the balance of the tonnage is now being distributed. Full requirements cover 925.000 tons of bars, plates and shapes, 23.000.000 tons of bolts, 7 000 tons of rivets and 18.000 kegs of wire nails.

Railroads that are now testing the market for structural steel for bridges and repair shops and for machinery are startled by the heavy increase in the cost of machine tools and consequently purchases may not be made to the full extent contemplated. The Central Railroad of New Jersey is revising its list for 100 tools. The Erie and the New York Central have made moderate purchases. The Baltimore & Ohio is building a locomotive repair shop at Glenwood, Pa., requiring 2,500 tons of steel. Specifications are now being issued for the cranes and other machinery needed.

## OPENING OF NEW ADDITION TO C.M.C.

### Ball and Concert Held by Mutual Benefit Association in Galt Extension

Over three hundred persons were in attendance at the ball given by the C. M. C. Mutual Benefit Society at Galt on May 17, the affair taking place in the new addition to the plant. Guests were present from Preston, Hespeler, Kitchener, Hamilton, Guelph, Brantford and Paris. The new building was handsomely decorated for the occasion and an orchestra of some fifteen pieces provided splendid music for the dancing. Previous to this a choice programme was rendered, the numbers being thoroughly enjoyed and heartily encored. T. H. Watson, president of the C. M. C., was chairman of the evening, and in his introductory remarks said: "So great is our confidence in the future prospects of this splendid city that we have erected this addition which after to-night will be the scene of much activity. One thing that is at present a drawback is the lack of houses for the accommodation of our workmen, the majority of whom stayed by us in the most critical period of our history and to whom I express my heartfelt gratitude, and I hope the day will soon come when every employee can have a home of his own."

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PORTABLE PLANERS
DRAW CUT SHAPERS
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Repair parts for Williams type 6-inch Ru-off machines.

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STERILIZED WIPERS
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HOW to tell a GOOD File by the tang

First, understand what we mean by "good." For an ordinary file may, for a time, do fast work on soft material. A file, to be what we term a **good** file, however, must do fast work on the hardest, the toughest material, and continue to do it long after the teeth of a common file would be worn smooth. A file made of

**Crucible Steel**

is the only file able to retain sharp cutting teeth against hard metal.
Therefore, only a crucible steel file meets our idea of a good file.
There is but one line of files from 3 to 24 inches made absolutely of crucible steel, and they're backed by 50 years of file-making experience. You can tell them by this trade-mark on the tang.

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METAL STAMPINGS

We are manufacturers of stamped parts for other manufacturers

We do any kind of sheet metal stamping that you require. Our improved presses and plating plant enable us to produce the finest quality of work in a surprisingly short time.

We can finish steel stamping in Nickel, Brass or Copper.

Send us a sample order.

W. H. BANFIELD & SONS
372 Pape Avenue, Toronto, Can.

BOLTS

Our large stock of Machine Bolts, Rivets and Washers assures quickly filled orders and prompt shipment. One quality only—The Best.
Send a trial order.

LONDON BOLT & HINGE WORKS
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Special Machinery
MADE TO ORDER

Mill Machinery, Engine Work
Grey Iron and Brass Castngs

TRY US FOR GENERAL REPAIRS

ALEXANDER FLECK, LIMITED
Vulcan Iron Works OTTAWA, ONT.

The new addition is up-to-date, bright and well ventilated, with a floor space of 34,798 square feet. It was built by P. H. Secord and Sons at a cost of $50,000.

## DRUMMOND McCALL OPENED NEW OFFICES

### And Improvement Has Also Been Made to the Warehousing Property

The general offices of the Drummond McCall Co., 373 Front Street East, Toronto, were moved this week into the handsome new quarters just completed, immediately in front of their premises. The office fittings, lighting schemes, and general arrangement of the layout are all that could be desired, and will be much more convenient for the carrying on of the business. The old office upstairs, and in the rear of the new one, will still be used for a portion of the work. The new office has a street frontage of about 60 feet and a depth of some forty feet. The exterior is an attractive buff brick design. The same street effect is carried right across the front of the new warehouse, on a frontage of 120 feet, and the whole premises now presents a very attractive appearance.

The warehouse property has a depth of 300 feet, and is fitted with overhead tracks for the lifting and placing of heavy orders. Along the side of the warehouse a large number of concrete pits have been built, to a depth of about six feet. These are used for the purpose of storing tubes, bars, small shapes and sections. In this way a great deal of floor space is conserved, and it is found that the arrangement makes the handling and stock-keeping of this line of goods a much simpler matter.

## EXPORT OF ASBESTOS FROM CANADA TO THE UNITED STATES

THE following procedure in regard to enport of asbestos from Canada to the United States has been agreed to by the Canadian War Trade Board and the United States War Trade Board.

Application for export will be granted by the Canadian War Trade Board on the undertaking to export either the shipment to the Asbestos Trades Bureau or, if shipment is consigned to importer, the bill of lading will be endorsed to the Asbestos Trades Bureau.

Collectors of customs have been notified that a license to export will only be granted when the above procedure is complied with. It is, therefore, not necessary for the exporter to produce United States import license when making application to Canadian War Trade Board for export license.

## TRADE INQUIRIES

THE following inuqiries have been received by the Department of Trade and Commerce, Ottawa. Further particulars may be obtained from the inquiries' branch of the Department.

399. **Machinery for corrugated sheet steel piling.**—A Natal firm of engineers and merchants requests catalogues from Canadian manufacturers of a piling machine to be used on corrugated sheet steel piling, for retaining walls, bridges, etc., in connection with ferro-concrete works. Prices and details regarding delivery are requested with catalogues.

402. **Calcium carbide.** — A South African firm of importers is prepared to take up the Canadian agency of calcium carbide. This firm has stores in each of the principal centres of South Africa.

406. **Catalogues.**—A Durban wholesale hardware firm requests catalogues and price lists from Canadian manufacturers of hardware of all kinds, tools of all kinds, shovels, stoves, enamelware and other iron and steel products, also particulars from Canadian manufacturers of cart and carriage woodenware and iron and steel ware, axes, springs, handles, paints and varnish and other lines suitable for wholesale hardware stores.

410. **Machinery and machinery supplies.**—A Durban firm, specializing in machinery of all kinds, requests catalogues and price lists from engineering firms, on machinery of all kinds and engineers sup'plies, and in a special way on electrical machinery and material.

## SUBSTITUTES FOR TIN PLATES IN ENGLAND

IN the summer of 1917, owing to the shortage of tin plate, steps were taken to find a substitute for packing army jam. After experiment a cardboard container was evolved for the purpose, and manufacture was commenced on a small scale in August.

The use of the container was gradually extended to other supplies than jam, and manufacture developed till at the present time there is an output of more than 3,000,000 containers weekly.

The bulk of these are of 2-pound size, but a proportion are of 1-pound and 5-pound sizes, the three sizes being used as substitutes for tinned packages.

A further great saving of tin plate is anticipated by the use of a large cardboard box of specially prepared material for packing biscuits and dried vegetables, an order for 200,000 of which has just been placed for experimental packing. The use of this box is expected to save at least 100 tons of steel for every 1,000 tons of bixcuits packed.

**Canadian Trade Commissioner at Yokohama, Japan.**—Word has been received that Mr. A. E. Bryan, B.A., recently appointed Canadian Trade Commissioner at Yokohama, Japan, has arrived at his destination and is now actively engaged in the interests of Canadian trade with Japan. Mr. Bryan may be addressed: P.O. Box 109, Yokohama, Japan. Cable address: "Canadian."

ACCORDING to the "Cabinet Maker," the Germans are now using for aeroplane propellers different kinds of wood laminated together, instead of the hard woods, such as mahogany and walnut, which it is the custom to use in this country. Experiments were made as to the resistant power of the propeller made from these common woods, and it was found that, skilfully compacted together as it was, it was as difficult to break as the hardest of our English woods. It must be remembered that the fierce strain necessarily makes the life of the best propeller a comparatively short one, and there is something to be said for the view that the German woodworker may, after all, have been right in getting all that he required out of very cheap timber.


## Hydro Electric Power For Sale

THE Pembroke Electric Light Company has a surplus of 1,200 to 1,500 H.P. Rates approximate $18.00 per H.P. per annum for twenty-four hour service.

Good labor conditions. Liberal inducements to manufacturers. C.P.R., G.T.R., and C.N.R. connections.

Industries requiring female labor especially desired.

Write

The Secretary, Board of Trade
(23) Pembroke, Ont.

## WIRE SPRINGS OF ALL KINDS

Machine Springs, Valve Springs, Automobile Cushion Springs, etc., of a quality that defies competition. Tell us your requirements. Send sample or specification for price.

JAMES STEELE, LIMITED
GUELPH ONTARIO

## JOHN STIRK & SONS, Limited

HALIFAX, ENG.

MACHINE TOOLS

Agents—The A. R. Williams Mcy. Co., Ltd.
Toronto, Winnipeg, Vancouver, St. John, N.B.

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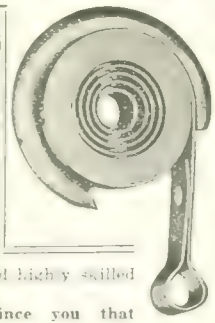

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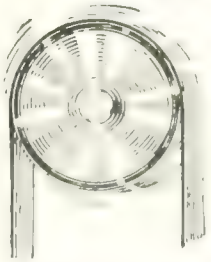

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# CANADIAN MACHINERY

## AND MANUFACTURING NEWS

*A weekly newspaper devoted to the machinery and manufacturing interests.*

Vol. XIX. TORONTO, JUNE 6, 1918 No. 23


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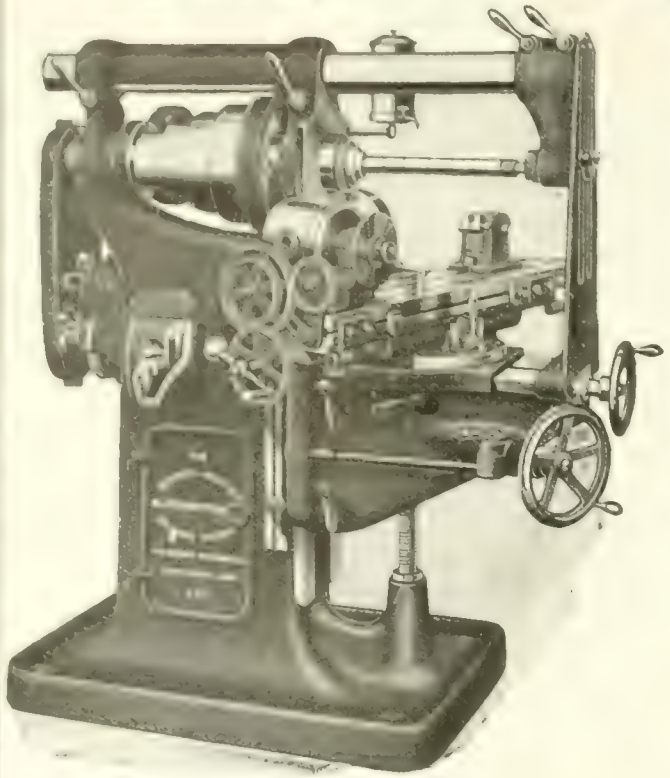
# Anybody Can Operate This Miller



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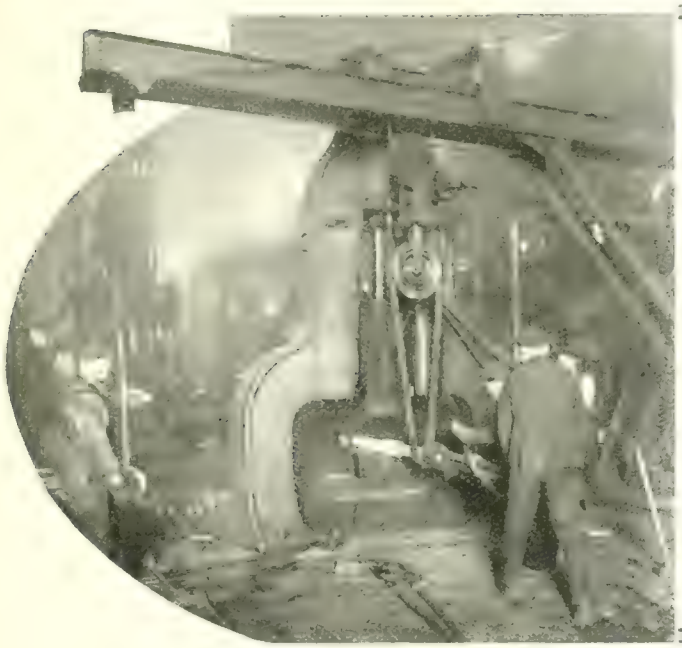

# THE PRODUCTION OF LARGE MARINE FORGINGS

BY A. G. WEBSTER*

**Suitable Equipment Enabled Urgent Work to be Carried Out in Good Shape —Heavy Tonnage and Quick Delivery Requirements Are Features of Marine Products Activity**

ONE of the most interesting industrial developments in Canada since the outbreak of the Great War in 1914 has been the manufacture of marine forgings. With the building of ships on an extensive scale came the demand for material for their construction. It was fortunate therefore that there was a plant in Canada able to undertake this class of work, not only because of the benefits that accrue from having forgings made in the country but also because of the great saving in time owing partly to the fact that the plants in the United States have more work of this character than they can conveniently take care of. To have had to rely on the States for forgings under prevailing conditions would have handicapped the shipbuilders and considerably retarded the rapid construction of merchant vessels.

### Equipped for Heavy Work

A well equipped plant had been operated at Welland, Ont., by the Canada Foundries & Forgings Co., who for some years had produced marine and locomotive forgings, but the former on a comparatively small scale, the demand not having been of the proportions calling for a heavy tonnage output. Despite this it was a matter calling for considerable expense and executive ability to organize the plant and labor, skilled and otherwise, to produce forgings of the kind required, to meet the rigid specifications. It requires skill of a high order to take an ingot of steel weighing 30 tons and reduce it down so that it will machine up clean and true without any undue expenditure of time in machining for removing too much surplus metal. A good and true forging means time saved in machining and consequently lower cost of production.

### Complete Line of Forgings

The Canada Forge Co. manufacture a complete line of marine forgings for both engine and hull, including principally crank shafts and crank ends, line shafts, tail shafts, thrust shafts, rudder frames, stern posts, etc. The steel used in the manufacture of these forgings comes to the plant in the form of ingots or slabs according to the requirements of the work, and is all open hearth basic, of an analysis to meet Lloyd's requirements. It is obtained from firms making the best material, particular attention being paid to this feature in order to ensure uniform results. The ingots from which the larger forgings are made vary from 14 in. to 30 in. diameter, the latter size ingot weighing about 15 tons.

The steel must be free from piping, blow holes, or segregation and carefully selected in regard to chemical analysis. This is the most important factor in the success or failure of forgings to meet the physical specifications prepared by the inspection companies in relation to marine forgings.

### Cutting Off Crop End.

The ingots are shipped to this plant with the crop end. The metal in the bottom end of the ingot is clean and homogenous, so does not need cutting off. The upper or crop end, on the other hand, has to be removed. This is done by first cutting a slot or nick about four inches deep all round the ingot with an oxy-acetylene torch and at a sufficient distance from the end to obtain metal free from piping or

*Associate Editor Canadian Machinery

A 7½ TON INGOT BEING FORGED ON 500 TON HYDRAULIC PRESS. INITIAL STAGE IN FORGING A PROPELLOR SHAFT. FURNACES IN BACKGROUND.

other flaws. The ingot is lifted up by an overhead travelling crane and allowed to fall, to break the crop end off after nick has been cut. The broken end is then carefully examined for piping and if any defects are found, which occasionally happens, two or three more pieces are cut off on a power saw to remove the metal containing the piping. The removal of the crop end is done either before the first forging operation or afterwards, according to the requirements of the case. In large forgings the crop end is usually left on until the other end has been forged because it serves as a very useful balance weight during the forging operation; apart from this it is immaterial when it is cut off.

After being inspected the selected ingots are then carefully heated to a uniform temperature ranging between 1900 degrees and 2150 degrees Fah. and are forged down to the desired size and shape under a William Todd 500 ton hydraulic press, care being taken to do the finishing work upon the forgings when the temperature of the steel is within the "critical range" this ensues fine grain structure which in turn ensures greater ductility than would otherwise result from finishing at higher temperatures. Another important feature is to select ingots large enough so that the sectional area of the body of the forging shall not exceed one-third the sectional area of the original ingot.

### Forging on Large Press

The large forgings and also some of the smaller ones are forged on a 500-ton hydraulic press. This press, it might be mentioned, was installed some years ago and was therefore in operation before this more recent development in the company's activities. The press is served by an electrically operated overhead travelling crane and also by a hand operated jib crane, while alongside the press are a number of large oil fuel furnaces.

In the case of an ingot that is to be forged with the crop end on, a bar is attached to that end for the use of the men during the forging operation. The bottom or sound end is forged first and after being heated for a sufficient length of time is carried over to the press. The ingot is carried by a steel chain sling suspended from an electrically operated overhead crane.

In making a line or tail shaft forging the end is forged first, leaving sufficient metal for the flange and test piece, the test piece being forged square after another heat. The shaft proper in the initial stages is forged square and afterwards finished off round. As the forging becomes reduced in diameter it lengthens out considerably and has to be supported at the end by a chain from a jib crane, to keep the forging from sagging. After being heated a second time this end of the forging is finished off. The crop end is then cut off by the process already described and the other end of the ingot is forged in the same manner as the first half. The smaller forgings for the most part are made on a steam hammer. The output of the press is about 10 tons per day.

On each forging a prolongation of the same sectional area as that of the body of the forging is left for testing purposes.

### Heat Treating

All marine forgings are heat treated, or annealed, the company having facilities for handling the largest forgings. As a rule the forgings are heated in a furnace and allowed to cool gradually but in some cases they are oil annealed. For this process large oil tanks are installed, each tank having a compressed air system for agitating the oil to equalize the temperature. The oil is cooled by means of cold water which circulates round the outside of the oil tanks..

The forgings having been allowed to cool are now ready for the heat treating furnace, which is of the car type, over fired furnace, using oil fuel and equipped with Tycos base metal, thermo electric, recording pyrometers, which are of inestimable value in affording a means to check temperatures. The manner in which the forgings are placed upon the furnace is a matter of great importance. The charge is raised above the furnace floor with suitable supports and each forging is placed a few inches

ONE OF THE ANNEALING FURNACES SHOWING SHAFT FORGINGS ON FURNACE FLOOR.

apart, so as to enable the hot gases to freely circulate through the entire charge, so as to insure uniform heating.

The chief reasons for heat treating forgings are to relieve internal stresses or strains which may have occured in the forging operations and to develop the dynamic and static strength of the forgings so as to meet physical tests that are required of them. The results in the heat-treating furnace are governed by the following: Rate of heating, temperature, length of soaking, and rate of cooling, as these features vary with the chemical content of each charge. The desired results can only be obtained with an operator of long experience.

### Inspection and Testing

After heat treatment the forgings are ready for inspection by the surveyor or inspector who has been assigned to this duty. All the marine forgings made at this plant have to pass Lloyd's or equally high inspection. The surveyor places the impresion of his private stamp twice on the prolongation of the forgings, the one piece to be used for the bend, the other for the tensil test. The bend test pieces are usually machined to a rectangular section 1 in. wide by ¾-in. thick, with the edges rounded to a radius of 1-16 of an inch. These are required to be bent cold over their thinner section through an angle of 189 degrees without fracture, the internal radius of the bend being not greater than ¼ of an inch. The tensile tests are machined to a standard size, with a diameter of .564 inches, and a gauge length of 2 in.

The test pieces are then gripped between the upper and lower jaws of a testing machine and the total resistance to rupture is measured. Knowing the cross-sectional area of the test pieces and the load required to break them, the strength per square unit may then be determined. The tensile strength is usually given in pounds per spare inch. The elongation is measured in per cent. of the original test section and is determined from the amount of stretch which occurs when the test has been pulled apart by tension.

The unsurpased quality of heat treated forgings manufactured at the Canada Forge Plant is conclusively proven by the ¾ cup and not uncommon full cup silky fractures combined with high elastic limits and large percentages of reduction of area which occur at this static test. The test results having been approved of by the surveyor the forgings are then ready for machining. The company has a large machine shop equipped with modern tools for machining forgings and other work in connection with its business.

ANOTHER VIEW OF ANNEALING FURNACE SHOWING PROPELLOR SHAFT FORGING ON FURNACE FLOOR

INTERIOR OF NEW MACHINE SHOP. GROUP OF MISCELLANEOUS MARINE FORGINGS IN THE FOREGROUND

## GAS AND WALL TEMPERATURE OF GAS ENGINES

By D. Street.

EXPERTS in Europe have been experimenting on the temperatures occurring in gas engine cylinders, and the experience gained is of great interest to all engineers specializing in this type of power engines. Moreover, it increases our knowledge of the working conditions in gas engine cylinders precisely where it is at present very deficient, and paves the way for further progress. The results obtained apply more or less to all types of combustion engines. For experimental purposes an engine has been found most useful, of which the following are the most essential details:—A small single cylinder, single acting, horizontal, four-cycle engine, having a cylinder seven inches in diameter, with a 15-inch stroke, capable of developing a maximum of twelve indicated horse-power at 240 revolutions per minute. This corresponds to a mean effective piston pressure of 68.5 lbs. per square inch. Ordinary town gas was utilized.

The gas and the wall temperatures are the points about which reliable information is required. The former can be measured by thero-electric couples formed of alloys of rhodium and iridium with platinum, whilst the latter can be measured by mercury thermometers when only average values are required. For more exact results thermocouples are used, in which one element is a plug let into and flush with the wall on the gas side, but drilled hollow, so as to leave a

INTERIOR OF ONE OF THE MACHINE SHOPS DRILLING CONNECTING ROD FOR MARINE ENGINE.

thickness of metal at the couple itself of about one-fiftieth of an inch.

The valves and the pistons are the parts selected for these couples. The wall plug is assumed to represent the skin of the wall metal so far as temperature measurements are concerned. The results obtained have shown that the explosion temperature at the maximum pressure occurs between 3,300 and 4,000 degs. F., depending on the conditions of running, the pressures varying apparently from approximately 236 lbs. to 440 lbs. per square inch. The higher pressures are considerably above those occurring in large gas engines of the double-acting fully water-cooled type. These temperatures were obtained at about three-eighths of an inch from the wall surface, and it may be assumed by prominent experts to range from 4,000 to 4,500 degs. F. It may be assumed that the lower explosion pressure in very large engines will cause somewhat lower temperatures to occur.

For the practical engineer suction temperatures are extremely important, because they serve as a guide to the general level of temperatures throughout the cylinder, and because if they get too high in large engines they limit the power developed by reducing the weight, not the volume of the charge taken in on the suction stroke. It has been the experience of most engineers that a dirty engine develops less power than a clean one, and although this is no doubt sometimes partly due to restriction of the inlet valve passages by tar and other deposit, yet it primarily arises from an increase in the suction gas temperature due to hotter metal in the walls. Moreover, apart from the power developed a high level of metal temperature increases the risks of fractures, and, since it usually indicates the presence of lodgements of carbonaceous or other deposits in the cylinder, it is likely to be accompanied by pre-ignitions, to avoid which the engine load has to be reduced or the engine taken out of service for cleaning.

Experts have worked out the following interesting fluctuations in wall temperature:— With an average mixture and cold jacket the greatest difference of temperature was 143 degs. F. in the centre of the piston head; but when the mixture was richer, yielding a warmer jacket, it was reduced 50 per cent. The cylinder barrel temperature, it has been ascertained, under certain conditions ranges from approximately 120 to 180 degs. F., the piston being mainly cooled by contact with these walls, also to some extent by air. The same experiments are stated to have yielded a piston temperature ranging from 430 to 648 degs. F., and the mean jacket-water temperature was ascertained to be 80 to 94 degs. It may be inferred from these data that should the jacket have too low a temperature the risk of fracture is somewhat increased, as the periodic variations of the temperatures are very considerable.

In the case of engines, when the piston is effectively water-cooled the piston temperature is considerably less. In engines with pistons without water-cooling the heat travels from the centre of the piston face to the wall of the piston; it then passes through the oil film to the barrel of the cylinder and across that to the water jacket. Experts have ascertained that the maximum range of the heat flow to the water jacket approximates to 720 B.t.u. for each square foot per minute; in effect a difference of 65 to 70 degs. F. through the cylinder wall from gas to water. For the Diesel engine, other experts have ascertained the corresponding figure to range from 880 to 900 B.t.u. The study of combustion-engine cooling has been somewhat facilitated by these data. The recognized method has been by sluggish water jackets, but internal cooling has recently been preferred by some experts who have experimented with water jets made to impinge on the metal walls; the resulting steam and hot water is, of course, got rid of in the exhaust.

In two-cycle engines scavenging by air is necessary to obtain the required internal cooling and to get rid of the burnt gases; in four-cycle engines it has its advocate. The system has the advantage of cooling the walls by direct contact where the heat is greatest. It should be added, however, that internal cooling is only available in the intervals between the maximum temperatures, whilst water jackets are continuously effective.

## MECHANICAL ENGINEERS HOLD SPRING MEETING, JUNE 4-7.

The spring meeting of the American Society of Mechanical Engineers will be held this year at Worcester, Mass., June 4 to 7, with headquarters at the Hotel Bancroft. Professional sessions will be held both at the hotel and at the Worcester Polytechnic Institute, and will largely relate to questions with which engineers are now having to deal in connection with the war.

The acquaintanceship session on the evening of June 4 will be followed by professional sessions on June 4 and 5 during which special arrangements have been made for plant visitations by the ladies. June 7 will be occupied with an automobile trip to Camp Devens.

The society points out that the Allies, after three years of bitter fighting, have found that co-operation greatly increases their resistance to the foe. This effect of co-operation is apparent, not only in the front line trenches, but also at supply bases and in every organization supplying material for the front trenches. It also extends through the very fiber of our social organizations. For this reason it is more essential than ever that the engineers should come together for mutual benefit and co-operation. The meeting is planned on this basis, and every member who can do so is urged to attend. Never before has it been so necessary for engineers to get together to pool their knowledge, co-ordinate their work, and secure an interchange of ideas. The following list of papers will be presented at the meeting:

Foundry Cost and Accounting System, W. W Bird.

The Public Interest as the Bed Rock of Professional Practice, Morris L. Cooke.

Moisture Reabsorption of Air-dried Douglas Fir and Hard Pine, and the Effect on the Compressive Strengths, Irving H. Cowdrey.

A High-Speed Air and Gas Washer, Lieut. J. L. Alden.

Investigation of the Uses of Steam in the Canning Industry, Julian C. Smallwood.

Efficiency of Gear Drives, C. M. Allen and F. W. Roys.

Some Economic Aspects of Fire Protection, J. Donald Pryor and Frank V. Sackett.

Self-Adjusting Spring-Thrust Bearing, H. G. Reist.

Air Propulsion, Morgan Brooks.

The Elastic Indentation of Steel Balls Under Pressure, C. A. Briggs, W. C. Chapin, H. G. Heil.

Electric Heating of Molds When Starting or Stopping, F. Hymans.

An Investigation of the Fuel Problem in the Middle West, A. A. Potter.

Oil Fuel in New England Power Plants, H. W. Ballou.

# The Employment of Women in Munition Factories

By Miss O. E. Monkhouse, M.B.E., B.A. (Lond.)

*The following article was read by the author before the Institution of Mechanical Engineers at London, England, last March. In the course of her remarks she referred particularly to the compliment accorded her in being asked to give her views before such a body.*

AT the beginning of the war it was an exceptional thing for women to be employed as general machinists and fitters in engineering shops, but the demand for a greatly increased supply of labor of all kinds for munitions production, and at the same time the necessity for conserving the man-power of the country to the fullest extent, made it necessary for the Government to turn to the largest source of supply of unskilled labor, namely, women. The successful employment of women in engineering works depends not only on the unskilled woman, but in an almost equal degree on the skilled man and the employer.

### The Employer

The successful employer of women labor faces the question of dilution squarely, and recognizes at the outset that the psychology of the woman worker is different from that of the man. Next he fixes on work suitable for his new type of employee, and then determines the quickest and easiest way to train her in the work. He assures himself of the extent to which the men will co-operate, and is always careful to provide suitable shop conditions and plant, etc.

Having made these preliminary arrangements, he realizes the necessity for carefully choosing the right class of labor, and his next step is to appoint a woman of experience to engage and look after the women, and to select as their technical overseer a foreman who he knows is sympathetic with his new venture.

The skilled men have to do the technical training, and have to use all their brains and skill in order to train inexperienced women. They have to sectionalize work, adapt machinery, and simplify operations so as to make it possible to employ women. In their hands is largely the power to oppose and retard all progress by women on skilled work, because at the outset hardly a single woman is in a position to know when obstacles are being placed in her way. She perforce has to rely entirely on their generosity, and her position in engineering shops to-day shows that she has not relied in vain.

On the other hand, it must be remembered that every man does not make a teacher, and that every teacher of men is not necessarily a suitable teacher of women. Thus the unequal success of women in different shops is due in a measure to this cause as well as to antagonism on the part of the men.

### The Unskilled Woman

The successful woman worker in an engineering works has a great deal to learn, because in addition to learning her work she has to acquire correct work habits and face obstacles, both necessary and unnecessary, which are constantly put in the way of her becoming efficient.

There are, however, three grades of unskilled women who must be taken into account:

(1) The educated type.
(2) The domestic type.
(3) The ordinary factory type.

The educated type come with trained brains; they know how to learn and how to apply their knowledge. They probably have mathematical training and can be taught in a very short time how to use a slide-rule, a micrometer, and other gauges. Fine limits present no difficulty to them, and in a sense they may be regarded as already half educated for the better class of engineering work.

The second type, namely, the domestic type, drawn mostly from the daughters of small tradesmen, generally have a good deal of sound common sense, are reliable, and enjoy, and so aim at securing, some position of authority. Such people train quite readily into good charge hands and forewomen.

The factory type are different from either of the other two—they are mainly concerned with making as much money as they can, and preferably on piecework. For the most part they resent being put on to a new operation, because every time they learn anything fresh it means a temporary set-back in wages. It has, therefore, been found best to employ such workers on purely unskilled work of a repetition nature.

But no matter what the type of unskilled women, it must always be borne in mind that their success depends largely on the judgment of the management in selecting a good class of women labor. At the present moment there are, roughly speaking, close on 1,000,000 women employed on the production of munitions of war.

The introduction of all these women into engineering shops meant that a great many difficulties had to be overcome. These may be briefly summarized as follows:

(1) A very large proportion of the women employed not being accustomed to factory life and discipline.

(2) The majority of works managers and foremen not being accustomed to managing women workers.

(3) The shop conditions for the most part planned with a view to the employment of men.

(4) The use of the machinery to which women have hitherto been unaccustomed.

(5) The difficulties of maintaining discipline in a mixed shop and in entirely female shops staffed by women of no previous factory experience.

(6) The long hours.

(7 The question of physical strength.

Many of these difficulties have been overcome by careful selection of suitable work, a careful choice of labor, proper shop organization, conforming to definite welfare standards, installing or adapting plant suitable to women's use, supplying proper training facilities, subdividing skilled work and adapting the hours of employment in accordance with the class of work done.

### How Women Have Reached Their Present Skill

At the stage which women have reached at the present moment in engineering nothing but harm can be done by praising their powers too highly, but there are many individual cases where women have shown very great ability, and have acquired. a knowledge of a certain branch of engineering work in excess of what would have been learnt by an apprentice in the same period under prewar conditions. This state of affairs may be attributed very largely to three causes:—(1) Women have been definitely taught, whereas the apprentices had to pick up their trade. (2) Women have, for the most part, been intensively taught everything in the shop itself under production conditions rather than in the school. (3) The conditions of the time have actuated and spurred on everybody to greater effort from patriotic motives.

There is little doubt that the advantage of getting their training under production conditions has been very largely instrumental in considerably speeding up women's training, and the author would like now to consider some of the methods in use for training women workers.

### Women Trained in Works in a Separate Shop

It is extremely difficult to start women in the same shop with men, unless the latter are in sympathy with the movement, and experience has proved that the only satisfactory way is to start women in a shop by themselves under a sympathetic foreman until they have proved themselves. In illustration of this the author can quote a firm who, up to last April, had no women bench fitters on aircraft work. They have adopted the above plan, and there are now 200 women fitters in the shop controlled by women charge hands, all doing exceedingly well.

Another type of case which should be mentioned is that of firms who cannot believe that women can do anything but purely repetition work, and regard a woman fitter, tool-turner, or tool-setter as an impossibility. It, therefore, is no use telling them that they must up-grade

the firm an expert woman demonstrator. She will first of all do the job herself in the shop to prove its practicability, and she will then continue to assist the firm by training some of their best operators [illegible] them to select others who are [illegible].

There are many firms which, having been assisted in this way, have become some of the most successfully worked shops in the country, not only from the [illegible] of women labor, but of record output as well.

### Other Successful Methods of Training Women Workers

[illegible] to go through at length all the various methods which have had to be adopted in order to make women efficient in the shortest possible time. Government training schools have done much by supplying a nucleus of semi-trained labor to shops desiring either to make a start with women labor or to introduce women on to some new class of work. Just a few large firms have done the ideal thing and set up their own training schools, from which they have a continual flow of semi-trained labor always ready to draw upon.

All consideration of women's work must be accompanied by a careful appreciation of the mental and physical characteristics of women. They have shown great adaptability and natural skill in successfully undertaking work of an entirely new character, but the varying degrees of success points to the necessity for thoroughly understanding their peculiar temperament if the best results are to be obtained.

### Shop Organization

Firms, who with male labor have been thoroughly successful, have failed when forced to employ women labor, thus proving that they did not understand their new employees. Other managers have not recognized their own failings clearly, and numerous cases can be quoted where the want of success of women labor has been traced to defective shop organization. By this term is meant the question of supervision and direction of the work in the factory—work usually performed by foremen and male charge hands. A foreman may be an admirable foreman of men and at the same time an unsuitable foreman for women, apart from the question of his technical ability.

There is no doubt that women do need special managment and it is folly to disregard the human element as some do by asserting that if women are to be employed on men's work they must be treated the same as men. In one sense this is true. Discipline and strict adherence to work should be expected from women just as much as from men. As a rule men are either too lenient or too stern in their treatment of women, or too busy to study their peculiarities, and experience has shown that women should be controlled and organized by their own [illegible] the best results are to be obtained.

### Choice of Labor

There is no doubt that, generally speaking, a woman is a better judge of a woman than a man, and successful firms have realized this and have appointed an experienced woman supervisor, to be responsible for engaging all their women labor. Very recently a case came to the author's notice of a factory where one side of the labor was chosen by a woman and the rest by a man. There was great complaint of the efficiency of the latter, but none of the former. Investigation showed the cause that those women who were "turned down" by the woman supervisor were generally engaged by the man.

In the choice of ordinary operatives, stability of character and suitable physique must be the main considerations, but different characteristics must be taken into account when choosing forewomen and charge-hands. It is most essential that such people should have shop experience, coupled with a certain amount of technical knowledge, and a thorough knowledge of how to manage women, and ability to hold their own in the shop. Women taking up this work must have tact and discretion, and the necessary power to enable them to work in harmony with the shop manager, whose authority should not be interfered with.

Generally speaking, the most successful forewomen and charge-hands have been drawn from the more educated classes. For it must be remembered that women as a whole have been introduced very quickly, in very large numbers, without proper training or proper discipline, and it needs someone with powers of leadership and organization to get the women labor going on a proper footing.

### Welfare

Placing in factories in such large numbers women, many of whom have never been accustomed to factory life or conditions, has also called for special consideration of welfare conditions on the part of the employers. In considering this question, two points of view must be taken in account: (1) Effect of welfare on production; and (2) effect of welfare on the race.

Employers have now for the most part fully realized that to give their women good welfare conditions is a sound business proposition. Without such provision they cannot get a good class of labor. The unwonted heavy muscular effort and constant strain through which they are working makes it essential that their off times should be restful, if good work is to be done after the break.

Good canteen accommodation also is most important, and there have been cases where managers have found that to provide one good meal a day free of cost has been more than repaid to them in output.

But quite apart from the effect of welfare on production is the effect of welfare on the race. From the national point of view this is the most important aspect to consider. For this reason the Health of Munition Workers' Committee was formed, whose special care was to safeguard any deterioration of the race which might perhaps accrue from women being compelled to work in all great industries. They have considered carefully (1) the hours of work; (2) rest periods and provision for meals; (3) sanitary conditions of the factory; (4) physical condition of women workers; (5) questions of management and supervision.

### Hours of Work

With regard to hours of work, experience has shown that a reasonably short shift is the most successful, producing less industrial fatigue as shown by few accidents, better timekeeping, and undiminished capacity of the worker towards the end of the shift so that a better average output is maintained. Another point in favor of shorter hours is the fact that a better class of labor is tempted to join the ranks of munition workers.

The other problems the committee have considered in full detail, and the result of their investigation has shown that the nation is under a definite obligation to consider women's health and comfort in the factories if they are to protect and safeguard their position as the mothers of the race. Experience has shown that wherever there has been proper consideration for women's welfare in factories that there has been not only no decrease in healthy physical development, but a decided increase in mental capacity. It has been an enormous advantage for women to have had this opening into a wider field of skilled and semi-skilled work, and the country has benefited by a tremendous increase of industrial efficiency.

It must be remembered that a woman's work is not ended when she leaves the factory. On her largely depends the life and happiness of the nation in creating and developing a happy healthy family life, and it is her privilege to care for the physical and spiritual welfare of the race. Added industrial efficiency, therefore, at the expense of women fulfilling their primary duties in their homes and to their children cannot result in anything but national disaster, and it is sacred duty of the State to ensure that women are only used as wealth producers in so far as it does not affect the healthy development of the race.

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EXPERIMENTS in the use of compressed cellulose piping have proved satisfactory in German chemical factories and mining works. It is claimed that the material is absolutely non-porous, is considered lighter than iron, can be worked like wood, and is, consequently, easily moved and repaired. As cellulose is a bad thermal conductor, it requires no particular protection against heat; it also resists chemical influences better than iron. Cellulose tubes are suitable for conducting hot and cold air, and for corrosive gases, which eat into iron conductors very quickly. They are not suitable, however, for steam.

# The Cultivation of Efficiency

## Manufacturers of Plumbing Supplies Co-operate With Employees—Work is Made a Pleasure and Pleasure is Made Profitable — Factory Construction and Individual Comfort Are Features of Conditions

By J. H. MacMillan

LOOK backwards a matter of a very few years and consider the working environment of the factory employee. In ninety-nine cases out of a hundred the employer had no interest in "Jim Smith" or "Mary Jones" other than procuring from them a day's work for a day's wages paid. Sanitation was practically confined to hospitals, and the very word was suggestive of the doctor.

Slowly, but just as surely, the manufacturers have been brought to the realization that, in order to obtain one hundred cents on the dollar paid to the employee that consideration had to be given to the mental and physical condition of the human unit of their organization.

Factory construction was the first item that showed the trend of affairs. Daylight buildings of concrete and steel and a maximum of window space appeared. "Texas" and "Saw-Tooth" roofs put in an appearance. Where a board-walk alley had previously been considered sufficient for a passageway between buildings, roadways of full width, cement paved, sprung into view. Hot and cold air systems for mechanically and automatically washing and freshening the atmosphere were added. Sanitary drinking fountains displaced the germ-laden community drinking cup and dust-laden water barrels. Individual towels, laundered by the company relegated the "wipe" or roller towel to the background, and light, airy toilet rooms took the place of the disreputable foul-odored corners that housed the sanitation facilities (?) of the manufactory of not so long ago. Doctors are employed and paid for by the company to regularly examine those whose duties entail the slightest opportunity for contracting a disorder.

All this, and much more, has taken place to guard the physical welfare of

[illegible] the factory owner even went a [illegible] factor. Based on the fact that a [illegible] is only a small percentage efficient, means of recreation came into being; means to lift the mental power of the human unit away from the daily task in order that the operating functions of that power should be become stagnant by being overfed with the monotony of the day's labor. Club rooms were furnished for the men and women, and from them have grown the spacious rest and recreation buildings that to-day provide the human element of an organization with mental stimulus to render 100 per cent. efficiency at the daily task. All of this is based on the old proverb of "all work and no play," etc.

When you stop to consider that the average employee spends a good deal more time at work than he does at play and at home combined—if you deduct the sleeping hours—it is not any more than fair that his place of employment should be as pleasant as possible.

For many years the various factories and branches of the H. Mueller Mfg. Co., Ltd., manufacturers of water plumbing and gas brass goods, etc., have been carrying out these ideas. To say they are costly is incorrect. The results that accrue more than equalize and justify the cost and upkeep of the institution.

The illustrations presented herewith show, conclusively, the lengths to which the Mueller Company has gone in their Sarnia plant. The plants at Port Huron, Michigan and Decatur, Illinois are equipped likewise. The consensus of the Mueller employees' opinions is the proof conclusive as to the success of welfare work. This work has a moral effect that is alone worth the value of the investment.

The Mueller Company employees have several internal associations, officered and operated by the employees themselves. Foremens' clubs, departmental clubs, etc., an employees' aid society, supported by nominal fees, disburses sick, accident and death benefits. The company itself is back of and supports both morally and monetarily any meritorious, welfare movement that is advanced. Hot tea and coffee is served gratis to each employee at meal times in the recreation building and music is provided and dancing permitted following the meal. Prizes are continually offered for effort along various lines, and co-operation rules in every angle of the big organization.

The writer of this article remembers, some twenty-five years ago, working in a broom factory for one dollar per week. That factory was one of the largest in the business at the time. Every available foot of space was crammed with material and stock at all times. Daylight was at a premium, and fresh air almost unknown. We had a clean-up [illegible] second week for which we didn't get paid—Sunday morning. Anybody caught sweeping the floor around his bench at any other time was fired—with a capital "F." Sometimes the refuse from the broom corn (partially decayed field mice, too, included) was knee high at my bench—I was a "hurl cutter." More than once my stomach revolted and that too, would have to lay. We were positively not allowed to leave our benches except when the whistle blew. Slave-driving methods constituted efficiency of those days. When we contrast conditions such as they were with the modern factory of to-day, we can be excused from wondering how the worker stood his job under the conditions of not so long ago.

There are numerous industries of to-day that have not as yet "seen the light," but they are few and far between. The average factory employee of to-day is the best-cared-for individual in the commercial world—and why not? The human unit is fundamentally necessary to the operation of any industry. We must oil and repair our steeds of steel and fabric; why should be neglect to apply the mental and moral lubricant to our muscle power?

## WEAR IN BIG GUNS

By Mark Meredith.

The wear of big guns has an important influence on the cost of the war, not only on account of the expense of effecting repairs, but because such wear leads to inaccuracy of fire and so increases the amount of ammunition expended to attain a definite objective. If a few thousandths of an inch of steel at the commencement of the rifling of guns, etc., would be prevented from wearing away in so short a time as at present, the reduction in the cost of war, so far as guns, ammunition, transport, etc., are concerned, is almost incalculable.

Differentiation must be made between the damage to the bore near the breach end—which is usually termed "corrosion"—and that near the muzzle, which might on account of its mechanical effect be called "erosion." The causes which produce the first-named class of damage are complex and include the effects of temperature, the form and dimensions of the powder chamber, the chemical and physical qualities of the powder used, the weight of charge and rapidity of fire, the gas escape past the projectile, and the composition and physical properties of the steel used for the inner tubes of the gun. All these matters present many points of interest. Much importance ought to be attached to the evolution of methods for securing the effective sealing of the gas escape immediately after the firing of the charge and as regards the physical properties of the steel used for the inner tube, it would be as well if the heat treatment were subject to the analysis of the steel and the forging effect, and it is really necessary to obtain more effective forging of the portion of the tube forming the bore than is done at present. With regard to the erosion near the muzzle due to frictional wear and metallic fouling, to secure good shooting it is desirable to prevent this by all possible means, such as slightly bellmouthing the bore. Electrolytic methods have removed 15 pounds weight of copper from the bore of an 8-inch gun after firing 100 rounds.

## MACHINE GUNS IN FLANDERS

THERE was a sudden change in the programme at the regular meeting of the Canadian Engineering Institute at their quarters on Mansfield Street, Montreal, due to the demands of military service. Lieut. Philip Bruneau, who had served with the machine-gun corps in Flanders, and recently returned from the front, was to have given an address on "Machine Gun Work in Flanders." He was prevented, for he had been suddenly ordered to leave for the United States for duty as a machine gun instructor.

Lieut. Bruneau's place, however, was ably taken by Lieut. Ashworth, of 2618 St. Urbain Street, who had gone overseas with the 24th Battalion, been transferred to the Machine Guns, been wounded thrice, and so severely dosed with German mustard gas that he had been invalided home, arriving here two weeks ago, with his eyes still suffering from the poison. He gave an interesting talk on the battle scenes he had so recently left, incidentally giving a description of the famous "pillboxes," which he said were the only real German answer to the British tanks.

Lieut. Ashworth cited the great development of machine gun work with the British forces since the first Canadian battalions went over equipped with only two Colt machine guns to a battalion.

There had also been much development in the use of the guns, firing by map and compass after dark, so as to cover ammunition dumps and other places at up to 2,000 yards, which got a lot of the enemy. The main development, said Lieut. Ashworth, had been in barrage fire to protect infantry advances, with a cross, frontal or oblique fire, so that not a man of the enemy could get through. This had been planned in the last big German push against Gen. Gough's division and the guns placed, but, favored by heavy mist, the Germans had been able to get past.

Lieut. Ashworth said the British had taken far more German machine guns than the enemy had captured, and with grim glee recounted how he had personally captured four, with 40,000 rounds of ammunition at Sanctuary Wood, and later used all the ammunition against the Huns with effect.

With the new barrage system for machine guns, Lieut. Ashworth said "going over the top" was not really so terrible, because the fire over their heads made it impossible for the enemy to stay, unless pillboxes were encountered, and these were quite annoying. These he described as cupola topped reinforced concrete structures, the dome only two feet above the ground, loopholed for the sweep of two machine guns, and holding twelve to fourteen men. The walls were eight feet thick, and they could only be destroyed by a direct hit from a heavy high explosive shell, which sometimes would then only overturn them.

# Some Considerations Regarding Modern Plant Organization--6

By M. H. Potter

*The factors which enter into the successful manufacturing business of to-day are interdependent to an ever-increasing degree. Location, type of building, transportation facilities, staff organization and plant equipment are features which require to be considered both singly and as a whole in relation to the particular product to be undertaken. A clear and concise idea of such considerations is necessary before entering any one line of manufacture.*

THE first question in the problem of selling costs is as to whether the sales division shall be charged for goods at the cost to the manufacturing division or at a somewhat larger figure—allowing the manufacturing division to claim a profit. The argument for allowing profit to the manufacturing division is that since greater efficiency will be registered in a larger amount of profit, the inducement to secure better economy will be great. There are, however, but two methods by which the manufacturing division will be allowed a profit. One of these is by allowing as profit an arbitrary percentage on cost. This obviously will not register economies, for the cost is itself the basis of profit. The other of these methods is to allow to the manufacturing division as profit any amount by which it can reduce cost below an arbitrary figure. Under this plan, if there has been a reduction in wages or in the price of raw material, the economy shown by the figure of profit is misrepresented; and, therefore, the plan fails in its specific aim. But, when labor or material has become more expensive, this plan seems to blame the manufacturing management. By this method, moreover, the labor of preserving cost has been largely thrown away, for it assumes as cost for selling purposes a figure that bears no relation to the books. The only possible method of measuring comparative economy is by comparing actual costs in different years and allowing for difference in effective wages and raw materials. This is comparative cost register and the ordinary cost books make this possible. Since such comparison is possible directly from the books, the effort to find a measure of economy in the profits of the manufacturing division is mere wasted energy, and sometimes worse than that, for it may misrepresent the facts. Finally, to handicap the sales division by charging it arbitrary prices is hardly fair when the selling department is in competition with other houses where this is not the practice. The conclusion is that the selling division should be charged for all goods at exact cost to the manufacturing division.

This general rule, however, is open to one notable exception, in the case of manufacturers who do not really manufacture, but have the goods made up on the outside. Some so-called manufacturers do not want to maintain a department devoted to making their products. They accordingly have their material assembled and give some other concern the manufacturing profit.

### Why Selling Cost Must Be Separated

The science of cost is intimately related to the department of sales, but complete separation between producing and selling expenditures is essential. It is absolutely necessary to know first what it costs to produce goods ready for sale, and second, what it costs to market them; since a factory manager may manufacture goods at a cost of production in every way favorable to most successful competition, and yet the business as a whole may not be profitable owing to the excessive selling expenditures. A separation of costs places responsibilities for two entirely different functions, and any changes in either manufacturing or selling conditions are quickly noted.

The principal elements of selling costs may be stated as follows:

**1. Sales Department Space Cost**

This will be determined by the ratio which the space occupied by the department bears to the entire space cost of the establishment; the percentage thus obtained will be calculated on such items as interest, taxes, depreciation, repairs and insurance on the property used by this division.

**2. Light, Heat, and Power**

A meter installed in the department will show the amount of gas or electricity consumed for lighting purposes; heating cost is charged in proportion to cubic occupancy; power, which in this instance might be for the passenger elevator serving many departments, could be distributed on a basis of the number of passengers carried.

**3. Accruals or Accumulated Stock**

Many large establishments are obliged in the dull seasons to accumulate stock ready for the demand of the active seasons. We have, therefore, interest depreciation, and taxes to figure on this accumulated stock. This is not exactly manufacturing cost, for the manufacturing division can not always make goods at the variable rate of the demand of the seasons. It must produce them when it can. It is, however, the task of the selling division to keep goods moving as rapidly as possible, and to offer such inducements as may be worth while to get them out of the warehouse in the dull season. The most effective stimulus to the selling division for keeping the warehouse clear is to charge this division with the cost of accumulating the stored stock. Though this may sometimes seem a hardship, it is unavoidable. For charging to manufacturing would to some extent nullify the careful cost-keeping, especially in the important mat-

STENOGRAPHERS WEEKLY SUMMARY SHEET

Week Ending_____19____

Department,_____ No. of Letters written,_____

| Name | Weekly Salary | Mon. | Tues | Wed | Thur. | Fri. | Sat. | Total | Aver. per day | Aver Per dollar |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| Total | | | | | | | | | | |
| Aver per Day | | | | | | | | | | |

FORM 1. STENOGRAPHER'S WEEKLY SUMMARY SHEET

TRAVELERS WEEKLY EXPENSE STATEMENT

Week ending 19

NAME _____ Paid Voucher No.

| Day | Mileage | Towns Visited | Hotel | Meals | R.R | Entertainment | Misc. |
|---|---|---|---|---|---|---|---|
| Mon. | | | | | | | |
| Tues | | | | | | | |
| Wed. | | | | | | | |
| Thur. | | | | | | | |
| Fri | | | | | | | |
| Sat. | | | | | | | |
| Sunday | | | | | | | |
| Total | | | | | | | |

should accommodate itself to the varying task of accommodation shall be laid upon the selling division. Whatever cost of this sort is incurred, however, seems properly to belong to the selling division.

#### 4. Office Expenses.

This comprehends the outlay necessary for the maintenance of an office concerning itself solely with the distribution of the product, and includes such items as salaries of selling officers and assistants, printing and stationery, postage, telephone and telegrams. Although the total expense is periodically carried into selling costs for distribution, yet to attain the highest state of efficiency a system of costs should be maintained within the office. The relative capability of each stenographer, for instance, may be deducted from a weekly summary, similar to that shown in Form 1.

For this summary when properly filled out, the manager can determine the total and average cost of letters written weekly, and by comparing the results with former figures he is enabled to set a standard. The fact that letters vary in length is not an obstacle, because in the long run the average length of letters will be about the same for all. The mailing clerks should count each stenographer's mail and initial her daily report, from which the above-mentioned weekly summary is prepared. Similarly the work of each employee of the office may be recorded, bill, mail, and filing clerks noting the daily total of papers officially treated by them; bookkeepers recording the number of daily postings, etc. These daily figures are summarized in the weekly reports to the manager. Where this plan has been tried the results have been very satisfactory, and it has resulted in a sort of friendly competition and endeavor to exceed previous records. The matter of office expense has been treated here only with reference to the selling department and the cost system mentioned is merely suggestive. In a business where the main expenses are represented by office outlays, the value of comprehensive cost keeping is obvious.

#### 5. Salesmen's Commissions, Salaries, and Expenses

These items constitute a considerable part of the expense of selling. Detailed expense accounts should be mailed weekly to the home office by the salesmen. Blanks arranged with columns for constantly recurring items should be provided for this purpose, see Form 2.

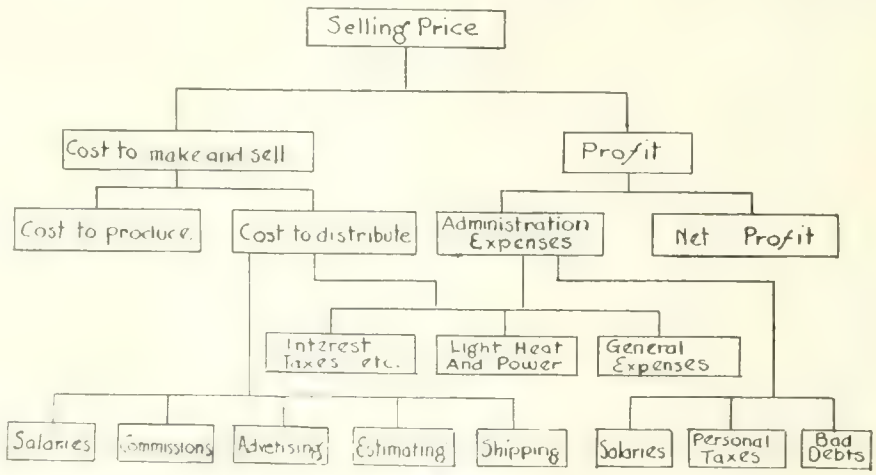
It is usual to open an account with each salesman, and to maintain a careful record of the sales in his territory. The records should show also the ratio of sales expense to each dollar of product distributed, and the relative worth of each salesman and the territory traversed by him.

#### 6. Advertising Outlay

The disposition of this factor requires a knowledge of the circumstances under which the expenditure is incurred. It is at one time an investment and at another an expense. For example, several thousand catalogues may be printed for a concern; these should be carried as an inventory item to be charged in proportionate amounts, as distributed, to expense. Again, in order to place itself prominently before the public, a concern may spend during its first year a large sum for advertising, the benefits of which may not immediately accrue, but which item is nevertheless a factor in the future sales; it would be manifestly unfair therefore to charge the entire amount against the first year's business. It is worth while to note, also, that some advertising costs may not be exhausted in the year of occurrence. An advertising campaign may have a duration of several months or years and at its close a large item of recourse may remain in a form similar to goodwill, in the sale of a business this would have to be acknowledged. In charging off advertising expense, therefore, a medium ground is advisable. A certain percentage of general advertising is an expense and chargeable as such; the remainder goes towards the purchase of good-will, an asset of the business.

#### 7. Cost of Estimating

A selling cost likely to be overlooked is that of the estimating department. In some businesses considerable money is expended in working out specifications and submitting proposals which do not result in sale; this is as much a selling cost as the travelling salesman's expense, and such items should be kept in an account by themselves and later charged in total to selling costs; when a sale is effected the expense connected with the preparation of the plans and specifications is charged against the individual job. The conditions above apply to cases where the proposals in question are for special work, and can not be used again. If, however, the estimate and drawings are to be utilized for future work, they should be considered a part of plant equipment and are properly chargeable to this account.




FORM 3 SUMMARY.

#### 8. Shipping Department Expense

Under this head would be charged

such items as wages of the shipping clerk and assistants, all shipping materials, and any other expenditures incident to the preparation of the goods for delivery.

### 9. Proportion of Administration Expenses

This represents a charge for supervision, and, as each administrative officer should keep a record showing the disposition of his time, the amount chargeable to each department is readily ascertained.

### Apportionment of Selling Cost

Some selling expenses may, however, apply more strictly to one item than to another. For example, if any article ceases to be advertised, yet continues to sell on its reputation, the advertising expense charged to its cost should be slight. If, again, a few articles are placed upon exhibition, the cost of the exhibition should be charged chiefly to the particular article shown; in the latter case, however, the entire cost should not be borne by the articles in question, as the publicity gained from the exhibition will probably cause a demand for other products of the firm. In the final distribution of selling expenses certain costs will therefore be assigned to particular classes of sales, and the remaining selling costs will be distributed over all classes on a percentage basis, which is obtained by dividing the total general selling cost by the total manufacturing cost. This percentage is then distributed [illegible] of production on a basis of their manufacturing cost which has been previously determined.

A distribution sheet should be maintained to show the ratio of the percentage, the expense each department bears to the entire expense, and from this record the manager can determine whether the selling prices are profitable or not. For instance, if the distribution sheet shows that it costs about 12 per cent. of the selling price to dispose of the goods and at that rate a fair profit is possible, the business will be on a safe basis as long as that rate is maintained, but should a period of depression set in, or sales fall off in anything like a permanent manner, the selling cost percentage will immediately increase. It is in enabling the management to reduce expenses without affecting the efficiency of the various departments that the distribution sheet is valuable.

The percentage can be applied to any individual item after it has been manufactured; for example, the cost of raw material might be 60 cents, productive labor 95 cents, and manufacturing or indirect expense 95 cents, thus making the total cost of production $2.50. Assume the selling cost of 12 per cent. of the sales price which shall be stated at $4.00. If the selling expense of 48 cents be added to the cost of production, i.e., $2.50, the cost of the article sold reaches $2.98, leaving a trading profit of $1.02, from which must be deducted its proportion of administration expense in order to arrive at the net gain of the transaction.

### Administration Expenses

While the manufacturing and selling divisions are engaged in working out their problems it remains for another department to control both, finance the establishment, and keep in touch with business conditions generally. These are the functions of the administrative department. Many of the expenses which it incurs may be traced to some particular process or department, and these are accordingly distributed and duly calculated in the producing or selling costs; the remainder, which are general in character, must be considered when the net profit on sales is calculated. Among the latter are:

1. Proportion of interest, taxes, depreciation, repairs, and insurance on the property used. This cost, however, can be made selective.

2. Light, heat, and power consumed by this department.

3. Taxes on personalty, which represent the annual levy to the capital invested; they do not include taxes on real property, which are already included in Item No. 1.

4. Officers' salaries: the balance remaining after all time spent in super[illegible] departments.

5. General office expenses, including: office salaries, printing and stationery, [illegible] miscellaneous items.

6. Bad debts. This would seem to be a just charge against the administrative department because all orders are filled by the selling division only after the former has passed upon them, it would seem unfair therefore to charge any loss for uncollected accounts to the selling division.

Summary. We have finally, then, for every article manufactured a certain specified list of items which enter into its selling cost. They may be summarized as shown in Form 3. An analysis of these items gives that which the business man wishes to know, namely, the cost of manufacturing and selling, the selling price, and the profit.

## INTENSIVE FUEL CONSERVATION CAMPAIGN IN IOWA

ANNOUNCEMENT was made recently by Royal H. Holbrook, state deputy of National Association of Stationary Engineers of Iowa, that a movement to effect fuel conservation throughout the state had been commenced by the association.

Practical methods are being followed and qualified advisers will be sent to any commmunity, large or small, which makes a request. A few of the most important test instruments will be taken along, such as a Bacharach pocket $CO_2$ machine, a draft gauge, a thermometer for about 800 deg., some charts for firing illustrations, and lantern slides, so that the engineers and firemen may have one meeting and the general public another. An intensive press campaign will be put on in all state papers, and a still more intensive plan in the city or community visited. The intention is to visit every plant, be it boiler or furnace that sends in a call. The list is usually made in advance by the secretary of the commercial club, which is in most cases responsible for the local expenses. In every city where there is an N. A. S. E., they will arrange for a campaign meeting in case it is not on the regular meeting-night programme.

## ANNUAL MEETING OF THE ONTARIO SECTION A.S.M.E.

THE annual meeting of the Ontario Section of the American Society of Mechanical Engineers was held at the Engineers' Club, Toronto, on Monday evening, May 27th.

The technical paper for the evening was presented by Mr. J. H. Billings on "Strength of cast iron in bending as affected by variations in cross sections." Following this was a very interesting and stimulating talk by Mr. Calvin Rice, general secretary, who had arranged to stop over in Toronto on his way back to New rork from a visit to some of the society's branches in the Middle Western States.

The results of election of officers for [illegible] follows: Chairman, Professor R. W. Angus, of the University of Toronto; secretary, C. B. Hamilton, of Hamilton [illegible] of executive, Mr. James Milne, City Hall; Mr. J. H. Billings, University of Toronto; Mr. T. B. Ahara, Canadian Fairbanks-Morse Co.

A NORWEGIAN engineer has devised an ingenious method of reducing the cost of paper manufacture by utilizing the residue from the mills, which produces a fuel to run the plant. The paper pulp obtained from wood constitutes only 45 per cent. of the wood, and the residual 55 per cent. has hitherto been found useful chiefly for the wood alcohol and acetic acid obtained from it by distillation. This engineer has recently patented and perfected a new process by which the residue furnishes a fuel in the form of a powdered coal, or charcoal, which evolves great heat in commbustion. The first plants have been erected at Greaker, on the Christiana fojrd, and it is estimated that they will shortly be able to yield an annual output of 6,000 tons of this new fuel. This will suffice to supply all the cellulose plants in Greaker with an inexpensive fuel, and at the same time it rids them of a burdensome encumbrance. Since the total production of paper pulp in Norway is estimated at 1,000,000 tons yearly, doubtless other plants throughout the country will soon be similarly equipped.—M.L.

# Using Stellite in Modern Shops: Applications and Devices

## Alloy of Semi-rare Metals Increases Production and Reduces Costs — Increasing Use of Metal Promotes Development of Accessories and Methods of Application

By W. F. Sutherland *

THE stimulus given to alloy research in the past few years has resulted in the discovery of many new alloys of great intrinsic value in the arts and sciences and many metals heretofore recognized only as laboratory curiosities are now an essential part of metallurgical industries.

Stellite, an alloy composed of cobalt chromium and tungsten, has been of great service in the quantity production

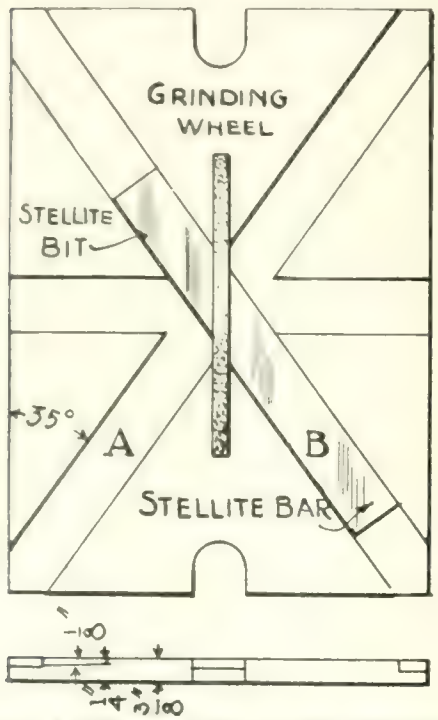



FIG. 1. FIXTURE USED IN THE NICKING OF STELLITE

of munitions and the present article deals with some of the uses to which it may be put.

### Grades and Physical Properties

The properties of stellite vary with the percentages of constituent metals employed and to so great an extent is this true that alloys can be made varying in hardness from that of untempered steel to the quartz crystal.

Three grades are available for machine shop use, each grade being adapted to certain operations and materials; No. 1 for machinery steel up to 30 point carbon, No. 2 for steel up to 100 point carbon and cast iron of moderate hardness, and No. 3 adapted for hard bronze and either hard or soft cast iron. No. 1 and 2 grades take the same shape and tool overhang as high speed steel while No. 3 requires as much heel as possible and the shape is governed by the class of work performed.

Since extreme hardness is an inherent quality of stellite and since it is impossible to forge or anneal it, all shapes must be cast in approximately the final form and finished by grinding.

The cutting of the stellite bars into the proper lengths is accomplished by nicking with a hot saw or by grinding a nick in both faces. Fig. 1 shows a jig by which the bars may be quickly nicked at right angles or on a 35 degree bevel. The bar is first placed in slot A, nicked to a proper depth and then put in slot B. When broken the fracture will follow these nicks and little grinding need be done to finish the tool.

### Typical Lathe Tools

Several types of lathe tools illustrating English practice are shown in Fig. 2. These are made by milling out the machine steel tool shank and welding the bits in place. As the alloy is hardest on the skin the shank is milled out on an angle so as to give the correct top rake without grinding. The different operations in the making of this tool are shown in Fig. 2, A, B, and C. Instead of milling the shank at an angle a special shape may be employed as shown in Fig. 2 D. The slot in all cases should be milled slightly smaller than the bit so as to allow for accurate fitting by grinding.

Fig. 2 F shows an open step tool which is used when a large depth of cut is required.

Welded tools are generally made by welding a tip of stellite to a carbon steel shank, no end milling as described above being done and in this connection it may be remarked that a comparatively thin piece of metal will suffice.

In Fig. 3 and 4 are shown two types of tool made in this manner. Fig. 3 shows a square bit tool deeply notched for the stellite. This construction has the serious disadvantage of weakening the shank very materially as the weld between the stellite and shank is not capable of withstanding the tension stresses developed above the neutral axis of the tool. Fig. 4 shows a more preferable construction. Here the bit is much thinner and is purchased in the wedge form. This obviates the grinding of the top face for side rake and preserves the extremely hard skin; as will be seen the shank is very much stronger.

### Brazing and Welding

Stellite may be readily brazed or welded to steel. In brazing, after the bit is accurately fitted to the shank it should be nicked with a grinding wheel to allow the brazing compound to take a firm grip. The shank should then be

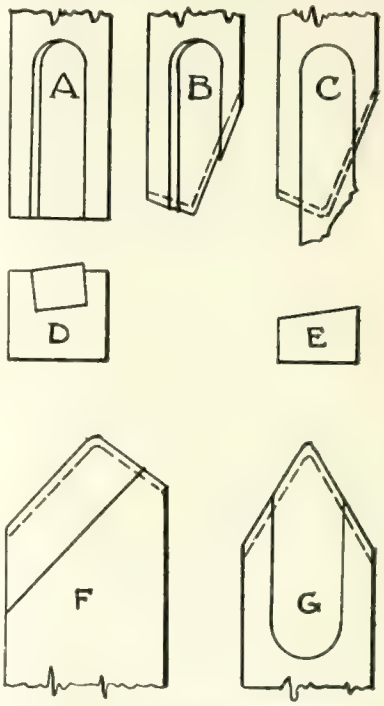



FIG. 2.—VARIOUS FORMS OF WELDED TOOLS, English Practice

well heated, brushed and a thin layer of brazing compound put in the slot. The stellite is placed in position with a piece of brazing compound or spelter of ample size on top.

The tool is then heated until the brazing compound has run well into the joints when it is then quickly drawn and

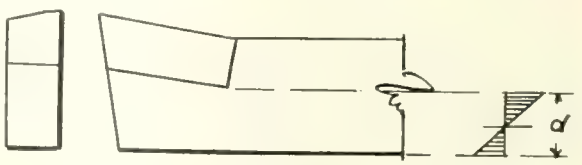



FIG. 3.—WELDED TOOL.

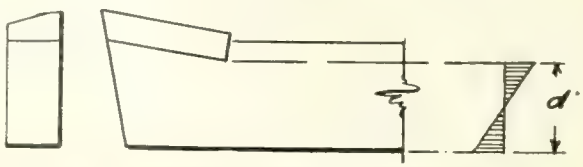



FIG. 4.—ANOTHER FORM OF WELDED TOOL.

the stellite lightly tapped with a hammer to spread the compound evenly.

In welding, both the oxy-acetylene or electric arc may be used. Stellite may be welded to any metal such as iron or steel and no special precautions need be observed beyond the advisability of keeping the stellite from alloying with iron, as far as possible, as iron when alloyed reduces the cutting qualities very materially.

Electric butt welding is difficult on account of the differences in the melting points and resistances of the two materials. The wattage converted into heat in the passage of an electric current through any conductor is measured by the following well-known equation, $W = I^2 R$

where W = watts lost
I = amperes
R = resistance in ohms.

The current flowing through the two objects being welded is of course the same, and therefore the heat resulting will vary directly as the resistance of the two materials.

Stellite has a resistance of between 600 and 700 ohms per mil foot while iron has only a resistance of 63 ohms per mil foot. It is readily seen that the heating of the stellite will be accomplished very much more rapidly than that of the iron since the heat absorbed is about ten times greater. The stellite would probably melt before the iron became red and hot.

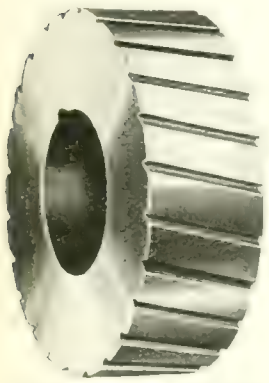


FIG. 5. CUTTER GROUND DOWN.

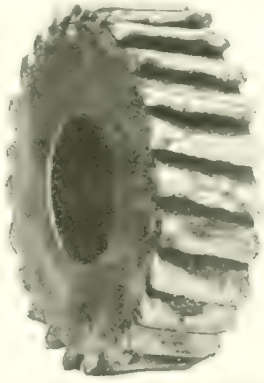


FIG. 6. STELLITE TIPS WELDED ON

FIG. 7. CUTTER RE-GROUND.

The following table is of interest, in giving the electrical characteristics of this alloy:

TABLE SHOWING COMPARATIVE ELECTRICAL PROPERTIES OF COPPER AND STELLITE.

| Property | Copper | Stellite No. 1 | Stellite No. |
|---|---|---|---|
| Specific conductance in mhos per inch cube | 626,000 | [illegible] | [illegible] |
| Specific resistance in michrohms per inch cube | 1.594 | 402.5 | 478.0 |
| Relative conductance | 100% | .0396% | .033% |
| Resistance in ohms per mil foot..... | 10.4 | 603 | 732 |

The electric arc method of welding stellite is quite satisfactory as is also the oxy-acetylene flame.

### Some Applications of Welding

Mention may be made of some of the uses to which alloy is being put in machine and munition shops. By taking a welding rod of stellite and with the oxy-acetylene flame building up a tip on the ordinary carbon twist drill, a twist drill results which gives unequalled service after being ground and sharpened. This process may be repeated any number of times and the combination of tough carbon steel or high-speed steel body and the extremely hard cutting edge of stellite has advantages readily understood.

A somewhat similar method is frequently used for the remaking of a carbon steel milling cutter. The worn down cutter is first ground somewhat as shown in Fig. 5 and a new stellite tip is built up on each tooth as in Fig. 6 after which the tood is reground and sharpened as in Fig. 7.

The special stellite holder shown in Fig. 8 and 9 has been designed to take advantage of the hard skin on the bit casting. This skin is even harder and more resistant to wear than the body of the metal. As will be seen the skin is presented to the work where the rubbing takes place. In this holder the stellite is easily adjusted and can be ground with any cutting rake desired.

A unique tool which has found considerable favor in the finish turning of various sizes of shells is shown in Fig. 10. As will be seen the stellite cutting bit is cylindrical with a hole through the centre. In sharpening, the bit is ground off flat and a conical wheel is then used to form the bevel, the cored hole permitting this to be done with a minimum amount of labor. When one portion of the edge is worn it suffices to turn the bit in the holder slightly until a new cutting edge is presented.

Stellite is adapted to the making of reamers and formed cutters of various kinds and shapes. Formed cutters up to ½-in. face are generally made solid; from ½-in. to ¾-in. face with welded blades and from ¾-in. up with inserted teeth. The solid cutters can be reground until the diameter is too small for further use. The inserted tooth cutter used in the larger sizes like all inserted tooth cutters permits the removal of any or all of the blades without the discarding of the whole cutter.

FIG. 9. DIAMOND SHAPE BIT HOLDER.

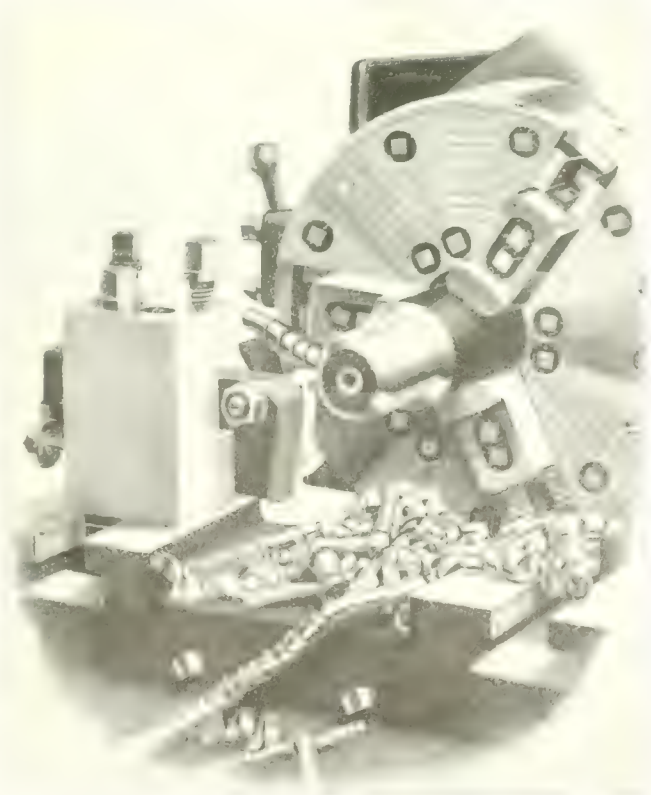


FIG. 8.—STELLITE HOLDER IN USE.

## CUTTING COAL COSTS

has been cheap and obtainable in abundance; cheap coal and cheap labor sometimes made it apparently economical in dollars and cents to install and run an inefficient plant.

Coal has now become expensive. It is hard to obtain. Efficiency in its use and avoidance of waste have become of first importance, since without power other materials cannot be utilized.

These conditions make it imperative for every owner or manager of a power plant to examine into the cost of the power his establishment uses, the economy with which it is generated and applied, and the increase in efficiency that is possible. Some of the steps that an owner or manager should take are:

Find the nearest source of coal that will meet the requirements, even if it does take a little more trouble to use it; the tax on the transportation system will thus be reduced so far as haulage by rail is shortened; coal is mined in twenty-six states, and these states extend practically across the continent and from the northern to the southern borders.

Give to the power plant and its personnel recognition and encouragement such as is due an expert and important department, thus getting new effort and attention to offset the extra attention and care needed with coal inferior in grade and preparation to the coal formerly available.

Seek to increase skill and proficiency in the men who handle the coal; a fireman at a hand-fired boiler shovels three to ten tons of coal a day—as great a value in material as many skilled men in other departments.

Put the fuel-using equipment into as perfect condition as possible; provide at hand-fired plants an ample firing floor with a good surface together with a smooth bottomed coal car if it can be used; eliminate leaks in the boiler setting, see that fire-doors fit properly, replace defective grate bars, make sure that smoke connections are clean and tight; if mechanical stokers are used, see that they are in good repair and that directions for using them are being followed; in general, make the plant and the fire-room of such character that an efficient man will stay on the job.

Install simple and convenient means by which the fire-room forces may see results; scales for weighing fuel and ash, meters for measuring water fed to the boiler, and devices for determining the quality of flue gases, the draft over the fire, etc., can be made to interest the men in the fireroom and show the actual results of efforts to economize; one convenient means for operating the flue damper must be installed.

Endeavor to run boilers in service at their capacity; if efficiency is increased, one or more boilers in a battery may be dropped.

Provide water that is free from scale by using, when necessary, water-testing devices if the plant is large and special feed-water heaters in small plants.

Reduce loss of heat after it is generated; see that that boiler surfaces and steam pipes are properly covered; the simplest and most inexpensive covering will reduce loss by 80 per cent.; in the engine room cut out useless steam lines, have valve properly set, reduce the small auxiliary pumps, etc., to a minimum, provide the repairs the engineer has been asking.

Obtain expert advice; good steam engineers are familiar with well-tried ways of reducing both consumption of coal and consumption of heat; their advice should be obtained in all practical cases; this is not a time for radical innovations but for utilizing tried experience.

One pound of coal per hour has yielded a horsepower per hour. That is the record of present possibility. It cannot by any manner of means be attained by every plant. But the fact that at present the average attainment throughout the country is but one-third or one-fourth of this record is indicative of the possible savings that can be made if the care and attention which the power plant deserves are actually given to it.

The foregoing items are part of Bulletin No. 2, issued by the committee on coal conservation of the Chamber of Commerce of the United States to owners and managers of power plants.

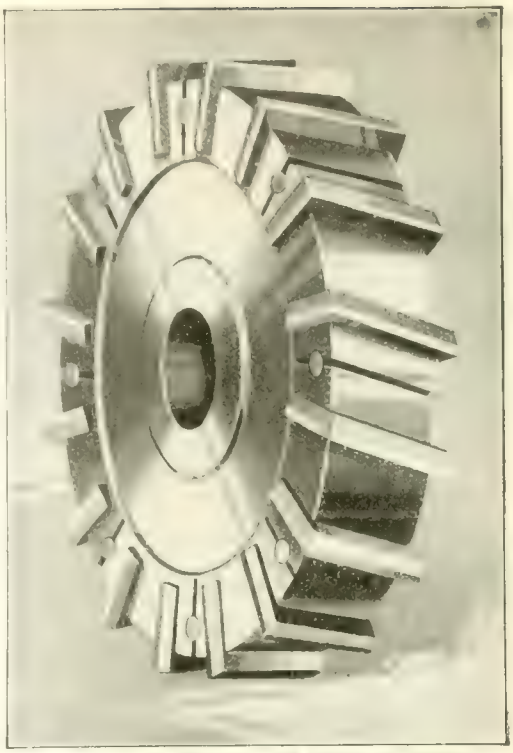


FIG 11. INSERTED TOOTH MILLING CUTTER

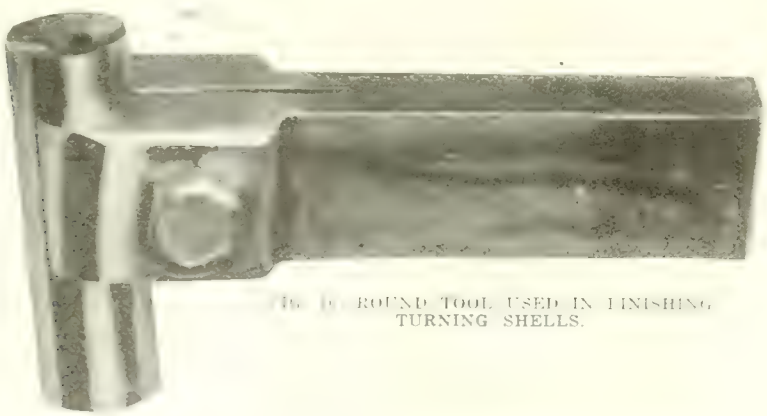


FIG 12. ROUND TOOL USED IN FINISHING TURNING SHELLS.

THE asbestos deposits of Rhodesia are being developed steadily. The production in 1914 amounted to 487 tons, valued at £8,612, whereas in 1915 it increased to 2,010 tons, valued at £32,190. During the first three months of 1916 the production was 914 tons, valued at £14,621. This field is situated in Victoria township, in the Mashatee district, Southern Rhodesia. The asbestos, unlike the Cape mineral, is a chrysolite of excellent quality. According to the returns made to the Department of Mines of the Union the production of asbestos of South Africa in 1915 totaled 2,138 tons, valued at £35,899. On the other hand, the export figures from that country show that 3,034 tons were shipped during that year.—"The Engineer."

ONTARIO is estimated to be now supplying 80 per cent. of the total world's production of nickel, which is now six times as great as in 1900. The richest nickel deposits so far discovered are those at Sudbury. The island of New Caledonia in the South Pacific, formerly yielded 65 per cent. of the total output.

PLATINUM is first recorded in Russia in the year 1821, when it was distinguished in the working of alluvial gold in the Ural mountains. Its value was not appreciated then, hence the discovery attracted little attention. Previous to this it had already been discovered in Colombia, South America.

# Standardization as Applied to the Gear Cutting Industry

By B. F. Waterman *

*In an address on the following page [illegible] of the Society [illegible] Spring meeting, April 18-20, Mr. Waterman outlined standardization as it pertains to industrial activities [illegible] organizations representing the various industries. He referred specifically to the engineering and electrical bodies and pointed out the valuable results arising out of their work.*

THIS association has considered it advisable for the advancement of the gear industry to appoint, as one of its standing committees, a "General Standardization Committee," together with a number of sub-committees, to consider and develop from the mass of data which now exists in various forms, standards for use in this industry, and which will be of value to all who may have to do with gears, either as manufacturers or as users.

In considering this subject, as applied to the various branches of the gear industry, we will first consider it in a general way, and later as applied to each division as represented by the sub-committees.

### Daily Problems

How many times in the course of our daily work do we have a problem to solve, the solution of which cannot be based on scientific data, for there may be none at hand, but must be based on our past experience, which may not fill the need of the moment, a good imagination, if we have one, and a guess? It is, at this time, that a standard method of procedure, based on the same similar data, would be desirable, and if we were called upon to outline such a one, we might do so; but then it would probably be applicable to the conditions of our recent problem only, and would not fit into the general scheme of things.

For instance, suppose we were called upon to furnish a pair of worm gears to give a certain reduction at a given speed to transmit a given horse-power continuously for ten hours without undue heating. How would you go about it? How would your associates go about it? This is nothing more, by the way, than a motor problem which has already been standardized.

It is possible that if a customer was to ask for proposals from every member of this association for a pair of spur gears to transmit a given horse-power between the motor and machine, he would find no two alike, with the result that he would probably take that pair offered by the one he thought knew the most about a problem of this kind, or he would take the smallest pair, as they would be the cheapest; but in any case he would not have any assurance the design he did choose was better than many of the others.

Why this difference? We would answer by saying that no two engineers will use the same strength formula, or, if they do, and [illegible] the same material, the values given the same factors will be different, or one engineer will use additional factors, not considered by the other, because his experience may teach him it is necessary.

A compilation of values, or a method of determining these values for various materials to be used in connection with some acceptable strength formula, might be considered a standard for calculating the strength of spur gears.

Let us now assume that of a dozen proposals received our customer finds this difference of which I speak. We can readily imagine what conclusions he will draw as to our ability to design, and as to our knowledge of spur gears.

Some will say immediately that "we do not make suggestions or offer proposals of this kind," that "we only cut gears to customers' specifications," etc.; very good, but as time goes on more and more will be expected of us in this direction, and we cannot entirely ignore questions like these, if we are to maintain our standing, for this information can be had or can be found if we look for it.

It will also be said, "as we only make the gears and do not use them, we cannot know exactly the requirements and, therefore, can not guarantee them." That is true, but we would know that what we did offer would fill certain conditions which would be stated clearly in the specifications, and if they failed we could feel reasonably sure that running conditions were not as specified. If we cannot answer these questions pertaining to our own line, how can the man unfamiliar with this business do so?

### What Must Be Done

You may think that this one point has been dilated upon more than is necessary, but what has been said here is applicable to any branch of this industry; we must be ready to advise on all gear problems and be able to say authoritatively that this gear, material, method of hardening, or, if we group it into one word, design, is the best.

As was stated in the general letter sent to the sub-committees, there are already in existence standards which are applicable to this industry, and many of the members of this association have standards of their own, based on years of experience that might be used by all, if the modifications that may be necessary are made.

There is also in the hands of our members enough data of a scientific nature, which, if brought together and analyzed, would form the nucleus of a respectable library of standards. One of our first duties should be to collect these standards and this data and from them make revisions of the standards to suit all conditions, if possible, and from the data develop other standards.

It will be admitted that any private standard that has the merit of successful use to recommend it will lend itself to general adoption much easier than some new one developed from whole cloth; therefore, we would suggest to each sub-committee starting on their work that they take those already in existence, whether in this industry or out of it, and endeavor to rearrange it if necessary for general acceptance.

Our reason for suggesting this is due to the fact, as stated above, that they lend themselves more easily to general adoption, and, as we are at the beginning of this work, the quicker we produce some standardized result the more easily will the more difficult problems succumb, due to our experience.

There have been, or will be, committees appointed to standardize, so far as possible, the work pertaining to various sub-divisions of this business. These sub-divisions are now ten in number, as you will have seen in the "Journal," and which I will not now take the time to enumerate, and, as the need develops, others will be made.

### What to Standardize

While the types of gearing, or the subjects represented in these sub-divisions differ from one another in some respects, there are a number of functions common to many or all of them, and an endeavor is made here to outline some of the things that might be standardized and applied to each.

The question of quality is probably the most important one we have to consider, as quality, other things being equal, governs price.

In times not so long ago a gear was only a gear, but in these days, and as we know it, a gear is a work of art, the product of love, and years of experience. So, too, it is considered by many users, although they are not always ready to pay the price for this artistry.

What we produce must fill certain standards of quality. What these are must be determined by ourselves and the users of the gears. It would be folly for us to set standards of quality if they do not fit the conditions of use to which the gears will be put, and there will always be conditions that any standard we make will not fit. These must be taken care of as they arise. Nevertheless, we can adopt those that will fit the

*With the Brown & Sharpe Mfg. Co., Providence, R.I., and Chairman of the Standardization Committee.

credit to us.

To maintain and produce gears of quality and suitability, we should adopt standard specifications which, when filed out, should state clearly what is required of the gears in question, so that the extreme care and the time that is necessary to produce the best is not expended on work requiring only ordinary workmanship.

There are now so many different materials and qualities of material that the best for each service with the proper treatment, if any is required, should be investigated.

Standards for the proportions of all types of gears might be developed, these to conform, as near as possible, to the various ones now in use by our members and by other large users of gears. A well-proportioned gear is essential in providing a well-designed machine, and while it is not to be expected that anyone who now has patterns will discard them, such a standard would influence the making of patterns in the future. In fact, "the commercial incentive to adopt our standard proportions will be supplied by the consumer asking or even demanding gears which embody such standards."

Many foundries now carry gear patterns, and if we were to order castings without specifying what we wanted, we would not know whether it would be a web gear or an arm gear, nor how many arms it would have, or their proportions.

### An Instance

A number of reference books have been investigated for the proportions of spur gear blanks, and it is found that they all differ, in some respects using different symbols to represent the various factors; some call for six arms for all gears; others vary the number of arms with the diameter of the gear, and some do not consider the number of arms. It is probable that until we adopt a standard for this problem every text or reference book will offer its reader something that differs from the others, if not in fact, at least in looks.

In speaking of looks, every engineer knows how convenient it is to work with symbols that mean the same thing day after day, and how inconvenient it is to find when looking up references in connectio with some problem to find that while each author may use the same symbol, it represents a different value from that used by another. For instance, in looking up arm proportions, it is found that for the width of arm at the hub the letters A, B and (small) h are used. Now if we want to check up or compare the results of these different formulae we have to keep our wits about

To overcome this difficulty, which applies to gears in general, it might be well to have a nomenclature committee to authorize a standard set of symbols to represent the factors we use.

Working limits should be adopted to assure our standards of quality, such as amount of runout permissible in the blank and in the cutting, size of hole, whether to be from standard-to-small or large, width of keyway, etc.

Standard formulae for calculating the strength of all gears with values to cover the various factors used.

### Variations in Formulae

It might be interesting to state here that Mr. John Cooper, in 1879, when investigating the formulae then existing for the strength of spur gears, found 48 well-established rules for horse-power and working strength, differing from each other in extreme cases about 500 per cent. We do not think this difference would show in gears offered by members of this association, but it would be possible. It is thought that the Wilfred Lewis formula is now quite generally used, but even here the proper value for strength of material must be used, and it is thought that it devolves on the Hardening and Heat Treating Committee to furnish us with these data; the values for the strength of various material under different conditions of treatment, as published in the data sheets of the Society of Automotive Engineers, would form a good working basis for this.

One problem that has not received the attention it should is the question of wear, and, while a gear may be amply strong when considered from the breaking point, it may not be suitable as to wearing qualities. What can be done here we will not attempt to say, but the most reliable information will come from successful examples of long-lived gears. This information might be accumulated in time, and it might be advisable to have a committee to accumulate such data. This committee might be known as a library committee. Such a committee might investigate the literature on gears, and there is much that is of great interest and which might be brought to the attention of the association by this committee. It is possible that each committee can do something along this line, as their investigations will lead them to previous unexplored sources. This subject has received some consideration, but it is doubted if any concerted effort was ever made to accumulate and analyze it.

### Application of Standards

Let us now consider standards as they apply to the various sub-divisions, and as they appear before you in the "Journal." We are at a loss to offer specific suggestions for some of these sub-divisions beyond what has already been pointed out as applicable to all gears, but it is probable that our members can offer suggestions that will furnish the cue for other standards.

Bevel Gears.—Within the last few years this type of gear has been very highly developed, due principally to a perhaps greater advance in machinery for producing them, this machinery being the invention and product of two of our member companies.

They have developed formulae for calculating the dimensions of bevel gears, differing from the usual or standard practice. Reference is here made to the long addendum and the circular type gears, and these formulae for calculating might be made standard whereby all of us may calculate alike the dimensions for these gears, as their growing use for general gearing demands that long addendum or circular type gears be made to some standard and not continue to be special types as they are now. There are now, as in the past, and will be in the future, many bevel gears cut with rotary cutters, and some consideration might be given to the proper cutters to use in cutting them.

Spur Gears.—By far the most used gear, and the one that has received the most consideration theoretically and practically. Most of the theory of gearing can be studied from it, and there are more distinct methods of producing it than any other gear. For this very reason any standard adopted must be one that does not conflict with any method of production, but should be applicable to each and all of them.

Worm Gears.—Within the last few years worm gears have come into their own, and are being used to transmit greater powers at higher speeds than was thought possible previously, but even now, with this great development, the design is not based upon complete analysis. There are so many conditions that enter into the design of worm gears that it is almost impossible to design a drive with any certainty of success unless we have before us a very similar successful design.

It would be well for the committee on worm gears to investigate the many successful drives now in existence and try to deduce some tangible working basis of design. This will not be an easy thing to do, but a start might be made towards this by getting in touch with the engineering societies. It is believed that the American Society of Mechanical Engineers have given this matter some consideration.

There is a great lack of uniformity in calculating the dimensions of both the worm and the wheel and also in the method of producing the worms, as well as in selecting the material from which to make them. To those of us who make or use hobs, it is known that the hob must be as near like the worm as possible and oftentimes when a customer sends in the wheel to be hobbed, intending to cut the worm himself, the question will arise, especially with multiple-threaded worms, just how the worm will be cut, whether with a tool or with a cutter. And even when we know a tool was used, was it made straight-sided on the normal or on the axis? If a cutter was used, was it straight-sided or was it formed to produce a straight axial section? If made on the normal section, what tooth proportions were used, those based on the axial pitch or on the normal pitch?

The committee should look into this subject and determine upon some standard specification sheet where all of these points will be considered.

### Worm Making

It would be possible to develop standard formulae for worm and wheel dimensions that would permit us all to produce similar gears under regular conditions. For instance, if we were asked to make a worm and wheel of any diameter with single thread it is probable that all of us would make the same worm in every respect except length, where we would probably differ, and the same wheel, except for width of face, but if we were to make a six-threaded worm it is probable that we would not produce the same worm or wheel.

Those who are equipped with a worm thread milling machine would use it to cut the worm and would use a straight-sided cutter, while others would use a lathe with either a straight-sided axial tool or a straight-sided normal tool. If these three methods are pursued the thread of each worm on any section would be different from the others, and any hob could be right for but one of them, the hob being made to the same system. Again, when the angle of thread with axis becomes less than 72 degrees it is the practice in the works of one associate to make the hob with spiral grooves, as it works better than a straight-grooved hob of this angle, so, too, they then calculate the tooth proportions from the normal pitch.

With worms of steep angle of thread, say from 45 degrees to 60 degrees with the axis, it is best to use a greater presure angle, as it produces better working conditions; in fact, it is quite impossible to make a hob for a 45-degree angle of thread worm of standard depth and pressure angle.

The proper length of worm and width of face of the wheel might also be investigated in this connection.

Herring-bone Gears.—It can be said of herring-bone gears, as of the others, that their greatest development has come only recently. This branch of the industry is highly specialized and any suggestions must come from others. What little experience I have had with these gears has taught me that they must be made extremely well if they are to fill their mission properly, and the sub-committee should take the initiative in determining what degree of accuracy should be demanded.

Sprockets.—This is another highly specialized branch of gearing and out of our control, in so far as the success of the drive depends on the chain which we do not make, as well as upon the sprocket. Any work this committee does should receive the sanction of the chain manufacturers.

We know that some chain manufacturers hesitate to furnish chain to run sprockets they do not cut themselves, owing to the lack of knowledge of many who would cut the sprockets, as to how they should be cut, and they may welcome the aid that this association can give they to make more successful the use of their product.

Composition Gearing.—For many years we have been called upon to furnish gears of other material than metal, and until recently these gears were usually made of rawhide or fibre, but now the two largest electric companies have developed a fabric composition that is being used to greater extent perhaps than any of the older materials. The working standards for any of this material will be different from those used for metal, and the committee will be governed by those who are most familiar with these gears.

Gears and Pinions.—"As applied to electric railways and mine work." As the members of this committee are associated in their daily work with this type of gears, we feel that they are more competent to suggest what is applicable to these gears, and wait upon them to furnish the initiative.

Hardening and Heat Treating Committee.—This committee has it in its power to do as much or more than any other committee to help clear the atmosphere on a most important subject. We all know that the best and most durable gears are those that are properly heat treated or hardened, and if they can suggest or develop standard methods to handle the various steels that are used for gears they will perform a service of inestimable value to every manufacturer and user. We believe that any steel manufacturer would be glad to help them in their work, for it would be to their profit to do so.

Inspection Committee.—This committee is a most important one, for upon it devolves the duty to develop standards of inspection suited to every kind of gear. Its members should endeavor to determine the working limits to suit all kinds and sizes of gears and the method of testing them.

To do this the committee, of course, should work in conjunction with each of the others, as we must consider the committee representing any kind of gear the authorities on that kind.

If any member of this association thinks that the work of these standardization committees is going to be easy we wish they would look up some of the reports of committees on standardization, as submitted to some of the engineering societies, such as those submitted to the American Society of Mechanical Engineers, and see for themselves the great amount of labor that must have been expended on them. We do not mean to say that all of the standards we may adopt will be the result of great labor, but to make a standard to fit all conditions we must deal with many men and many conditions, and this will take time, and the longer the time the greater the labor. Therefore, as we said before, let us start on the easy things, if there are any, so that results will show quickly, thereby gaining experience and accustoming ourselves to the use of the standards we develop.

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A NEW alloy of copper and nicked is claimed to have unusual properties, being permanent, non-corrosive, and capable of withstanding higher temperatures than German silver.

## FOREIGN TRADE AFTER THE WAR

E. M. Herr*

OUR business men, since the close of the Civil War, have been so engrossed with the development and care of our domestic trade that the selling of goods in foreign lands has been of little interest because in comparison with domestic trade it was not only far less profitable but also much more difficult to handle.

Our geographical remoteness from other nations, and consequently our unfamiliarity with their language and customs, also tended to cause foreign trade to languish.

On account of this apathy toward foreign trade, rather than a contributing cause of it, came the decline in shipbuilding in America an dthe remarkable decrease in the American merchant marine. This was hastened and accentuated, to be sure, by adverse legislation, culminating in the Seamen's Act of March 4th, 1915, until by the fall of that year the only American steamship line in foreign trade on the Pacific Ocean was driven from the sea.

On September 7th, 1916, the Act creating the United States Shipping Board was signed and the means for the present unprecedented activity in the acquisition and construction of merchant shipping was provided. $50,000,000 was provided in the original Shipping Act of Congress. Our country's entry into the Great War, however, caused nearly $2,000,000,000 to be placed at the disposal of the Shipping Board, which now has under construction upwards of eleven hundred vessels and is endeavoring to add, during the year 1918, more gross tonnage to the merchant marine of the United States than was comprised in the entire American Merchant Registry three years ago.

This enormous addition to our merchant marine will be still further increased, if the war continues beyond another year, and even should the war end sooner the very large and splendidly equipped shipbuilding yards now being provided on our coasts will undoubtedly enable our merchant fleet to be further enlarged to provide ships to replace those destroyed by the submarines during the war.

### Shipping Before the War

What this shipbuilding program really means will be better understood by a comparison of more statistics of the world's shipping before the war.

At the outbreak of the Great War, the merchant shipping of the world, of 100 tons and upwards, according to Lloyd's Register of Shipping, consisted of 30,836 ships of 49,089,552 tons, of which there were 24,444 steamers of 45,403,877 gross tons and 6,392 sailing vessels of 3,685,673 net tons.

Great Britain and colonies owned 15,123 steamers of 20,523,706 gross tons.

All belligerents, except United States, 16,331 steamers of 32,334,893 tons.

### Ship Ownership

United States July 1st, 1915, owned [illegible] per capita.

Great Britain July 1st, 1915, owned [illegible] per capita.

World's merchant marine tonnage 1890 to 1915 increased 122.7 per cent.

World's merchant marine steam tonnage 1890 to 1915 increased 252.2 per cent.

United States merchant marine total tonnage 1890 to 1915 increased 30.9 per cent.

United States merchant marine steam tonnage 1890 to 1915 increased 161.1 per cent.

In 1890 the United States had 20 per cent. of the total tonnage of the world and in 1915 11.96 per cent.

### Ingenuity Uses Structural-Steel Methods

Shipbuilding is developing a new era, brought about by the much higher wage rate here than in foreign countries. Inasmuch as American engineers have demonstrated their ability to underbid the world in the cost of erecting the structural steel used in our high buildings in the face of higher wages, it is possible to carry out the same operation with another form of structure—namely, a ship—and show equally brilliant results from an economic point of view. This idea has been so developed and perfected that the ships of the Emergency Fleet Corporation are being built of steel plates and shapes, all the laying out, cutting and punching of which is done so accurately by the manufacturers of these products in their shops before shipment to the shipbuilding yard that on their arrival they are assembled and riveted in place without re-handling or extra labor.

### Our Marine Equipment Plays Its Part

These ships are also being provided with high speed steam turbines geared directly to the propeller shaft. These turbines are very much more economical in steam consumed per horsepower delivered to the screw propeller and are at the same time very much lighter and smaller than the ordinary reciprocating marine steam engine, and even with the gearing required occupy much less space.

By the use of this lighter, smaller and more efficient propelling machinery, several important economies and improvements are effected:

Cargo space and tonnage are saved and the freight or passenger carrying capacity increased.

The greater economy of the turbines means less coal bunker space, or, with equal space, larger steaming radius.

The turbines are more easily and cheaply inspected, maintained and operated.

As an example of the advantage of high-speed turbines geared to the propeller shaft over the most modern steamship equipped with direct-driven steam turbines, an article was published in *International Marine Engineering* for October, 1914, showing the results which would have been obtained had the steamship "Lusitania" been equipped with high-speed geared turbines instead of the direct turbine drive installed on that ill-fated vesel. This comparison showed that with the geared turbines only three-quarters of the boilers would have been required, a reduction of 40 per cent. in weight of machinery secured and more than 25 per cent. of the coal saved. This change would also have released a large amount of space for additional revenue tonnage, all resulting in a total estimated saving of $898,000 per year in the operation of this vessel.

Our Government, recognizing the advantages of the high speed geared turbine in ship propulsion, has, as stated above, specified this design of machinery in the vessels now building in the yards of the United States Shipping Board.

### What Follows the Ships?

Assuming we have adequate merchant marine with ships economically built and efficiently propelled, what further is necessary to enable our merchants and manufacturers to successfully develop our foreign trade after the war?

### Our Competitors

Let us first consider what competition we will find most difficult. Some light on this important subject may come from an examination of the competition met before the war. Then England and Germany were the leading nations in export trade, the United States being third. In 1913 the combined imports and exports of these countries in dollars were:

England, 7 billions; Germany, 5 billions; United States, upwards of 4 billions; France, 3 billions; Belgium, 1.7 billions; Russia, 1.5 billions; Austria-Hungary, 1.2 billions; Italy, 1.2 billions.

Imports exceeded exports in all the above countries except the United States and Russia. For Great Britain the difference was $650,000,000; for Germany $160,000,000, and for France $315,000,000.

This difference is paid for by Great Britain through ocean freights, income from foreign investments and the trade in commodities among the countries. The other countries pay for their surplus imports in general in the same way, a larger amount, however, being paid in trade, which means that they are all vitally concerned in their foreign trade and are, therefore, the great trading nations of the world, and the largest and best customers of the United States. We, however, take from them more of their manufactured products—they from us more of our raw products. As we develop in ability to reduce the cost of our manufactured products and learn how better to meet the exact requirements of their trade, we will gradually increase our exports of manufactured products to these countries. This is especially true now that we have become a creditor instead of a debtor nation.

### Opportunities in Smaller Countries

The opportunity for such increase is, however, much better in those countries of smaller industrial development, like Russia, Japan, China and the South and Central America countries, all largely dependent on imports from foreign countries to supply their need for manufactured goods.

All trade is reciprocal, and we must not forget that if we are to supply a nation with the products of our industry we must take from them a considerable proportion of this trade in their products or establish some trade or financial relation which will enable them to largely pay us in trade for our goods. It requires co-operation among our manufacturing exporters to bring about the best results in this as in other trade matters.

We are fortunate in having a national organized body of manufacturers for this very purpose, which is rapidly becoming more effective and influential. I refer to the American Manufacturers' Export Association of New York, of which all manufacturers interested in export trade should be members to secure the results of close co-operation in foreign trade problems and be brought into close contact with that related organization—the National Foreign Trade Council—which has done and is doing such splendid work for the best development of foreign trade.

## NEW PROCESS OF TUNGSTEN FILAMANUFACTURE

A NEW German process for making lamp filaments of tungsten involves forming the lamp filament out of one long crystal. It is impossible, according to the "Electrician" to make tungsten crystals form gradually out of a mixture of tungsten powder and thorium oxide. The mixture is squirted through diamond dies into a filament of 0.02 m.m. to 1 m.m. diameter. This filament is then drawn through a chamber in which it is rapidly heated to a temperature of 2,400 deg. C. to 2.600 deg. C., and with a velocity of about 2.5 miles per hour, which is rather slower than the crystallization velocity of tungsten, so that a single crystal of indefinite length is formed. The chamber is filled with a neutral gas, and the heating is performed in two stages by a pair of electrically-heated coils, through the centre of which the filament is passed. The filament in this state is ready for use in a lamp without further treatment. It is softer than drawn tungsten wire at low temperatures and hard at high temperatures, which makes it particularly suitable for use in lamps. Filaments consisting of a single crystal of 25m. length have been produced in this manner.

ACCORDING to the "Revue de Metallurgie, the riches in iron of Brazil are manifest. The mountain of Itabira do Matto Dentro is said to have a plentiful outcrop of iron ore containing 70 per cent. of iron. Situated in virgin forests, an abundance of charcoal would be available for the furnaces. Moreover, there is ample water power at hand for the operation of electric furnaces for the manufacture of steel and other finished products.

# Principles & Practice of Mechanical Sketching & Drawing--I.

## Every Mechanic Should Know How to Make and Interpret Mechanical Drawings and Sketches of the Simpler Types—A Practical Course Prepared Especially For Younger Men and Newcomers in the Industry

By Terrel Croft

MECHANICAL DRAWINGS, so someone had aptly stated, afford a universally-understood means of conveying information about engineering matters. Thus a mechanical drawing, rendered in accordance with the prescribed practices, can be understood by any man who can read drawings, regardless of the language which he speaks. An engineer who understands only the Swedish or the Japanese language can, assuming that he understands certain well-established conventions, easily read a drawing prepared in North America and in accordance with North American methods.

Hence every man who has anything, either direct or indirectly to do with engineering should know how to make and to interpret mechanical drawing and sketches of the simpler types. This does not mean that it is desirable that every man should be a skilled draftsman or designer. But it does mean that he should be able to produce neat and decipherable sketches or drawings of the ordinary parts of machinery. And he should be able to read ordinary working drawings quickly and without effort.

### Scope of Articles

Every practical man who has served his apprenticeship and been through the mill understands the value of a sketch or drawing. Hence the statements in the preceding paragraphs contain nothing new for him. But the younger men or those who are just entering the engineering profession may not appreciate the importance of these things.

Now the series of articles of which this is the first is going to constitute a practical course in practical drawing and sketching, prepared especially to satisfy the requirements of these younger men. This course will not be laid out on the basis usually followed in the average school or college. On the contrary only the things which it is essential and desirable that the practical man should know will be treated. The thousand and one non-essentials which, from an academic standpoint, may be exceedingly interesting, will not be given consideration. Particular attention will be accorded to the preparation of working "sketches." The reason for this is that the practical man on the job will probably have to make an average of twenty sketches to one finished drawing.

If something breaks and repair parts must be ordered, it is up to the man in charge to make an understandable sketch of that part, or if additions or alterations must be made in an existing installation—and, as the practical man knows by sad experience, this state of affairs occurs only too often—sketches or finished drawings must be produced on which quotations can be made and from which the work can be installed after the new outfit has been purchased. Furthermore, if new equipment or apparatus is to be bought, the individual who is responsible should be trained to read the drawings so that he may check them for general arrangement and design and so that he may prepare himself [illegible] operation when they arrive.

### Sketches and Drawings

The distinction between a sketch and a drawing, as these terms will be used in this series of articles, is this: A sketch is a rough sort of drawing, made usually with a pencil only, but sometimes inked in, upon which no time has been spent in order to obtain a finished appearance. A drawing is always finally rendered in ink, usually on tracing cloth, but sometimes on drawing paper, and is finished with a border line and a complete title to be preserved as a permanent record. Usually it is justifiable to spend the amount of time necessary to insure a neat and finished appearance on a drawing because it may be referred to and used many times in the years to come.

The preferable sizes of sketches and drawings is a thing that is worthy of careful consideration. Frequently, when the first drawings are made around a plant or shop, they are laid out on sheets of many odd and different sizes, and hence are difficult to file, in that they may not fit the regularly-manufactured filing cabinets. Furthermore, when the sheets are of a number of odd sizes it is inconvenient to finger through a pile of them in order to pull out the one which is required. It is just as easy and as cheap to start systematically with a standard system of sheet sizes and to follow it consistently in the future.

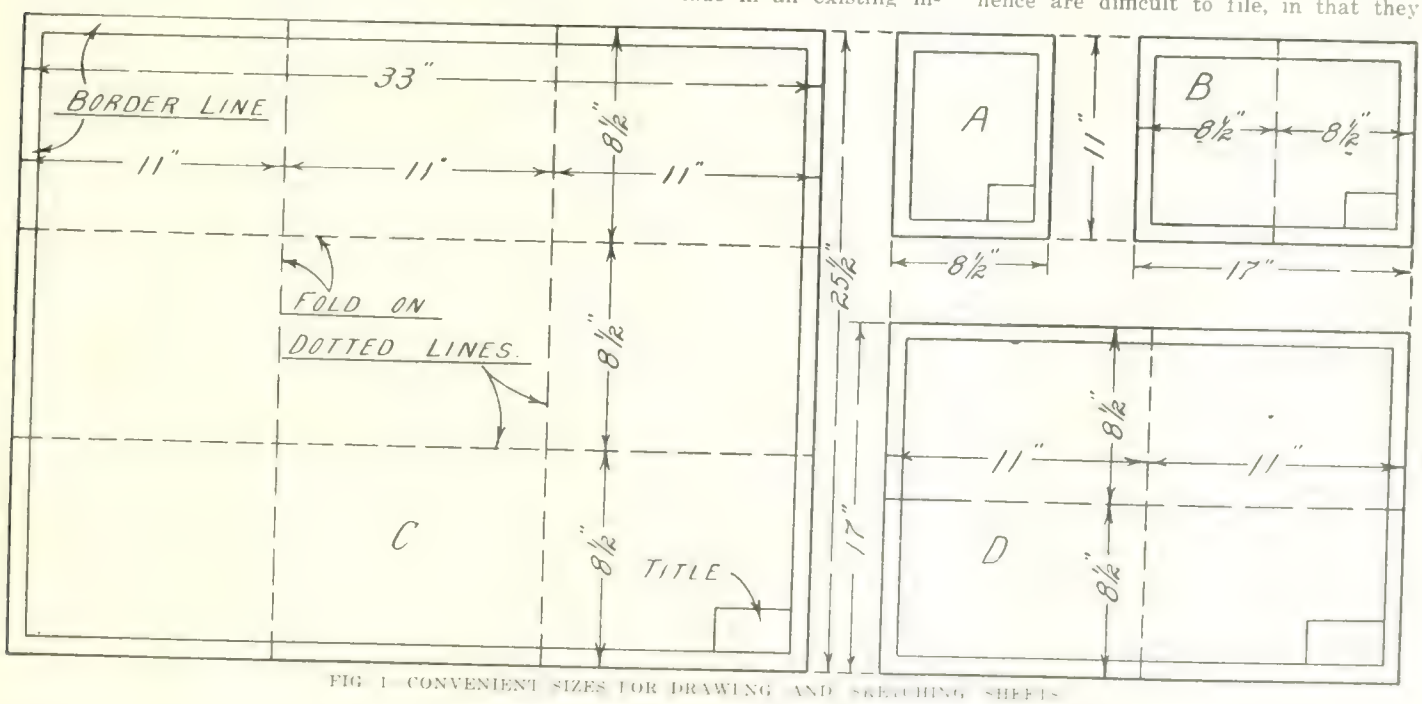



FIG. 1. CONVENIENT SIZES FOR DRAWING AND SKETCHING SHEETS

### Sheet Sizes

There are many different systems of sheet sizes in use in different shops and

*Registered in accordance with the Copyright Act.

system will answer every requirement. However, the one system of sheet sizes which is to be described has shown itself during a period of many years of experience to be the most satisfactory of any which have come to the writer's attention.

The basis of the system which we ad- sheet. This is the size of the usual sheet of business correspondence paper. The smallest size sheet, A, of the series, 11 in. over all. Sheets of this size can be readily attached to and filed with correspondence and can be stored in the standard vertical correspondence files. All of the other sheets, B, C, and D, have dimensions which are even multiples one way or the other of the $8\frac{1}{2}$ in. x 11 in. unit. Therefore, blueprints made from the B, C, or D sheets will fold accurately can be mailed with or filed with correspondence with minimum confusion and waste of space. In the average plant only three sizes, A, B, and C, and ordinarily required.

Because of the fact that it is desirable to have as few standard size sheets as possible, the D size should not be used at all unless special conditions justify its adoption. The steel companies and many of the engineering offices have used extensively a sheet which measures 24 in. x 34 in. over all. The C size sheet illustrated in Fig. 1 has dimensions sufficiently near 24 in. x 34 in., that it can ordinarily be substituted for the 24 in. x 34 in. sheet. Many shops find that they can get along very nicely by using only the A and C size sheets. The C size is then utilized for assemblies and general drawings, and the A size for details and sketches.

The selection of drawing paper is of sufficient importance where much work is done to justify consideration. The general tendency appears to be to use papers which are more expensive than is necessary. On the other hand it is uneconomical to use too cheap paper. For finished drawings or for design work a tough, relatively thick paper, which will stand considerable erasing is requisite. The "detail" paper, which can be purchased in rolls from the drawing supply houses and which is a light buff in color answers these requirements admirably and is relatively inexpensive. This paper also has the advantage that it does not become brittle with age, which is an essential feature where

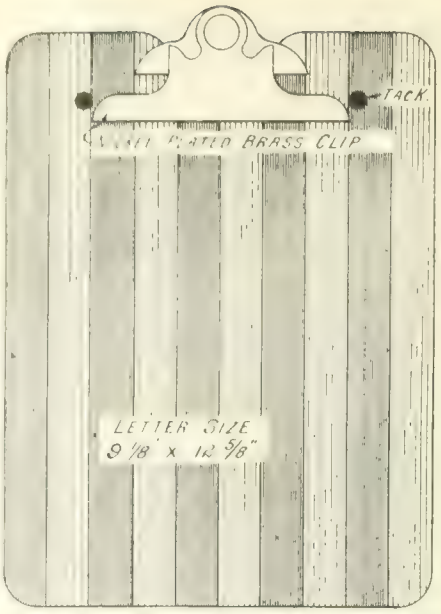



FIG. 3. CLIP BOARD FOR HOLDING SKETCH PAPER.

paper drawings are to be reserved for record. Furthermore, the buff tint appears to produce less strain on the eyes, particularly where the work is done under artificial light, than does brilliant white paper. However, this buff detail paper is not altogether satisfactory for sketching because it is too hard to take the smooth even line produced by a relatively soft pencil.

In a pinch almost any kind of paper can be used if the drawing is not for permanent record. The writer has used wrapping paper borrowed from grocery stores and the dark brown paper used for general bundling and it served the purpose well.

Paper for sketching (assuming, of course, that the sketch is not to constitute a permanent record) can be of any tough, open-grained material. Inasmuch as most sketches are made on $8\frac{1}{2}$ in. x 11 in. sheets, the writer's practice has been to use for this purpose sheets of ordinary bond correspondence paper. He finds that 16 lb. Hammermill bond is very satisfactory. As will be explained later, squared or cross-section paper (Fig. 2) is often very satisfactory and economical for sketching.

### Materials and Methods

Sketching will be treated first in this series of articles. The materials and the methods used in mechanical sketching will be given attention, and finally drawing and tracing will be treated.

A clip board constitutes an admirable sketching pad. Such a board, sometimes called a letter file, is illustrated in Fig. 3. In use the sketching or cross-section paper is held under the nickel-plated brass clip on the wooden back, which is about 5-16 in. thick. It is composed of hardwood strips glued together to prevent warping, and provides a smooth working surface and a rest for the hand. One of these boards can be conveniently carried to any part of the shop so that the sketcher who owns one may be sure of a satisfactory working surface wher-

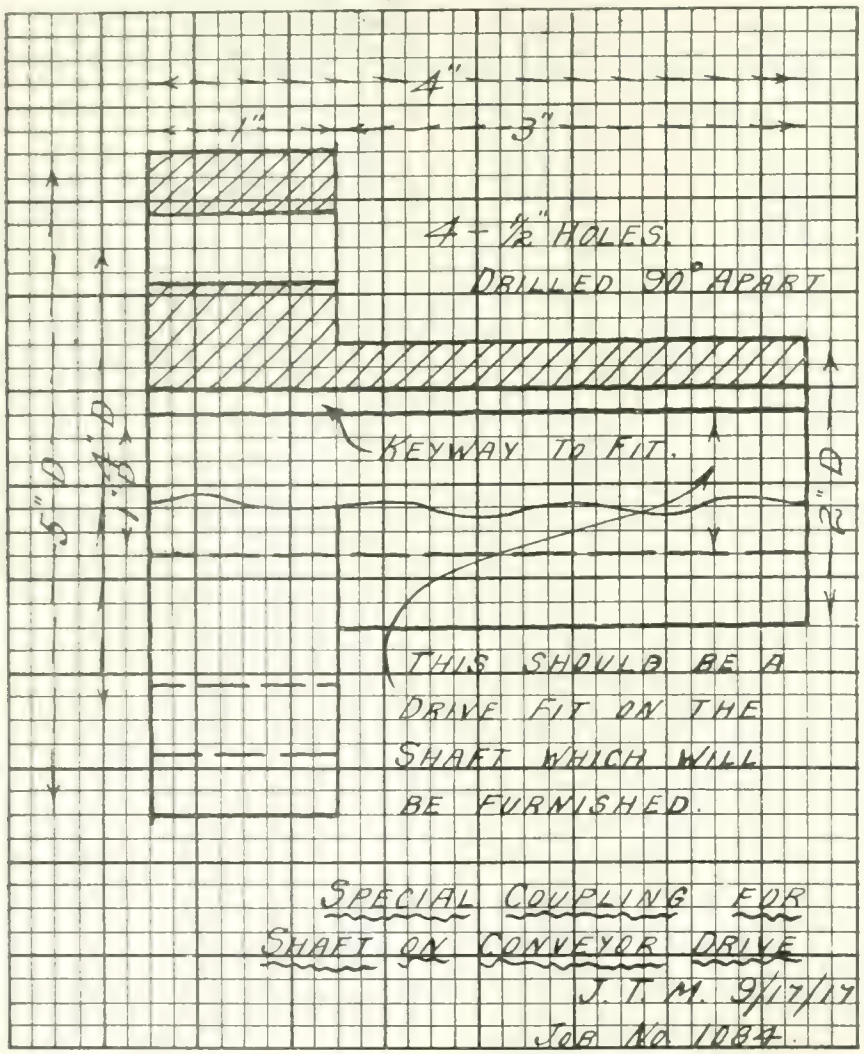



FIG. 2. EXAMPLE OF TYPICAL SKETCH DRAWN ON CROSS-SECTION PAPER.

ever he goes. When he starts out to make a sketch the board may be "loaded" with a number of sheets of plain and of cross-section paper. After he makes one sketch he withdraws this finished

FIG. 1 HOW TO SHARPEN A PENCIL.

sheet from the top of the file and places it at the bottom so that it will not become soiled. A couple of brads or tacks should be inserted in each board as shown in Fig. 3 to prevent the sheets from slipping too far up under the clip.

A clip board will cost from about 35c to 50c. There are certain precautions which should be observed in purchasing. Some of the boards on the market are not satisfactory for holding sketching paper. The clip itself should be of brass. Some of these clips are stamped from sheet iron, and while the nickel finish on them is bright when they are new, they will, after being used a while, due to perspiration and moisture, become rusty and soil the sketching papers. One can test the metal with a small magnet. If it is nickel-plated iron the magnet will stick to it, whereas if it is brass there will be no attraction. Furthermore, some of the boards have clips which will not remain open, whereas others, due to a little spring catch, will automatically remain open while the sheets are being changed. This feature is a great convenience.

Squared paper is a great time saver when sketches are to be made. Fig. 2 illustrates a sketch made on an 8½ in. x 11 in. sheet of this kind of paper. The paper may be purchased either in pads or in sheets and costs from one-tenth of a cent to ½ a cent a sheet, depending on the quality of the paper on which the squares are printed, the number of squares per inch and the quantity purchased. For general mechanical sketching the paper which has lines ⅛ of an inch apart each way (Fig. 2 is reproduced from such paper) is the most effective. Sketches can be easily and [illegible] ed paper. Even if they are not made to scale, the horizontal and vertical lines afford a guide whereby the sketch can be easily, rapidly, and neatly made.

If it is desired to make blueprints from the sketches, very thin squared paper, specially manufactured for this purpose, can be purchased. Then if the sketch is drawn in on it either in heavy pencil lines or with India ink satisfactory prints can be obtained.

### Quality of Pencils

Pencils for sketching should be rather soft, but the grain of the graphite should be even and contain no hard spots. In other words, it is not economical to use a pencil which is too cheap. A hard pencil is not satisfactory for sketching because it is difficult to control. That is, with a properly sharpened soft pencil one can obtain at will a fine line or a rather bold one. Such variation is impossible with a hard pencil. For his own work the writer has found a pencil made by the American Pencil Company of New York, and called "Velvet" No. 2.557 as satisfactory as any. Each of these pencils has a red rubber eraser in the end, which is a great convenience. The "Velvet" pencils cost 5c each when purchased separately, but when bought in boxes of one dozen each the price is about 50c per dozen. It does not seem

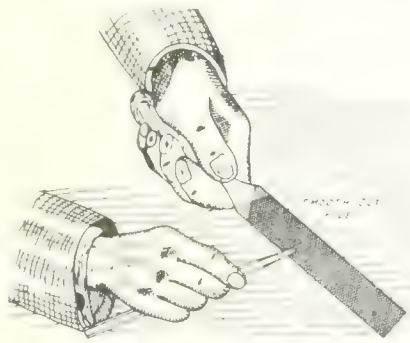


FIG. 3 FINISHING PENCIL POINT WITH A FILE.

FIG. 4 CORRECT METHOD OF SHARPENING A PENCIL.

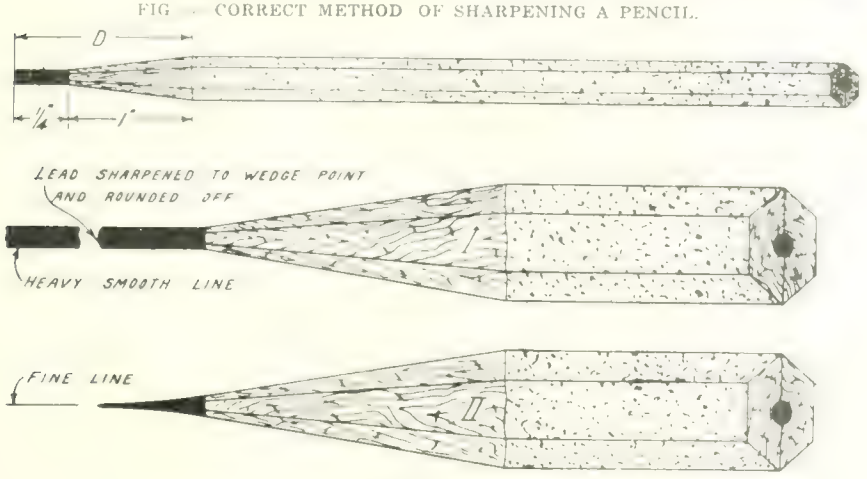
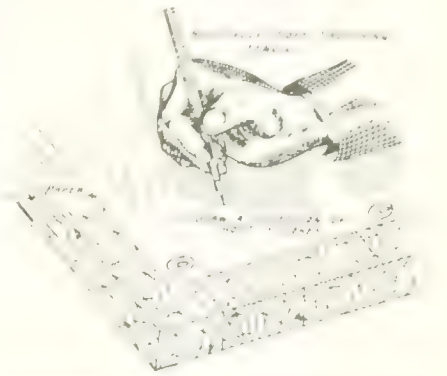



FIG. 6 DETAIL OF POINT.

that it is necessary to pay more than this for sketching pencils.

In sharpening the sketching pencil certain precautions should be observed. Probably every fellow thinks that he



CORRECT METHOD OF HOLDING A PENCIL FOR SKETCHING A VERTICAL LINE.

knows how to sharpen a pencil, but in this, as in many other things, there is one way which, all things considered, is the most satisfactory and economical. The first operation is to cut the wood away from the lead as shown in Fig. 4. Needless to say, the knife blade should be sharp, and kept so, hence it should not be permitted to cut into the graphite. The pencil should be held, as illustrated in Fig. 4, in the left hand and the knife blade drawn with the right toward the pencil point, the movements of the blade being controlled in the meantime by the thumb of the right hand resting against the wrist of the left hand. It is a mistake to endeavor to sharpen a pencil in the left hand and whittling on it out into space because, where the pencil is held in this way it is impossible to control the blade properly, and the consequence is that the manipulator breaks the graphite point off about as rapidly as he whittles away the wood which exposes it. Fig. 5 suggests about how the sharpened pencil point should look. The exposed graphite should be in the neighborhood of ¼ in. in length and the wood should be whittled back for approximately 1 in. If the distance (D, Fig. 5) is too short, one cannot get the right kind of point on the pencil, and if it is too long the working end of the pencil is weakened excessively.

In finishing the point of the sketching pencil the excess graphite (Fig. 7) is ground away so that the exposed lead takes the wedge form delineated in Fig. 6. With the point ground as shown (Fig. 6-I) the draftsman may hold the pencil (Fig. 6-I) so that the flat side of the point is presented to the paper when he desires to draw a heavy outline or boundary line. When it is desired to draw a fine projection center or dimension line, the pencil is rotated so that its fine edge is presented to the paper as shown at II. In grinding the point, a smooth-cut file (Fig. 7) is about the most convenient tool. While fair results can be obtained with almost any sort of a flat file, a new, sharp, smooth-cut tool will justify its cost. If a file is not available a strip of fine sandpaper or medium

Erasers

tainable. Some of them are worthy of

FIG. — CORRECT METHOD OF HOLDING PENCIL FOR SKETCHING A HORIZONTAL LINE.

consideration and some are not. When sketching, unless the sketch is to be inked in with a fountain pen (the fountain pen method is described below) only one kind of eraser is required. For this general service, the eraser manufactured by Eberhard Faber, of New York, and known as the "Ruby" 112 has been found very satisfactory. This is wedge-shaped at each end and measures over all 2¾ x ⅝ x 5-16 ins. The price of this eraser is 5c. Where not a great deal of work is being done, the red eraser in the end of the "Velvet" pencil described above will be satisfactory. Where sketches are inked in with a fountain pen the pliable or cleaner eraser should be used for rubbing out the pencil lines after the inking in has been done. For this service the Hardmuth eraser, which is manufactured in Austria and now difficult to obtain, gives good service. Another similar eraser which apparently does quite as well is the "Janus" No. 70-13-12, manufactured by A. W. Faber, Newark, N.J. Both of these cleaner erasers measure 1 5-16 x 5-16 x 2 ins. and cost about 6c each.

A fountain pen may be used very effectively in making sketches. The procedure is first to pencil the sketch in and not to erase any of the pencil lines, construction or otherwise, which were used in mapping out the job. That is, in making a sketch it is usually impossible to have the pencil lines go where they should the first time, but with this method when a pencil line is drawn in the wrong place, do not at this time erase it, merely draw another in the right place and proceed. After the draftsman has determined the form of his object he then inks in with the fountain pen—using the ordinary writing fluid or fountain pen ink—the lines of which will comprise his sketch, then all of the pencil lines that should be obliterated are rubbed out at once with the soft rubber. By following this procedure the time that would be wasted in constantly erasing and changing pencil lines is saved.

The correct methods of holding the sketching pencil are shown in Figs. 8 and 9. Any line which is sketched in should comprise a series of short strokes, that is the sketcher feels his way along as it were. It is not feasible to draw a long continuous sketch line with one stroke of the hand. The base of the hand and the forearm should rest on the drawing board or some other support; the ends of the successive strokes should not be lapped over one another but they should join so as to form a continuous smooth line. When the line to be sketched is a vertical one, the hand rests on its side and the strokes are executed by movements of the fingers, as detailed in Fig. 8. In sketching a horizontal line (Fig. 9) the whole hand is moved, hinging from the wrist, whereby a series of short strokes is produced, it being necessary to move the hand from location to location as the development of the line proceeds.

In arranging the different views of the object to be sketched on the sheet it is usually desirable, though not by any means always feasible, to put the plan view (see Fig. 10) in the upper left-hand corner, the side elevation to the right of the plan view and the end elevation below the plan view. This arrangement provides space for the title in the lower right-hand corner.

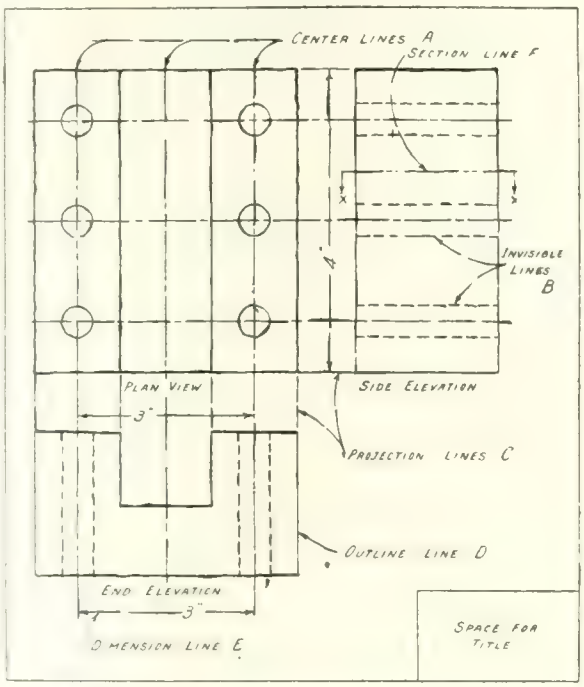



FIG. 10. DESIRABLE ARRANGEMENT OF VIEWS ON A SHEET AND SIGNIFICANCE OF DIFFERENT LINES.

**Lines and Their Purposes**

The different kinds of lines which are used in making a sketch have different meanings. In other words, each kind of a line is in itself a symbol, hence, to understand drawings one should appreciate the significance of these different symbols. Unfortunately, practice regarding the meanings of the lines of the different kinds has not been standardized universally. The practice which will be followed herein (and which is explained in the paragraphs immediately following) is, it is believed, in line with best usage.

All of the different lines which will be used in this series of articles are black lines. Formerly it was the practice to use for mechanical drawings lines of different colors, red, blue, and the like to indicate different things, but since it is impossible to accurately reproduce these colors on a blue print or on a page which is printed only with black ink, their use has been discontinued in practical engineering; experience has shown conclusively that mechanical drawings which are entirely legible can be constructed wholly from black lines.

Boundary lines or outlines are those which indicate any edge or boundary of a surface, when that edge or boundary is visible from the location from which the object (which is shown in the drawing) is viewed. Boundary lines are always full continuous black lines, as shown at D in Fig. 10. They are frequently made quite heavy so as to emphasize the contour of the object.

Invisible lines are used to show any edge or boundary of a surface when that edge or b oundary is concealed from view. As suggested at B, Fig. 10, dash lines with relatively short dashes are used for this purpose. The spaces between the dashes should be about ¼ the length of the dashes. Whenever two lines consisting of dashes lie close together and are parallel, the breaks between the dashes should be staggered; where this is done the course of each broken dash line can be followed readily with the eye.

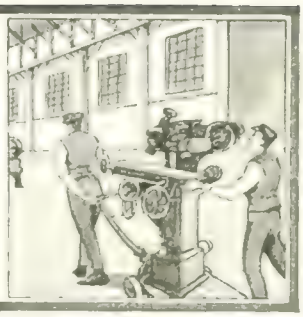
Center lines are imaginary lines, comprising a series of alternate dashes and dots (A, Fig. 10), around which the object of the drawing or certain parts thereof are symmetrical. In laying out a drawing or sketch, usually the first step is to plot the principal center lines.

Projection lines are imaginary lines (C, Fig. 10) connecting, in the drawing, the same edges of surfaces in the different views. Thus, a projection line is used for projecting the position of a surface or edge in one view to the position of that surface or edge in another view. Projection lines are also drawn as shown in the end elevation of Fig. 10, where it is desirable to project the outline of an object so that a dimension line, W Y, can be drawn between the projection lines. A dash line composed of rather long dashes is used for a projection line.

A section line consists (F, Fig. 10) of a series of dashes with two dots between each pair of dashes. Section lines are used to indicate the location at which a section of a drawing is taken. This

Continued on page 607.

# DEVELOPMENTS IN SHOP EQUIPMENT



*Makers of equipment and devices for use in machine shop and metal working plants should submit descriptions and illustrations to Editorial Department for review in this section.*

## SHELL BOURLETTE GRINDERS

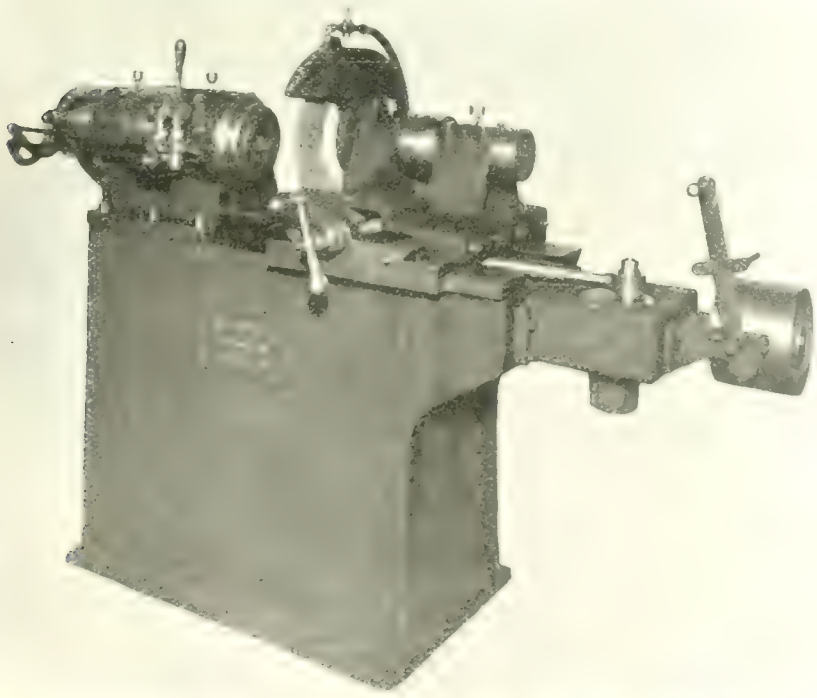
THE manufacture of new types of shell in Canada, the 75 mm. and the 155 mm. calibre, has called for special machinery for certain operations, one of these being grinding the bourlette. Part of the bourlette is flat and it was for this work that the machines were designed.

The Ford-Smith Machine Co. of Hamilton, Ont., designed and is building a new line of machines for grinding the bourlette. It is a development of their well known grinders but embodies a number of special features which will be observed in the accompanying illustrations. The grinders are made in two sizes, for the 75 m.m. and 155 m.m. shells respectively, the machine for the latter being of course larger and a heavier construction, although the general design is practically the same for both grinders. The machines have already proven to be a success for the firm that placed the first order has already sent in a repeat order for a larger number of grinders. The machines were tested and found to be entirely satisfactory for the work they were called upon to perform.

One of the chief problems that had to be considered was handling the work, for the actual grinding of the bourlette takes but a little time. An air chuck was found to meet the requirements of the situation, so both types of machine are fitted with a quick acting air chuck. The 155 m.m. grinder has in addition a swing arm to enable the shells to be handled expeditiously and so speed up the operation of the machine. Being a heavier shell than the 75 m.m., the swing arm is of considerable assistance to the operator as well as in speeding up production. No special provision of this kind is necessary for the 75 m.m. shell.

Apart from the differences already mentioned, the operation of these grinders is identical. The shell to be ground is gripped in a spring collet in the headstock spindle and is operated by the air chuck. The headstock spindle is revolved at a moderate speed on the 75 m.m. machine, by means of a large pulley on the spindle, while on the 155 m.m. machine it is operated through gearing. The emery wheel has an independent drive and is mounted on a heavy spindle which runs in bearings on a carriage as shown. The carriage is adjustable and is traversed by means of a worm drive, back and forth across the work, while the wheel is fed as desired, the feed being regulated by means of a gange. The emery wheel is provided with special flanges and suitable splash guards.

A lubricant pump is provided, the tank for the lubricant being cast integral with the bed. In some cases a pump is not required, for in many munition shops where only a few thousandths are left for finish, grinding the operation is done dry, in which case the wheel hood is connected to a dust exhaust system. There is nothing of a complicated nature about these grinders, only unskilled help being required to operate them. The operation is rapid and accurate, the speed of production depending largely upon the amount of metal to be removed. The accompanying illustrations show the general design of these machines, the principal dimensions being given below.



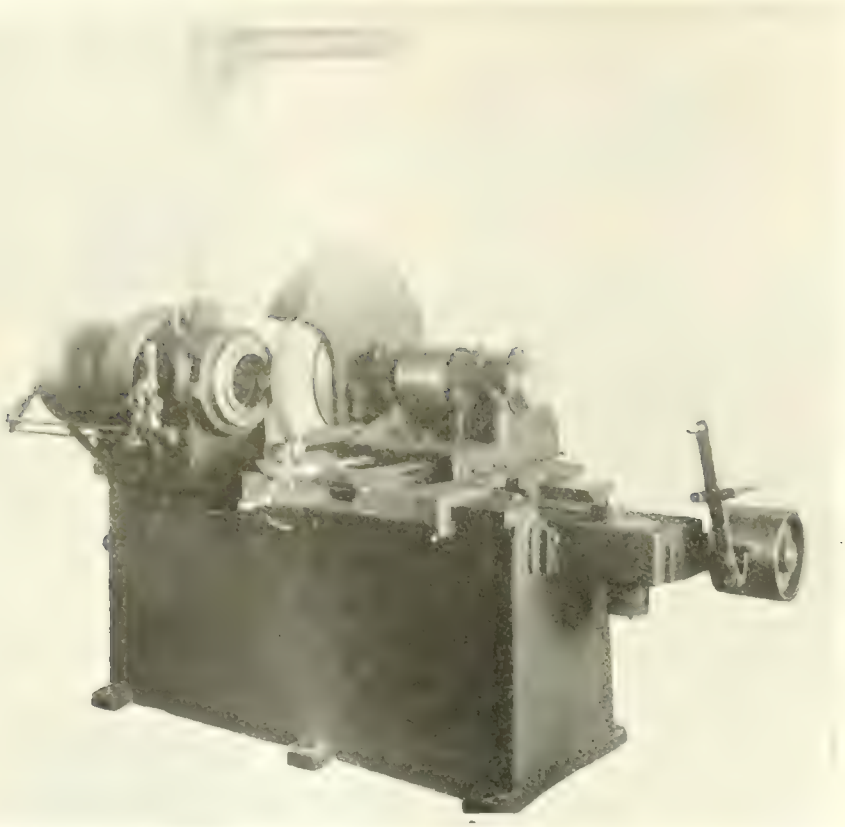
SHELL GRINDER FOR BASE AND BOURLETTE OF [illegible] PDR. AND [illegible] MM. H[illegible]

## BAND RESAW

The band resaw and scroll saw illustrated herewith is made by the Oliver Machinery Co., Grand Rapids, Mich., and is recommended as a general utility tool of more than ordinary work. Its adaptability is shown in its ability to resaw expensive lumber, such as white pine, cherry, mahogany, etc., with very little waste.

As a resaw, this machine will rip by power feed, 10, 15 and 20 ft. per minute, [illegible] thick. As a scroll saw it will take 18 ins. under the guide, and will saw 38 ins. between the saw and the column. Saws from 18 to 20 ft. long and up to $2\frac{1}{2}$ ins. wide may be used.

The change from resawing to ordinary band sawing is instantly effected by swinging the arm carrying the two



GRINDER ARRANGED FOR GRINDING THE BOURLETTE ON 15-MM. SHELLS.

power-driven corrugated rolls out of the way and changing saws.

The frame is cast in a cored form, and has a base 46 x 23 ins. The floor space needed is 60 x 47 ins. The table is 40 x 36 ins. and 40 ins. from the floor, and tilts 45 degs. one way and 5 degs. the other. It is heavy, double-ribbed, and is supported on rockers for angle adjustments. The tilting is done by means of a worm gear and hand wheel at the right of the operator. The rockers are machined all over and tongued and grooved firmly to seats. The angles are indicated in degrees, upon the dial at the front of the machine.

The auxiliary table is 21 x 22 ins., and is bolted to the frame. It increases the surface of the work table almost half. It is vertically adjustable.

The wheels are of cast iron, 38 ins. in diameter, are machined all over and are given a running balance. Best quality leather bands are cemented to wheels. Upper wheel guarded with heavy wire mesh door supported on cast iron hinged bracket attached to column of machine. The lower wheel is enclosed in a metal casing having two doors. It is provided with a device whereby the dust is collected and thrown to the front of the machine for convenience in attaching an exhaust fan. The upper wheel is carried in a long split box lined with genuine babbitt. End thrust is taken up by end collar.

The outboard bearing supports the end of the lower wheel shaft and is self oiling. The tight and loose pulleys are located between this and the main bearing.

Saw tension is secured by a telescope spring of correct strength and elasticity, automatically adapting itself to the varying tension required for light or heavy saws. It is very sensitive.

The guide post is made of steel 1½ in. square and counterbalanced by an encased coil spring. It is readily locked to a fixed position. The post carries a frictionless roller guide, adjustable for varying widths of saws and another similar guide is located below the table.

A grooved saw guard is located on the column receiving the saw and protecting it both sides. A front guard made of steel with a wood facing is carried on the guide post and covers the saw above the blade.

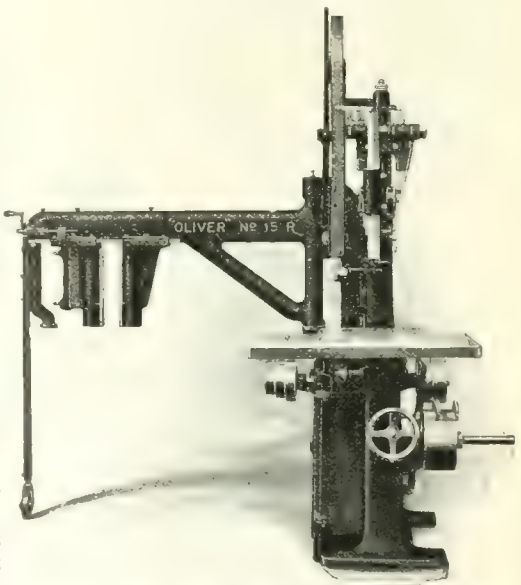
## JAPANNING IRON AND STEEL

By L. E.

The process of japanning iron and steel castings is not by any means a difficult process, providing reasonable care is exercised and that the operator has had some practice. The castings must first be dressed and all the sand and dirt removed, preferably by dipping them in a pickling solution, after which they should be well coated with good linseed oil. When the surplus oil has run off, the castings must be put into a slow closed oven and gradually heated till the surface is quite black. Should the oven be too hot the work will be spoilt by blisters, but to be of the correct heat when taken out the castings should have a fine black polish.

Another method of imparting a deep and beautiful black to iron and steel is to impound the work in a mixture composed of ten parts of saltpetre to one part of black oxide, but this mixture must first be heated in a pot until it is hot enough to char a piece of wood. This process is, of course, only used for machined and finished work, and this must be carefully cleaned first. There is, however, some disadvantage in the use of a heated chemical mixture for tempered steel, as the temper is sometimes drawn. Blacking iron and steel is sometimes done by first making the work brown, and for this a chemical solution, consisting of sixteen parts of alcohol and one part of corrosive sublimate, is used. After being cleaned the piece of iron or steel is washed with lime, then scrubbed with dry lime, as there must be no grease left upon it. It must not be touched with the hands. Rust plays an important part in the process. A sponge must be used to apply the chemical solution, after which the piece of work being treated must be put in a dark place to rust. This may bake anything from a few hours to several days, according to the conditions existing. When dry the rust must be carded off, and then another coat of solution put on, and the process repeated until the required brown is obtained. To change the brown to a permanent black the part should be put into a steam-heated oven for a few hours.

A simpler, but not quite so good, way of changing the color from brown to black is to simply dip it in boiling water, and before it has cooled to give it a coat of boiled oil. Sometimes instead of blacking or browning metal it is desired to make it blue, and this is not done by

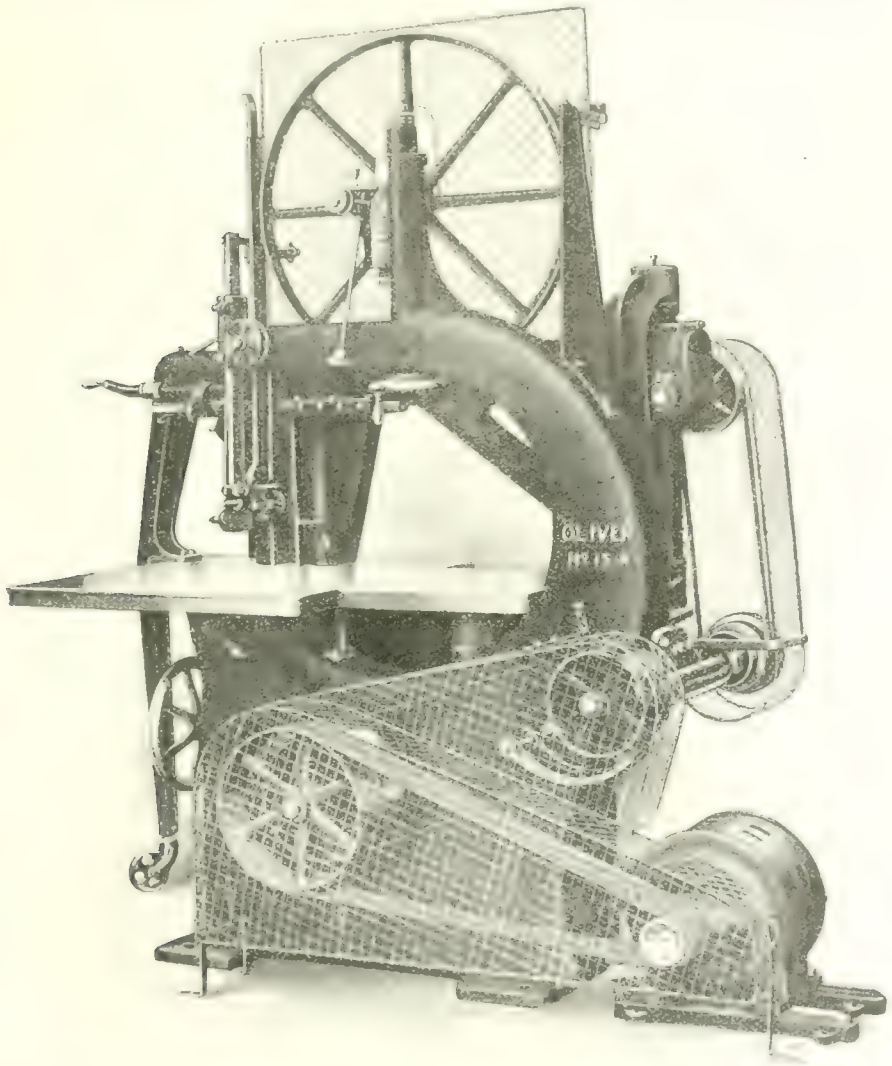



BAND SAW WITH RESAW ROLLS SWUNG OUT OF THE WAY.

dipping, but by heating it in charcoal or hot sand or wood ashes. Whichever agent is used is put into a pot over the fire, so that every particle may be evenly heated. It is stirred all the time it is put on the fire. The metal work will have to be hung by wires while it is dipped in the heated sand or ashes, and care must be taken that the work is absolutely clean and dry and highly polish-

ed. In bluing or blacking work the higher the polish the better is the result. Usually charcoal is used if a dark blue color is wanted and ashes or sand if a light blue color is wanted.

All sand and dirt should be removed, even from castings and forgings that are not to be colored, to save the cutting edges of the tools. Dilute sulphuric acid is a convenient and is also the commonest pickling solution, and a lead trough



BAND RESAW WITH WIRE GUARDS

makes a good pickle bath. It is a very easy matter to make a contrivance over the bath from which the castings can be suspended. The acid really melts the rough surface of the work sufficiently to lossen the dirt, when it is more easily brushed off. To secure direct action on the sand hydrofluoric acid can be used in the proportion of one part to ten parts of water, and it acts much more quickly than sulphuric acid.

## THERMIT

IN the process of melting aluminum by means of the thermit process the slag represents three-quarters of the contents of the crucible and, for the present at any rate, has to be thrown away as useless. Attempts have been made to convert it into a refractory but without success. Thermit products are restricted to the rarer kinds of metals and alloys which cannot be produced readily by ordinary fuel methods. Prior to the war the various compositions necessary for working the process came from Germany, but now that the company has been brought under entire British control, means have been found for producing everything that was formerly produced from materials of German origin, from materials obtainable in this country. This result has necessarily involved a great deal of research, but it has been successfully carried out, and there are now some thirty metals and alloys dealt with in this way. As has been known for some time, the Germans have made use of thermit in connection with incendiary bombs dropped from aircraft, and generally thermit is now a recognized military store. The thermit process for melting metal cannot, of course, be recommended on the score of economy, but where it is necessary to do so quickly in circumstances in which time is more important than cost, then it has an important place in industry. The use of the process for ship repairs and similar work during the war has been invaluable, and it is now a common thing for ships to carry a thermit outfit on voyages.

## CARBORUNDUM

The discovery of carborundum is due to Dr. Acheson, of the United States, who, following up some early work of Moissan, discovered that hard crystals were deposited after passing a current through a mixture of salt and coke. The first sale of this material, which was to a jeweler, was made at the price of £175,000 per ton, the output being at first four ounces a day. As the use of the material for grinding became known its output increased, and the price dropped to £2 per pound, then to one guinea, and later to 2c. per pound. Carborundum will not always successfully deal with steel, with the result that a harder material, alundum, or aloxite, had been introduced for this purpose. It is produced by fusing bauxite, the most important deposits of which are in the South of France, although there are some in County Antrim which are of uncertain composition. The material is produced at the mines and sent to the works of the Carborundum Co. at Manchester, where it is made into various grinding stones. The Norton Company, of Canada, also owns some American deposits of bauxite. Alundum has also been found to act as a good refractory, having a melting point of 2,050 deg. An interesting feature of its use in the electric furnace is that if a silica muffle is wound with platinum wire the wire will not stand the high temperature, whereas when wound round an alundum muffle it will. Alundum is porous and is used as a filtering medium.

## MECHANICAL SKETCHING AND DRAWING

Continued from page 604.

situation will be described in detail in another article.

Dimension lines (E, Fig. 10) will, in this series of articles, be shown as broken lines comprising a series of very short dashes which are almost short enough to be dots. In many shops it is the practice, and, in fact, it is universally considered good practice, to make dimension lines very fine, unbroken black lines. However, where drawings must be reproduced for cuts, a dotted line gives more contact and is hence more readily understood than a fine unbroken line.

Arrow heads are used on the ends of dimension lines (E, Fig. 10) on the ends of section lines, as at F, and for other purposes. The arrow heads should always be bold and big enough so that they will be quite legible.

(To be continued.)

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### HISTORY REPEATS ITSELF

INDUSTRIAL developments in the United States, due to the increasing pressure of war conditions, have served to strengthen the advocates of equal treatment for male and female workers.

When the dilution of labor first commenced in Great Britain, the hide-bound traditions of trade unionism sustained many a severe jar resulting from the undiluted sincerity of women workers in doing their best. When the United States entered the war, it was not at once realized that women might be called on to help as they had been in Europe, but circumstances are demanding it, and the good showing of their English sisters has been largely duplicated by American women.

The appalling shortage of skilled labor in the States is perhaps realized by a few only. It is not that there are not many hands, but the capable hands are few while the jobs are many. The council of national defense through the chairman of its section on industrial training for the war emergency states that of 10,868 skilled men who applied for jobs in one district during one month, only 1,200 were found to be competent machinists. An average of 10 per cent. only of all applicants where the work demands skill have been found usable without training.

Not only is good instruction difficult to secure but care has to be taken to prevent many learners absorbing undesirable and inefficient methods of working.

While such a condition can be remedied in time and by concentration of effort, the problem of reconciling a large proportion of the men to the newcomers is much more difficult of solution and meantime operates against the war effort of the nation.

Two instances indicate the change of spirit which must be effected: in a certain shop a girl made $9 a day almost from the start because a man who operated the machine before her had satisfied his employer that $5 worth of work was all that could be produced—again, male workers in another factory turned out 20 pieces per hour of a certain fuse part, where as a result of a price dispute the men had greased the belts, etc., and cut it to 12 per hour. Women were trained for the work and ultimately raised the output to 55 per hour.

The mention of price dispute touches on a feature which has done much injustice to male workers in general. The only conditions which will result in maximum output from men are absolute honesty and sincerity on the part of the employers so that the men will trust them in all of their dealings. There is no use in blaming it on the men; most of them have been stung once, and they must be shown now more than ever before that reasonable effort on their part will not react to handicap and overload them while the employer makes war profits.

If a firm has accepted a contract, based on certain existing shop conditions, and then through patriotic and other methods induces the help to become more efficient, the help must share accordingly. Perfect frankness must accompany any proposed reduction, and the suggestion has been made that a committee of employees should act on behalf of the shop hands and be informed and consulted where a reduced rate is obviously reasonable where conditions have been brought about by the firm's initiative and at their expense.

On the other hand a maximum rate might well be arranged with the men, a rate which all might not hope to reach or even be capable of reaching, but which some brighter minds might attain through extra effort or resource. A liberal bonus system for such employees, rated according to increased results obtained would do much to stimulate effort and remove that distrust which in these days is one of the enemy's best weapons.

### NATIONAL CONCENTRATION

ALMOST four years of warfare have removed most of the national hesitation, nervousness, indecision and ignorance which came to light occasionally as the tide of fortune ebbed and flowed in the great struggle. Periods of elation and depression have alternated. When the United States entered the war spirits ran high, to gradually subside awaiting definite accomplishments by our big Ally.

It was presumed by many, that, having the benefit of British and French experience, plus American hustle, things would be doing soon. Despite the disappointment experienced by those expectant enthusiasts, the work of the States during the last year has been on a colossal scale, characterized by a deliberateness of action and actuality of accomplishment which in days to come will be more than ever appreciated. Treachery and treason are best dealt with silently.

The increasing importance of the United States forces, due to the rapid growth of numbers and the development of home sources of war supplies, is of particular interest at this time. Not the least interesting phase is the publicity given to actual accomplishment, and the calculable effects of real facts on the morale of the enemy is probably one reason why such work is given special attention by the authorities at Washington.

An announcement by the Shipping Board shows that one wooden ship per day has been turned out for the past few weeks and steel vessels are being delivered almost as rapidly. In noting this fact it should be observed that one factor has been the overcoming of the lack of transportation. A great speeding up in the delivery of cars for transporting shipbuilding materials is reported by authorities and what has been done in respect of this industry will doubtless be accomplished for the rest of the country's activities in proper rotation.

### WELSH TINPLATE SHUT OFF

ONE of the shifts in trade occasioned by war conditions is the shutting off entirely of Welsh tinplate from the Canadian market. "Hardware and Metal" states that an arrangement has apparently been reached between Great Britain and the United States to the end that the United Kingdom would cease to ship tinplate to countries to which the United States is now exporting.

The output of the Welsh mills has been greatly curtailed since the outbreak of war. Last year the output was estimated at 350,000 tons compared with 825,000 tons in 1913. The British output is taken up for munition requirements for herself and some of the Allies, for the Board of Agriculture and Fisheries, the Ministry of Food, the Railway Executive Committee, the High Commissioners for Australia, South Africa, New Zealand, the crown agents for the colonies and the Egyptian State Railways.

It will be seen that with the decreased output of the Welsh mills there is quite a sufficient demand from other sources to forego the Canadian trade in favor of United States mills. The United States will also supply South America and the East with tinplate.

# WON HONORS FOR HIS WORK AS LIFE SAVER

**Robert Hugh Nichol Has Been With Well Known St. John Firm for Almost Forty-Four Years.**

ALMOST forty-four years ago, Robert Hugh Nichol, after a public school education, entered the shop of T. McAvity & Sons, at St. John, N.B., and he has been there ever since, working his way up to the position of foreman of the brass works on Water street.

His experience is that of many others who have come to hold positions of responsibility in firms in Canada or elsewhere. CANADIAN MACHINERY, during the last few months, has succeeded in coming into contact with a large number of men who are now foremen or superintendents in Canadian plants. Their experience is interesting. It bears out what Mr. Nichol has found from actual experience, viz., that a boy with only a public school education soon finds out that it's up to him to start in and study as soon as he begins his trade. Otherwise he is not going to be much of a success.

ROBERT HUGH NICHOL.

Mr. Nichol was born at St. John, in 1861, the son of a pattern maker on ship work. He received the common school education offered to the boys of his day, and before the age of 14 he entered the McAvity shops as an apprentice, serving five years at that training. It is well worth recalling, by way of comparison with present day wages, that the apprentices of forty-four years ago accepted the scale of $1.50 a week as a matter of fact.

Finishing his apprenticeship in the brass business Mr. Nichol continued with the firm, and kept up the studies and reading he had undertaken. His promotion to the position of superintendent followed.

Athletics have always appealed strongly to Mr. Nichol, and he has been connected with a number of organizations of a public character. For instance he was with the 62nd Fusiliers of St. John and had the rank of sergeant; was for 20 years connected with the St. John fire department, joining in 1885. During that time he won the hook and ladder race with competitors from all Eastern Canada and Maine, U.S.

### For Life Saving

Probably one of the most interesting incidents that could come into any man's life was the one that resulted in Mr. Nichol's receiving a gold medal from the late President McKinley, of the United States, as well as a bronze one of the Royal Humane Association for conspicuous bravery in saving life at the imminent risk of his own. This happened almost at the close of the year 1899, on the second day of December. The schooner Hazel Dell, a U.S.A. boat, got into difficulty so serious during a storm that she was wrecked off St. John. Mr. Nichol, when volunteers were called, was one of the first to jump into the boat that pulling out to the rescue. The trip was a hard one in bad weather, and the volunteers had a hard time from exposure and cold. The subject of this sketch has always been an expert oarsman, and that stood him in good stead. Apart from the recognition mentioned above he received a letter of appreciation and a gold piece from the city of St. John.

In following his work in the brass business, Mr. Nichol has shown considerable ingenuity and initiative, and has invented and perfected numerous tools and articles for brass workers.

"I would strongly advise the young mechanic and apprentice to keep in close touch with technical papers, etc. In this way he can keep posted as to the latest development, and the methods and devices that are being employed by men all over who are really doing and accomplishing the worth while things." That is the way in which Mr. Nichol views the value of trade and technical papers, and he is not backward in starting the value he attaches to them.

## You Know Some of These Chaps

> Sir John Foster Fraser, chairman British National War Lecture Committee:—"Kerensky failed because he talked and talked, and talked—the characteristic Russian failing. He had committees and meetings, and committees are the curse of real progress."

By heck I know a heap of folks what's bent in that way, too; they're always lookin' for a chance to wrangle and to chew—to them it is a joyful thing to grab some helpless wop—and make him open up his lug to drink in all their talk.

What always strikes me 'bout these kind of folks what speak of this and that, is that 'bout nine times out of ten they're hollerin' through their hat.

There's lots of them most every day a-clamberin' on a stump, and smitin' at the atmosphere with one terriffic thump—to tell us what things should be did, and what things should be said, you'd think they soaked up knowledge from the feet clean to the head.

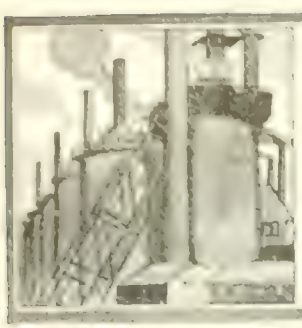
They know all things there be to know of metal, iron and steel; they know about the monkey wrench, likewise the drivin' wheel.

They know what's wrong about the war, by heck they make me sick; I'd like to smite 'em with a rail and whack 'em with a brick—they like to stick their thumbs inside the corners of their vest, and then to squirt ten yards of talk from somewhere 'neath their chest.

There ain't no peace when they're about, no time for thinkin' deep; they're simply always rantin' round somewhere on top the heap.

I'd like to go to them there folks and speak just what I think, and tell 'em that their domes is bent and sadly on the blink. I'd like to go and tell 'em that a lot of folks was prayin' for them to close unless they had a thought well worth the sayin'.—ARK.

Not so many years ago real estate men used to be fond of telling of money that they might have made. They rolled under their tongue with great satisfaction the fact that they might have bought lots at ten dollars a foot and worked them off on some other lobster at fifty and sixty per inch. To-day much the same wails of regret come from other lines. Tin sells to-day from $1.25 to $1.30 per lb., while not so many months ago it was trading around thirty cents. Pig iron used to meet the old Buffalo price of $12.80 per ton, but at present the seller with a pen of iron pigs can pull down four times that amount. Plating chemicals now cavort at two, three and four times the old lists, while high speed steel is on a double and plus list on top of that. So when it comes to speaking of prices that were and prices that are the real estate man is simply going to get elbowed off the edge of the platform.



# MARKET DEVELOPMENTS

## Non-Ferrous Lines Don't Feel the Pinch As Much as the Steel and Iron Trades

### Firms Still Able to Secure Their Supplies in Good Volume—Boiler Tubes of the Two-Inch Size Are Practically Off the Market—Sharp Rises in Plating Supplies

CANADIAN dealers, although they are not talking of it yet, may be figuring what the freight increases in United States are going to cost them. Steel will probably feel the increase more than any others in the group, on account of the volume of it moving, and for another reason not so apparent. There are almost five tons of raw material represented in a ton of the finished article and the haulage on all these primary ingredients will figure against the finished product.

Boiler tubes of the two-inch size are badly needed in Canada. It may be that a shortage of help keeps production low, but whatever the reason, the fact remains that the situation in Canada right now is correctly described as "acute," for the sizes needed in repairing the average locomotive and stationary boiler are almost off the list now. The average threshing outfit boiler uses the two-inch type.

Canadian plants in several cases are turning over their shops to new shell orders. In some circles there has been a tendency to make it appear that new munitions business coming to Canada was a clear gain to the volume of material being turned out, but this is not the case. Some plants will simply wind up British orders and turn to American business, so in reality such a change will represent no increase at all in the actual volume of business being done.

Pig iron is in great demand and the supply to keep pace is not forthcoming. Prices are four times the figure at the outbreak of the war. Nor is the right kind of scrap material forthcoming in large enough quantities to help out the situation.

Carbon and high speed cutters, drills, etc., are firm and still on plus and double lists. Prevailing price lists on valves are withdrawn, pending a new price announcement, with prospects of an upward tendency.

A Toronto dealer in a position to know the facts estimates that there is not much over 25 tons of available tin in the country at present. Tin used to trade freely at 20 to 30 cents in pre-war days. Now a man with tin to sell can be certain that bids will start at minimum of $1.25 per pound. and may go higher, depending on the urgency of the sale. Other non-ferrous metals are firm. For the most part industries depending on these as basic materials are faring better than those which enter the steel and iron market for supplies.

Demand is brisk for machine tools and supplies, there being no signs of a cessation from this condition.

## MONTREAL IS STILL A VERY BUSY PLACE WITH MUNITIONS BUSINESS

Special to CANADIAN MACHINERY.

MONTREAL, Que., June 4.—Recent announcement to the effect that a new large shipbuilding plant would be commenced immediately in the vicinity of Halifax does not come altogether as a surprise as negotiations to this end have been under way for some time. This new enterprise which will be known as the Halifax Shipbuilders' Limited, expects that the expenditure will be approximately $3,000,000, and the only connections with the government will be that this body guarantee the placing of capacity volume of tonnage. It is anticipated that the first vessel from this yard will be completed within a period of about fifteen months. Munitions production goes on apace, and the activity in this industry has been further accentuated by additional orders from the States. Rapid progress is being made by several Montreal firms in the completion of plants for recently received contracts and equipment is being acquired as rapidly as possible. Darling Bros. have started to excavate for their new iron foundry which is expected to be completed this summer. Apart from activities directly connected with war essentials, general business of an industrial character is very quiet.

### Steel

With the near approach of the hot weather steel dealers are anticipating a little greater difficulty in obtaining materials owing to the established fact that such conditions affect the output from the mills and furnaces. With the present requirements constantly increasing, any serious reduction would have a corresponding effect upon the manufacturing industries and the existing pressure would be still further emphasized. As reported by a local dealer, one of the great difficulties under present conditions is the inability to state definitely just what volume of steel will be required for American war purposes during the coming months, and this uncertainty tends to maintain the demoralization in the ordinary demand that has been virtually nil for several months past. While the greater number of mills are devoting their entire production to government needs, it is also true that in some instances stocks are gradually being accumulated, but the producers are reluctant or unable to dispose of these until it is definitely decided just what quantity of steel will be required for government consumption. Canadian consumption at the present time is practically confined to war requirements, and little steel can be diverted to ordinary domestic purposes. This applies in particular to material coming in from the States as the license necessary for delivery of steel makes it almost impossible to secure material for other than war essentials. The declining tendency that was noted in the plate situation a couple of weeks ago had little effect on the market here as dealers reported that the lower price had little to do with the action of the market, as the existing movement in steel was confined to war requirements exclusively, so that price

changes were of little account when no steel could be obtained. Local quotations have, however, been again advanced to the previous level, but the market is unchanged.

### High Speed Steel

The increased activity in the shell industry and also that of machine tool construction has been reflected in the additional demand for high-speed steel. Local dealers report considerable activity in the demand for the larger sizes of steels to meet the requirements for the heavier shells. One local dealer said that less difficulty has been experienced in obtaining this particular grade of steel from points in the States and intimated that some provision might be made in the near future whereby increased quantities could be obtained from England. Quotations range from $2.00 to $2.25 per pound.

### Metals

The general metal situation has taken on a more settled tone following the announcement of the War Industries Board in the States regarding the fixed price of copper for the ensuing period. The action of the board in this respect has apparently removed some of the nervousness apparent a week or so ago and transactions during the past week indicate greater confidence on the part of the trade generally. Copper is more settled on the reaffirming of the previous fixed price. Tin is still very strong but an easier tone has developed. An undertone of strength is shown in both lead and spelter. Antimony is unchanged, with aluminum tending to a higher level.

**Copper.**—The decision of the American Government to retain the previous fixed price for the sale of copper during the ensuing three months has not come as a surprise to the greater proportion of the trade although there are still those that appear to think that a higher price should have been established. Probably a higher price might have been an inducement for greater production but the present output is apparently sufficient for all essential requirements, and as these are virtually absorbed by the government this body probably figured out that the additional price would necessitate greater outlay without materially altering the actual conditions. Local demand is steady, but the market is unchanged with prices firm at 29 and 30 cents per pound.

**Tin.**—This metal is still retaining the interest of the market, but recent advices appear to indicate that a weaker tendency will develop in the near future. Little surplus metal is available but the London market is gradually declining and the prospects for increased supplies on this side are brighter than for some time. However, the situation is still acute and dealers here do not look for a speedy change but anticipate a gradually adjusted market to a lower price level. The local market is still strong but dealers are asking prices that show a decline over last week of 5 cents per pound. The nominal quotation is now $1.30 per pound.

## POINTS IN WEEK'S MARKETING NOTES

**A record for ship production was made in United States yards during the month of May.**

**Coal shipped from United States producers that is not clean can now be turned back at the expense of the producer.**

**Business pending in United States for machinery for war purposes will run into $100,000,000, and the next 60 days will probably see the most of the deals closed.**

**U.S. Ordnance Department is in the market for 310 lathes from 18 to 32 inches.**

**It is hard to say what effect the U.S. freight rate advances will have on iron and steel prices. In a ton of steel the freight on almost five tons of raw material comes into consideration.**

**Firms who rely on the non-ferrous metals as their raw material are not feeling the war pinch nearly so much as those using iron and steel.**

**Boiler tubes of the two inch size are a very scarce article in Toronto and district, and are needed for repairs to threshing boilers and stationary and locomotive boilers.**

**One Toronto firm placed an order this week for 700 eighteen-foot lengths of 3½-in. tubing for repairs, and dealers are hopeful of it passing the war board.**

**One dealer estimates that the available supply of tin in Canada at the present time is not over 25 tons.**

### Machine Tools and Supplies

The demand for machine tools continues in a very encouraging volume as a result of theh revival in the shell industry created by the additional placing of American munitions contracts. While the general requirements for tools are generally for the special designs of single purpose machines, dealers report considerable enquiry for standard equipment, a great deal of this being caused through the inability to get delivery in a reasonable time of the tools they desire. Many machine shops in this district are actively engaged in the construction of special tools for the different size shells that have recently been placed. Owing to the abnormal requirements for machine tools of every description shipments of machinery from the States is very indefinite and few dealers are able to give a reliable date for delivery from American tool builders. Work for the new factory for Lyall's is well under way, and orders for the necessary equipment for the 155 m.m. shell have been let; about 100 of these are being manufactured by the Robt. Gardner Co. of Montreal. The entire equipment for the 155 m.m. shell plant of Caron Bros. has been ordered; H. E. Streeter, for the Swedish Gage Co., placing the requirements for the gage standards. Dealers report a very brisk business in all classes of machine tool accessories and shop supplies.

### Scrap

The old material situation has the appearance of being quite unsettled owing to the evident uncertainty that prevails in the market. Considerable activity is shown in various lines, particularly in the demand from the foundries for cast iron scrap, this demand being created from the blast furnaces. Heavy melting steel is in demand but generally the dealers handle little of this owing to the fact that the same is utilized by the shell plants themselves or is shipped direct to the billet-making foundries. Aluminum scrap has a stronger tendency, but scraps with tin and lead in their make up are showing a declining tendency. Local prices are generally firm, but the market is comparatively quiet.

## THE BOILER TUBE SITUATION ACUTE

**Market Is Practically Bare of the Two-inch Size—Large Amount of War Business Offering**

TORONTO.—Although commercial orders are being discouraged by the War Board, by the dealers themselves, and practically by every person who is trying to give priority to war orders, indications are not wanting that there is a good amount of this business piling up against the day when the barriers against it shall be let down. As a matter of fact there are commercial lines that are very closely allied to the war, and to the safety of the individual in the meantime. One Toronto concern is in the market this week with an order for well on to a thousand 3½-inch boiler tubes of the eighteen-foot length. There is a good chance of this order being passed by the War Board, as it is for the repairing and upkeep of power and heating systems. But the boiler tube situation is now at the state where it can be correctly be described as acute. The warehouses are practically bare of the two-inch size, and this is the type used very largely in the average boiler, the locomotive, threshing boiler, etc. There are many cases, so we are informed, where tubes are needed to make necessary repairs, but those wanting them are meeting with no success at all in having their needs attended to.

A man with pig iron to sell in Canada at the present moment would hardly need a selling organization or an advertising campaign to help him out, for a needy industrial world would beat a path to his door. The call incessantly is for pig iron and more pig iron. The Muni-

on war orders. Substitutes that are iron pile are not to be had in appreciable quantities, the yards being quickly stripped of any offerings that come their

will have on the price of pig and steel coming to Canada from U. S. points. Of course it will be reflected in the price of steel more heavily than in the case of iron. In a ton of finished steel it is required to move almost five tons of raw material to the furnaces, while in the case of pig the amount of basic ingredient is not nearly so great.

The tin market is gradually working into a smaller groove, and trading in it still continues to be a case of making the best possible bargain with the man who has some to sell. One dealer, who is in a position to speak on the matter, stated to CANADIAN MACHINERY to-day that he did not believe that there could be much over 25 tons of tin in the country at the present time.

### The Steel Situation

Some idea of the congestion that took place last winter in the transportation and delivery from the mills can be found in shipments that are coming forward this week. One warehouse in Toronto took in plate to-day, orders for which were placed in the last months of 1916. Orders that are being placed now are making fairly good time. The prices that went to a higher level last week remain at the new figure, and are likely to do so for some time. Staybolt iron advanced ten dollars per ton to-day. The price for this has been firm at $8.50 per hundred for some months, there being always a good demand for it, its high-grade being relied upon for use in heavy chain work, etc. The boiler tube situation is not improving. "We are not getting any twos at all," stated one dealer to-day, "and there are many cases where it is highly desirable that this size should be supplied. Threshing outfits and a great many locomotives and stationary engines use that size. The larger ones can be had." One Toronto house ordered 700 18-foot 3½-inch tubes for repair work to-day, and the expectation is that the order will be passed by the authorities at Ottawa.

There is a keen demand for plates, the shipbuilders using a large tonnage at present. There is always a fairly brisk demand from the yards for plates to take the place of "rejects" that are found in the shipments, and it is necessary that they should always be able to get these on the shortest possible notice. Apart from the staybolt iron price, no other fluctuations are recorded this week locally.

### Second-Hand Metals

There is hardly an interesting feature in the used metal market this week. Prices have not changed since the last letter a week ago, and in many ways there is a feeling of dullness and near-stagnation over the entire business. Just now there are movements under way by which large amounts of non-ferrous holdings may be released for domestic orders. If these go through, the yards here will be in a position to restock, and may be keener to take on business. At present they will buy what is offered at strictly current quotations, this being necessary to protect their credit, but they are not anxious to take on any more material that cannot be turned over to the war appetite establishments.

### Tools and Supplies

There is still good business being done by men who have lathes of the heavy type for sale. Other machine tools are in demand, and a large amount of business is turning in both new and second-hand machines. There is a tendency in some parts to take it that the new munitions contracts that have been handed out will create an immense amount of new business. This is not altogether true. It means that many plants are "turning over" rather than starting at the beginning. They will be simply making another size shell and dropping orders that are now nearing completion. In this process there are cases where new equipment is needed, but there are others where only a tooling up is needed to make them ready for business, so it is hardly fair to imagine that every mention of new orders for shells means a new plant and new business for the machine tool men. There is a brisk demand for carbon and high speed goods. Prices keep firm. As a general thing carbon goods are 60 on the list now, while the high speed is two and a half times the list. An order was sent out, becoming effective on the first of June by which prevailing lists on valves are cancelled, pending the issuing of a new list. Prices generally are ten on the list now, but the withdrawal of the old lists is taken to forecast an increase which dealers anticipate will run the new price well on to 35 on the list. Chucks are scarce in some places, particularly the 9 to 12 size, and there is always more or less delay in getting permits to bring them across the border.

Firms operating on lines that depend on the non-ferrous metals for raw material are not yet feeling the war pinch to the same extent as those using iron and steel, which come more directly under the notice and control of the War Board. As long as the supply lasts there seems to be no disposition to hold it up. Tin is scarce. There's nothing new in that statement, but it is becoming increasingly scarce. There are not over 25 tons in the country just now, according to one dealer who is in a good position to judge the situation correctly. About the time the war broke out tin used to trade around the 25 to 30 cent. mark, but now a person who has tin to sell can start the bids at $1.25, and work from there up. Lead is slightly firmer in tone and a slight price advance was recorded this week.

# PIG IRON VALUES HAVE JUMPED OVER THE MOON IN RECENT YEARS

Inquiry among men who are in the steel business as producers or as jobbers fails to bring out many opinions favorable to the plan of the Canadian government, whereby a three year output will be taken from any new producer of pig iron in the Dominion.

It will be remembered that a deputation, or several of them, had been in Ottawa from British Columbia, urging that a subsidy should be given to the producers there in order to develop the pig iron business in that country, where the iron ore, coke and lime are to be had.

Rather than pay a bounty the government announced that it was willing to enter into a contract with any of the producers who would put in smelters, and take over their output for a period of three years.

"If that satisfied the people of British Columbia," stated a well known steel CANADIAN MACHINERY they are very much more easily satisfied than I had ever reckoned on in the past. It is possible that I may be mistaken, but it looks to me as though the government had handed them a blank. What is the use of telling men to go ahead and produce pig iron and assuring him of a market for a three year output, when such a market is already assured? It will take a long time before there is enough pig on the market to make it necessary for any assistance to be given in selling the output."

Pig iron is pulling down fancy prices just now. Many of the dealers are fond of harking back now to the days when the producer in Canada had to meet the old Buffalo price which used to hang around the $12.80 mark. The experience of one Toronto dealer, as told to this paper is interesting. He was figuring out his gains—on paper—on a deal that never went through, because the mills have never poured out his order for him.

"It was in 1914 that I placed an order for a thousand tons of pig at a Canadian blast furnace," he stated. "The price then, according to the records I was looking up to-day was around $16.25, and that was considered a very fair figure, as the prices had not yet commenced to climb. Well, they never came to that order, and now the priority of strictly war business has placed me on the indefinite waiting list. But the price of that pig to-day would be—well not far from about $66.25 a ton. Don't you see where I would have made $50,000 by buying then and selling now?" he laughed, and the reporter had to admit that it was a very simple matter to build up fortunes, especially on paper.

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago | 37 50 |
| Standard low phos., Philadelphia | |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 32 00 |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | | |
| Victoria | | 50 00 |

## FINISHED IRON AND STEEL

| Per lb. to Large Buyers. | Cents |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 5 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 5 75 |
| Chequered floor plate, 3-16 in. | 12 20 |
| Chequered floor plate, ¼ in. | 12 00 |
| Staybolt iron | 9 00 |
| Bessemer rails, heavy, at mill | |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | *3 50 |
| F.O.B., Toronto Warehouse | |
| Steel bars | 5 50 |
| Small shapes | 5 75 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

## FREIGHT RATES

Pittsburgh to Following Points

| | Per 100 lbs. C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 38.1 | 50.5 |
| Halifax | 39.1 | 51.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

## METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $30 00 | $28 50 |
| Electro copper | 30 00 | 28 50 |
| Castings, copper | 29 00 | 28 00 |
| Tin | 130 00 | 125 00 |
| Spelter | 10 00 | 9 50 |
| Lead | 9 50 | 9 00 |
| Antimony | 15 00 | 16 00 |
| Aluminum | 50 00 | 50 00 |

Prices per 100 lbs.

## PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¼ to ½ | $10 00 | $10 00 |
| Heads | 10 00 | 10 25 |
| Tank plates, 3-16 in. | 10 50 | 10 10 |

## WROUGHT PIPE

Effective Feb. 5, 1918.

Standard Buttweld

| | Per 100 feet | |
|---|---|---|
| ⅛ in. | $ 6 00 | $ 8 00 |
| ¼ in. | 5 16 | 7 29 |
| ⅜ in. | 5 16 | 7 29 |
| ½ in. | 6 55 | 8 12 |
| ¾ in. | 8 28 | 10 41 |
| 1 in. | 12 24 | 15 39 |
| 1¼ in. | 16 56 | 20 82 |
| 1½ in. | 19 80 | 24 89 |
| 2 in. | 26 64 | 33 49 |
| 2½ in. | 42 72 | 53 53 |
| 3 in. | 55 85 | 70 00 |
| 3½ in. | 70 84 | 87 86 |
| 4 in. | 83 93 | 104 10 |

Standard Lapweld

| | | |
|---|---|---|
| 2 in. | $ 29 60 | $ 36 08 |
| 2½ in. | 44 46 | 54 70 |
| 3 in. | 58 14 | 71 53 |
| 3½ in. | 72 68 | 90 62 |
| 4 in. | 86 11 | 107 37 |
| 4½ in. | 97 79 | 122 56 |
| 5 in. | 114 00 | 142 82 |
| 6 in. | 147 80 | 185 28 |
| 7 in. | 192 80 | 241 57 |
| 8 L in. | 202 50 | 253 75 |
| 8 in. | 233 30 | 292 32 |
| 9 in. | 279 50 | 350 18 |
| 10 L in. | 259 20 | 324 80 |
| 10 in. | 333 70 | 418 18 |

Prices—Ontario, Quebec and Maritime Provinces.

## WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

## OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 22 50 |
| Copper, heavy | 22 50 | 22 50 |
| Copper wire | 22 50 | 22 50 |
| No. 1 machine composition | 22 00 | 21 50 |
| New brass cuttings | 16 00 | 14 00 |
| Red brass turnings | 18 00 | 17 00 |
| Yellow brass turnings | 12 50 | 12 50 |
| Light brass | 10 00 | 9 50 |
| Medium brass | 12 00 | 12 00 |
| Heavy brass | 15 00 | 14 00 |
| Heavy melting steel | 24 00 | 21 00 |
| Steel turnings | 12 00 | 12 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 27 00 | 20 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 23 00 |
| No. 1 machine cast iron | 34 00 | 30 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 22 00 | 17 00 |
| Car wheels, iron | 26 00 | 30 00 |
| Steel axles | 38 00 | 35 00 |
| Mach. shop turn'gs | 9 00 | 8 50 |
| Cast borings | 12 00 | 12 00 |
| Stove plate | 19 00 | 19 00 |
| Scrap zinc | 6 00 | 6 50 |
| Heavy lead | 7 00 | 7 00 |
| Tea lead | 5 00 | 5 75 |
| Aluminum | 21 00 | |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, ⅜" and less | 10 |
| Carriage bolts, 7-16 and up | net |
| Coach and lag screws | 25 |
| Stove bolts | 55 |
| Plate washers | List plus 20 |
| Elevator bolts | 5 |
| Machine bolts, 7-16 and over | net |
| Machine bolts, ⅜ and less | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | 10 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | add 25 |
| Nuts, square blank | add $1 50 |
| Nuts, square, tapped | add 1 75 |
| Nuts, hex., blank | add 1 75 |
| Nuts, hex., tapped | add 2 00 |
| Copper rivets and burrs, list plus | 30 |
| Burrs only, list plus | 50 |
| Iron rivets and burrs | 25 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 37½ |
| Wood screws, O. & R., brass | 32½ |
| Wood screws, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

## MILLED PRODUCTS

| | Per Cent. |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil. Head Cap Screws | net |
| Flat But. Hd. Cap Screws | plus net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. & Semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2 in. | plus 10 |
| Studs | net |
| Taper pins | 40 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | list plus 20 |
| Collar screws | list plus 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | 65 |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add 7 00 |

## BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $47 50 |
| Open-hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.
F.O.B. Pittsburgh.

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails | $5 25 $5 20 |
| Cut nails | 5 70 5 65 |
| Miscellaneous wire nails | 60% |
| Spikes, ⅜ in. and larger | $7 50 |
| Spikes, ¼ and 5-16 in. | 8 00 |

## ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 41 |
| Plumber's oakum, spool | 8½ |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila rope | 0 33 |
| New Zealand hemp | 0 33 |
| Transmission rope, Manila | 0 45 |
| Cotton rope, ½ in. and up | 62½ |

## POLISHED DRILL ROD

Discount off list, Montreal and Toronto net

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | 0 50 |
| Solder, guaranteed | 0 53 |
| Babbitt metals | 18 to 70 |
| Soldering coppers, lb | 0 53 |
| Lead wool, per lb. | 0 16 |
| Putty, 100-lb. drums | 4 75 |
| White lead, pure, cwt. | 16 05 |
| Red dry lead, 100-lb. kegs, per cwt. | 15 50 |
| Glue, English | 0 35 |
| Tarred slater's paper, roll | 0 95 |
| Gasoline, per gal., bulk | 0 33 |
| Benzine, per gal., bulk | 0 32 |
| Pure turpentine, single bbls., gal. | 0 71 |
| Linseed oil, raw, single bbls. | 1 95 |
| Linseed oil, boiled, single bbls. | 1 98 |
| Plaster of Paris, per bbl | 2 50 |
| Sandpaper, B. & A. | list plus 20 |
| Emery cloth | list plus 20 |
| Soft Soap | 0 03½ |
| Sulphur, rolls | 0 05 |
| Sulphur, commercial | 0 04½ |
| Rosin "D," per lb. | 0 03 |
| Rosin "G," per lb. | 0 03½ |
| Borax crystal and granular | 0 12 |
| Wood alcohol, per gallon | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

### CARBON DRILLS AND REAMERS

| | Per Cent. |
|---|---|
| S.S. drills, wire sizes up to 52 | 40 |
| S.S. drills, wire sizes, No. 53 to 80 | 40 |
| Standard drills to 1½ in. | 40 |
| Standard drills, over 1½ in. | 40 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 |
| Bit stock | 40 |
| Ratchet drills | 15 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 40 |
| Sleeves | 40 |
| Taper pin reamers | net |
| Drills and countersinks | list plus 40 |
| Bridge reamers | 50 |
| Centre reamers | 10 |
| Chucking reamers | net |
| Hand reamers | 10 |
| High speed drills, list plus | 75 |
| High speed cutters, list plus | 40 |

### COLD ROLLED SHAFTING

| | |
|---|---|
| At mill | list plus 40% |
| At warehouse | list plus 50% |

**Discounts off new list. Warehouse price at Montreal and Toronto**

### IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 8 00 | $ 7 75 |
| Sheets, black, No. 10 | 10 00 | 9 50 |
| Canada plates, dull, 52 sheets | 9 00 | 8 65 |
| Can. plates, all bright. | 9 50 | 9 50 |
| Apollo brand, 10¾ oz. galvanized | ..... | ..... |
| Queen's Head, 28 B.W.G. | ..... | ..... |
| Fleur-de-Lis, 28 B.W.G. | ..... | ..... |
| Gorbal's Best, No. 28 | ..... | ..... |
| Colborne Crown, No. 28 | ..... | ..... |
| Premier, No. 28 U.S. | ..... | 8 70 |
| Premier, 10¾ oz. | ..... | 9 00 |
| Zinc sheets | 20 00 | 20 00 |

### PROOF COIL CHAIN

B

¼ in., $12.35; 5-16 in., $11.85; ⅜ in., $11.50; 7-16 in., $10.90; ½ in., $11.20; $11.00; ⅝ in., $10.90; 1 inch, $10.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $15.50; 3-16 in., $11.70; ¼ in., $8.40; 5-16 in., $7.40; ⅜ in., $6.35; 7-16 in., $6.35; ½ in., $6.35; ⅝ in., $6.35; ¾ in., $6.35.

**Prices per 100 lbs.**

### FILES AND RASPS.

| | Per cent |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 40 |
| Black Diamond | 40 |
| J. Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 37½ |
| Disston | 50 |
| Whitman & Barnes | 50 |

### BOILER TUBES.

| | Seamless | Lapwelded |
|---|---|---|
| 1 in. | $36 00 | $..... |
| 1¼ in. | 40 00 | ..... |
| 1½ in. | 43 00 | 36 00 |
| 1¾ in. | 43 00 | 36 00 |
| 2 in. | 50 00 | 36 00 |
| 2¼ in. | 53 00 | 38 00 |
| 2½ in. | 55 00 | 42 00 |
| 3 in. | 64 00 | 50 00 |
| 3¼ in. | ..... | 58 00 |
| 3½ in. | 77 00 | 60 00 |
| 4 in. | 90 00 | 75 00 |

Prices per 100 ft., Montreal and Toronto.

### OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | |
| Royalite, per gal., bulk | 18 |
| Palacine | 21 |
| Machine oil, per gal. | 26½ |
| Black oil, per gal. | 15 |
| Cylinder oil, Capital | 49½ |
| Cylinder oil, Acme | 39½ |
| Standard cutting compound, per lb. | 0 06 |
| Lard oil, per gal. | 82 60 |
| Union thread cutting oil antiseptic | 88 |
| Acme cutting oil, antiseptic | 37½ |
| Imperial quenching oil | 39½ |
| Petroleum fuel oil | 13½ |

### BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30-5% |
| Standard | 40% |
| Cut leather lacing, No. 1 | 1 95 |
| Leather in sides | 1 75 |

### TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 3½ to 05 |
| Emery glue | 28 to 30 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 45 |

**Prices Per Lb.**

### ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | .08½ |
| Grits, 80 and finer | .06 |

### BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 38 |
| Brass sheets, 24 gauge and heavier, base | 0 43 |
| Brass tubing, seamless | 0 46 |
| Copper tubing, seamless | 0 48 |

### WASTE.

| White. | | Cts. per lb. | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 18½ |
| Peerless | 21 | X Empire | 17¼ |
| Grand | 19¾ | Ideal | 17¼ |
| Superior | 19¾ | X press | 16 |
| X L C R | 18½ | | |

**Colored.**

| | | | |
|---|---|---|---|
| Lion | 15 | Popular | 12 |
| Standard | 13½ | Keen | 10½ |
| No. 1 | 13½ | | |

**Wool Packing.**

| | | | |
|---|---|---|---|
| Arrow | 25 | Anvil | 15 |
| Axle | 20 | Anchor | 11 |

**Washed Wipers.**

| | | | |
|---|---|---|---|
| Select White | 11 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING.

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

### ANODES.

| | |
|---|---|
| Nickel | .58 to .65 |
| Copper | .36 to .40 |
| Tin | .70 to .70 |
| Zinc | .23 to .25 |

**Prices Per Lb.**

### COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | 42 50 | 43 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 46 00 | 44 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 48 00 | 48 00 |
| Copper sheet, planished, 16 oz. base | 57 00 | 45 00 |
| Braziers,' in sheets, 6x4 base | 45 00 | 44 00 |

### LEAD SHEETS.

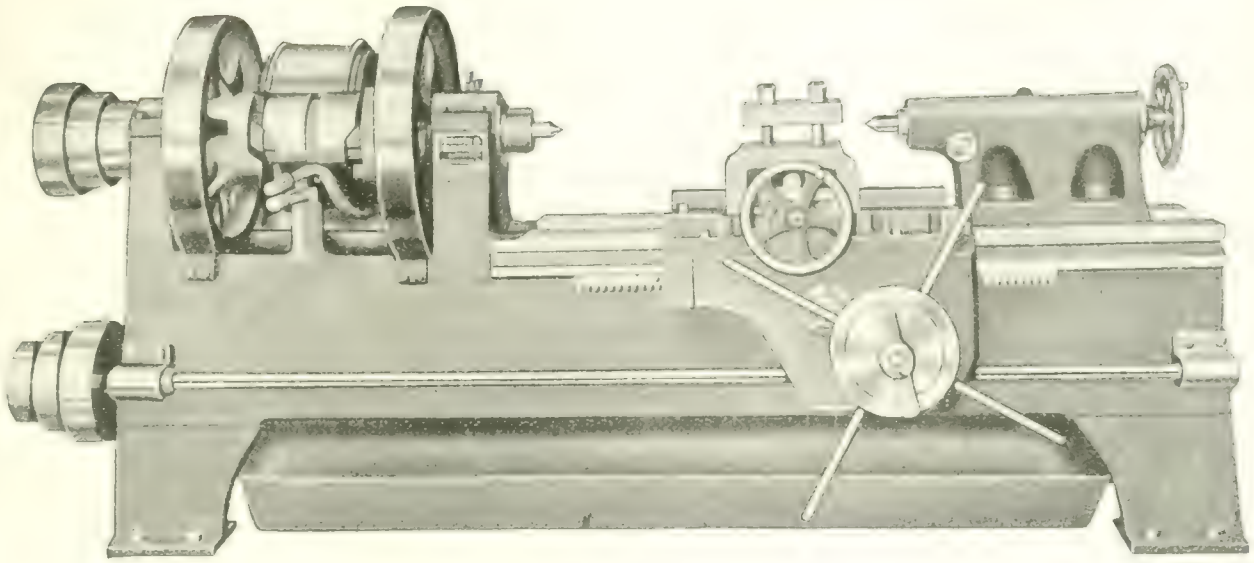
| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $13 25 | $13 25 |
| Sheets, 3½ lbs. sq. ft. | 13 25 | 13 25 |
| Sheets, 4 to 6 lbs. sq. ft. | 12 50 | 12 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS.

| | |
|---|---|
| Acid, boracic | $ .22 |
| Acid, hydrochloric | off |
| Acid, hydrofluoric | .09½ |
| Acid, nitric | .10 |
| Acid, sulphuric | .03½ |
| Ammonia, aqua | .14¾ |
| Ammonium carbonate | .20 |
| Ammonium, chloride | .40 |
| Ammonium hydrosulphuret | .50 |
| Ammonium sulphate | .30 |
| Arsenic, white | .25 |
| Copper, carbonate, anhy | .45 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .90 |
| Iron perchloride | .20 |
| Lead acetate | .35 |
| Nickel ammonium sulphate | .25 |
| Nickel carbonate | .65 |
| Nickel sulphate | .35 |
| Potassium carbonate | 1.50 |
| Potassium sulphide (substitute) | .20 |
| Silver chloride (per oz.) | .85 |
| Silver nitrate (per oz.) | .75 |
| Sodium bisulphite | .25 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .50 |
| Sodium hydrate | .18 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | .18 |
| Tin chloride | .85 |
| Zinc chloride | .90 |
| Zinc sulphate | .18 |

**Prices per lb. unless otherwise stated.**



# *Speed Up Production*

## *with the*

# MONTREAL LATHE

for the economical production of 4.5, 6 and 155 MM. shells. If you are interested in obtaining maximum production at minimum labor expense, investigate the records of the MONTREAL lathe in plants of the largest producers of shells in Canada.

The MONTREAL lathe is wonderfully simple in operation and construction, yet every worth while improvement has been embodied in the design.

A powerful machine—designed to transmit all the power that the cutting tools will stand—with large broad ways, liberal wearing surfaces and unbreakable apron. The MONTREAL lathe comes to you equipped as you need it—with carriage for rough turning —with rigid single bar for boring, or with swivelling bar for inside profiling.

***Write Now for Prices and Delivery.***

## The A. R. Williams Machinery Co.

LIMITED

**64 Front Street West - - - TORONTO**

# CLEAN COAL OR IT WILL BE RETURNED

**New Order of Things to Provide the Supplying of Good Material to Consumer**

Special to CANADIAN MACHINERY.

WASHINGTON, June 3.—President Wilson's address to Congress this week, calling for new revenue legislation, has been interpreted as notice to business in the United States that it must bear the burden of additional taxation. The new bill will be particularly aimed at those persons and corporations which are making large profits out of war work. President Wilson has also called upon Congress to deal with "profiteers." There is evidence in the various Government departments that certain individuals are taking advantage of the crisis which faces the nation and are using it to amass large profits. Special investigations will be undertaken by Congress to learn who these parties are and what interests they represent and the penalty for "profiteering" will be heavy taxation, and it is also the plan to attempt to secure additional criminal legislation which will put a stop to the practice.

### Raise in Rates

Another event of importance to business in the United States and Canada [illegible] has been the announcement by Director-General of Transportation McAdoo of new railroad rates. Passenger rates are raised, but this will not affect seriously the work of business. Increases which have been made upon freight rates, however, have aroused the business interests and already protests have been made to the Director-General. An increase of twenty-five per cent. has been ordered on all class rates. The same increase applies to commodity rates [illegible] In the cases where commodity rates affect a commodity which is shipped in large quantities. In those instances the increases are graded. Increases on coal have been ordered which run from 15 to 50 cents a ton; coke, 15 to 75 cents a ton; iron ore, 30 cents a ton. All of these rates will be subject to the review of the Interstate Commerce Commission and it is very likely that hearings will be held when those affected may present their arguments against the increases. Business all over the United States and Canada will be made to bear the burden. Another order issued by the Railroads Administration will also seriously affect the business interests of both countries. This order provides that there shall only be cash transactions with the railroads in the future. In the case of freight, however, under special conditions credit is extended for forty-eight hours.

### A Record Month

The month of May has been the greatest ship-producing month on record, according to reports from the United States Shipping Board. During the month the launchings have averaged more than two ships a day. For the week ending May 25, there were ten steel vessels launched with a total tonnage of 63,486. Eight of these were requisitioned ships and two were ships which were contracted for by the Shipping Board. The total ship production for the week was 109,700, which included wooden, composite, steel and concrete vessels.

Under the direction of Charles M. Schwab, the newly appointed head of the Emergency Fleet Corporation, that Government department has been moved to Philadelphia. In the future the actual work of directing ship construction will be directed from Philadelphia. Plans and policies and general administration work will still be done in Washington, however, by the United States Shipping Board, with Edward N. Hurley as chairman.

### Ship Clean Coal

Coal production in the United States has fallen off during the month of May. This is partially due to a shortage of cars and partly due to the lack of labor. The Fuel Administration is nevertheless hopeful that the production can be maintained at a point which will insure the nation's business against any recurrence of the serious coal shortage of last winter. As an aid to industry the Fuel Administration is taking steps to enforce coal producers to ship clean coal only. Orders have been issued that coal which is not clean may be turned back to the producer at the expense of the producer.

President Wilson, by executive order, has created the War Industries Board as a special governmental agency. Under this provision the War Industries Board will no longer be an adjunct to the War and Navy Departments but will be a separate unit which will control the war business of the United States. Bernard Baruch, as chairman of the board, will become a virtual business dictator.

### Price Fixing

Prices have been fixed during this week on a number of mineral products which are essential to war industry. By an agreement between the producers, President Wilson has approved new fixed prices for zinc. The prices fixed are 14 cents a pound for plate zinc and 5 cents a pound for sheet zinc. A price of 33 cents a pound has been fixed on aluminum and manganese ore has been subjected to a sliding scale of fixed prices according to the quality. This sliding scale of prices for manganese runs from 86 cents a unit to $1.30 a unit. Efforts are being made through the fixing of these prices to stabilize the mineral industry in the United States so that there may be no shortage of minerals which are necessary to the work of winning the war and it is also argued that fixed prices will stimulate production. Steel manufacturers have complained to a considerable degree that their output has been hampered by a lack of manganese and because of widely fluctuating prices, owing to the fact that there is great competition for the available supply. The new fixed prices, it is believed, will to a large degree control this matter of competition for the supplies of manganese

# FIGURING OUT WHO PAYS THE INCREASE

**When Government Is Chief Customer the Chances for Lower Prices Are Increased**

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., June 4.—The joint committee of representatives of the war industries Board and the steel makers appointed May 17 is progressing with its work of determining the probable monthly steel requirements of the various war activities and the prospective supplies, but no information whatever as regards the nature of its conclusions is forthcoming. It is improbable, indeed, that anything will be made public except through the medium of such action as the War Industries Board may take upon receiving the report. This action may be in the nature of the board's taking over complete control of the allocation of all steel, but that is quite improbable and would occur only in the event of its being shown that there will be very little steel left after the direct war requirements are covered. It is more probable that the finding will be that in the long run it will not be necessary to divert to the war activities as much steel as is now being shipped in that direction, while the mills are operating under their 100 per cent. pledge of war efficiency.

It does not follow that there is any possibility of the steel left after actual war orders are taken care of being allowed a free movement to whoever desires it. Some measure of control is certain to be exercised, for nothing is clearer than that the Washington authorities regard the commercial requirements in steel as of widely varying shades of importance, with respect to the aid they may give indirectly towards

# ADVANCES HAVE BEEN QUITE SHARP

**Plating Chemicals Have Gone Sharply Up In Recent Weeks**

Foundrymen who are replenishing their stock of plating chemicals and supplies are finding that they are buying from a much higher market. This is especially true of ammonia products.

Ammonium sulphate was quoted a few months ago at seven cents per pound, while to-day the price is placed at 30 cents, an increase of over four times the former value.

Ammonium chloride is quoted now at 40 cents, while not long ago the selling figure was given at 11 cents.

White arsenic, another ingredient used in plating, now sells for 25 cents, being double the price at the first of the year.

Price increases in plating supplies that run only thirty to sixty per cent. are hardly worth making special mention about. So when the man who does plating begins to talk of high prices, don't talk back to him, or he'll floor you.

# THE A. R. WILLIAMS MACHINERY CO. LTD

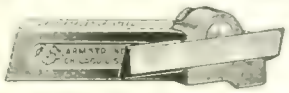
64 FRONT ST., W. TORONTO, ONT.

SALES SUPPLY DEPARTMENT SERVICE

# WHEN EQUIPPING YOUR PLANT

**"ARMSTRONG" TOOL HOLDERS**

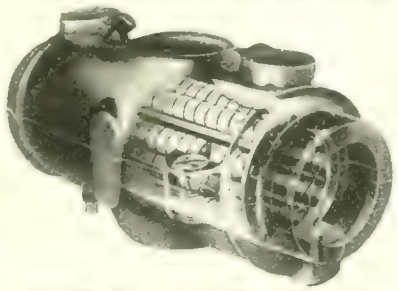
A complete line of these well known tools always on our shelves for quick service.



We have an Armstrong Tool oHler for every operation, Turning, Boring, Threading, Knurling, Cutting Off, Planing, Slotting and Drilling metals.

**"HYATT" ROLLER BEARINGS**

Friction in the transmission of power can be minimized through the use of the Hyatt Roller Bearing, the bearing of the highest practical efficiency. Hyatt, the economical transmission bearing, cost less

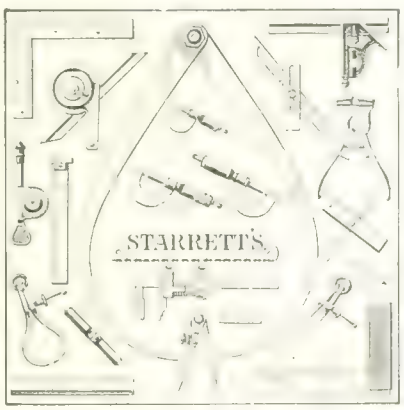


to install, does away with continuous expense in oiling. Being a split bearing can be put on anywhere or any time. Many installations throughout Canada speak for this bearing.

**do not overlook the fact that our SUPPLY DEPARTMENT is in a fine position to supply your every demand, including prompt service and right prices.**

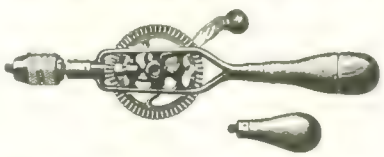
**"MECHANICS" TOOLS**

We have one of the finest assortments of these tools in Canada.




**HAND AND BREAST DRILLS**

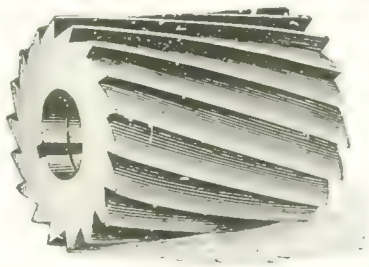
A [illegible] popular make and [illegible] for immediate [illegible]



Drills, Hack Saw Frames, Chuck Drills, Twist Drills, Reamers, Taps and Dies

**MILLING CUTTERS**

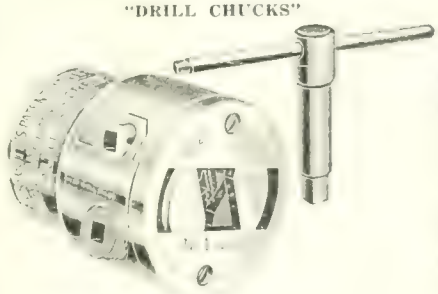
Our stock of Carbon Cutters, including Metal Gear, Angle Bevel Gear, Metal Slitting Saws, etc., is quite complete



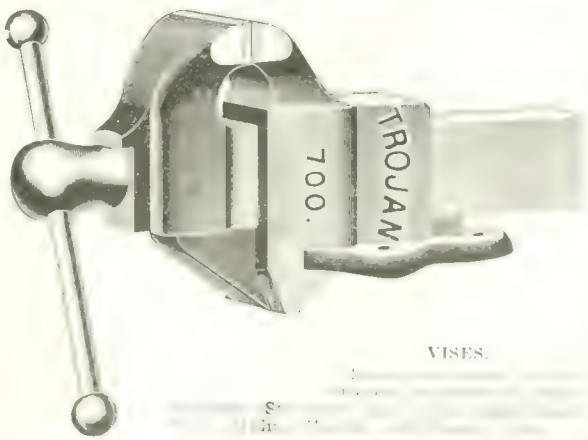
therefore, it is seldom we get an inquiry for Cutters but we have the [illegible] in stock. This means a lot to you under present conditions.

**"ACME" HIGH SPEED THREAD MILLING HOBS in stock for immediate delivery. Get your orders in early as supply will be limited owing to great demand.**

**"DRILL CHUCKS"**



All types and makes of Drill and Lathe Chucks carried in stock. When in the market for Chucks of any kind be sure to try Williams first, with a good assorted stock, at the right price, this means SERVICE with a [illegible]




VISES.

[illegible]

**Complete line of Transmission Equipment, Power House, Mill and Factory Supplies always in stock.**

## THE A. R. WILLIAMS MACHINERY CO., LTD.

TORONTO, ONTARIO

the control will originate with the War Industries Board and how much with the producers themselves.

It is likely to be a week or two still before the cost committee presents its findings. Steel cannot become scarcer, with the commercial industries, than it is now when the mills are operating under the [illegible] and it may become decidedly more plentiful. When the increased shipments to the war activities, and particularly the shipbuilding industry, were undertaken more than a month ago, it was the expectation of the mills that a few weeks of this intensive shipping would stock up the various activities and lead to a call on their part for a curtailment in shipments. There are no signs of such a call being made in the near future, but still it is believed that many if not all these activities are really receiving steel at a greater rate than is actually necessary.

### Production

Production has not increased materially in the past ten days, by reason of the extremely hot weather, fully as hot as is usually experienced in the hottest periods of summer. A fair estimate for May production as a whole is a 42,000,000-ton-a-year rate in pig iron and 44,000,000 to 45,000,000 tons in ingots, against capacities of at least 43,000,000 tons in pig iron and 47,000,000 tons in ingots. While these are large outputs compared with averages in 1916 and 1917 of about 39,000,000 tons in pig iron and 41,000,000 tons in ingots, yet if production of ingots in May were at the rate of 44,000,000 tons and in June at the rate of 45,000,000 tons, the average rate during the first half of the year would have been only 39,000,000 tons, so that the industry would have fallen far short of making up the deficit in production caused by the very light output in January and February.

### Advanced Freights

Freight rates are being worked out, to go into effect June 25 in accordance with Order No. 28 of the Railroad Administration. Generally speaking freight rates are to advance by an average of 25 per cent., and passenger rates go up also. The object is to overcome the increased operating costs and avoid drawing upon the Federal treasury to make good the earnings guarantee to the roads under which they were taken over. The iron ore rates are advanced a flat 30 cents per gross ton. Lake ore that has paid the advance in a haul to the upper lake docks is not required to pay another advance on the rate from lower lake dock to point of consumption. Limestone goes up a straight two cents per 100 pounds. Coke rates go up by a graduated scale, depending on the size of the present rate, the average being about 30 cents a net ton. Coal goes up on the same principle, and in such a manner that by-product coke will in the main be affected practically as much as beehive coke, the former being generally made at the blast furnace from shipped coal while the latter is produced at the mine and shipped to furnace. The three advances make about $1.11 increased cost per ton of pig iron made, and various incidentals will make the total increase about $1.25 per ton of pig iron. Finished steel will feel a greater effect, as coal and other supplies are also involved, and the increased cost of making a net ton of finished steel will be somewhere in the neighborhood of $1.75.

### Prospective Prices

The freight rate advance has set going the quarterly discussion as to the controlled prices, which late in March were named for the current quarter. In continuing the set prices for the quarter with the slight reductions in scrap and Bessemer and basic pig iron, the War Industries Board was undoubtedly actuated in part by consideration of the fact that the furnaces and mills had had a very hard winter, with especially light production in January and February and exceptionally high costs in consequence. Otherwise there would have been a strong move for a reduction in prices, and in many quarters the idea was that the industry was given three months of grace, in the matter of a reduction in prices, in order to recoup against their supposed light profits in the first quarter of the year. The quarterly reports, however, showed rather fair earnings in January and February, and good earnings in March, while the earnings this quarter are running very large. In the circumstances the War Industries Board would naturally be disposed to seek very considerable reductions. To offset such a demand, the industry has three arguments: (1) The 15 per cent. wage advance that went into effect in April; (2) the increased freight rates; (3) the prospective large increase in the excess profits tax.

The present controlled prices for finished steel are about $40 a net ton above the ten-year average ended with 1913. If the War Industries Board should seek a reduction, therefore, it would be not $1 or $2 a ton, but $5 or $10 a ton. The 15 per cent. wage advance means something like $2 a ton. The freight advance means not over $2 a ton. Thus these two arguments might not be held sufficient to overcome entirely the move for a reduction. As to the excess profits tax increasing, when the proportion of the total steel output which the Government buys and pays for is much greater than the proportion of the total profits it takes as taxes, it is obvious that the Government can make or save more money by reducing prices than by increasing the rate of taxation. If the public were the steel industry's chief customer, it would be enterprising to allow it to make a great deal of money and then take the money as taxes, but when the Government is the chief customer it is more enterprising to reduce the earnings. Thus there is a distinct possibility, though perhaps hardly a balance of probabilities, that there will be lower prices for deliveries after June 30.

# AMERICAN FIRM IN TORONTO ENTERPRISE?

### Report Says Very Large Shells May Be Turned Out in Canadian City

Special to CANADIAN MACHINERY.

NEW YORK, June 4.—Machinery manufacturers and dealers are being deluged by a flood of orders and inquiries for equipment of various kinds required by shipyards, ordnance plants, shell makers and other manufacturers of war munitions as a result of the large contracts being placed by the U. S. Government. The Navy and War Departments, also, have put out additional lists of machinery wanted at Government arsenals and other Government plants at Washington, Philadelphia and Norfolk. Railroads and many private manufacturing plants are also inquiring for cranes and other shop equipment. It is estimated that business now pending for machinery of various kinds will call for an expenditure of $100,000,000 in the next sixty days.

### New Shipyards

The Emergency Fleet Corporation has decided upon the construction of two new Government-owned shipyards, one to be located on the Atlantic and the other on the Pacific coast. It is understood that the Bethlehem Steel Corporation will undertake the construction, equipment and operation of the plants, with Government funds. It is stated that each yard will have ten ship ways to be served by its own fabricating, machine and forge shops. Provision is also to be made for the building of additional fabricating shops to serve Government shipyards. One report is that the McClintic Marshall Construction Co., that has shops in various sections of the country, will undertake the building and equipping of the Government plant.

Six shipyards on the Atlantic coast, now active, are also preparing to increase output by extending ways and building new plants and by adding additional equipment to present shops. Four of these yards are already in the market for cranes and fabricating machinery. The New York Shipbuilding Corporation has bought eight cranes and 20 punches as well as other machines. The Newport News Shipbuilding and Drydock Co. is building another boiler shop and has issued a list of machinery required. The Wm. Cramp & Sons Shipbuilding Co. and the Merchant Shipbuilding Corp. have placed orders for cranes with a manufacturer at Kenton, Ohio.

The two new Government shipyards will require nearly 200 overhead electric cranes and 150 to 200 hoists. The fabricating machinery will include 75 to 100 punches and shears as well a large number of other fabricating tools. The Fleet Corporation is also preparing for the extension of present plants and machine shops for the manufacture of marine turbines, boilers and other equipment and various ship parts. The Fed-

# Daylight Saving

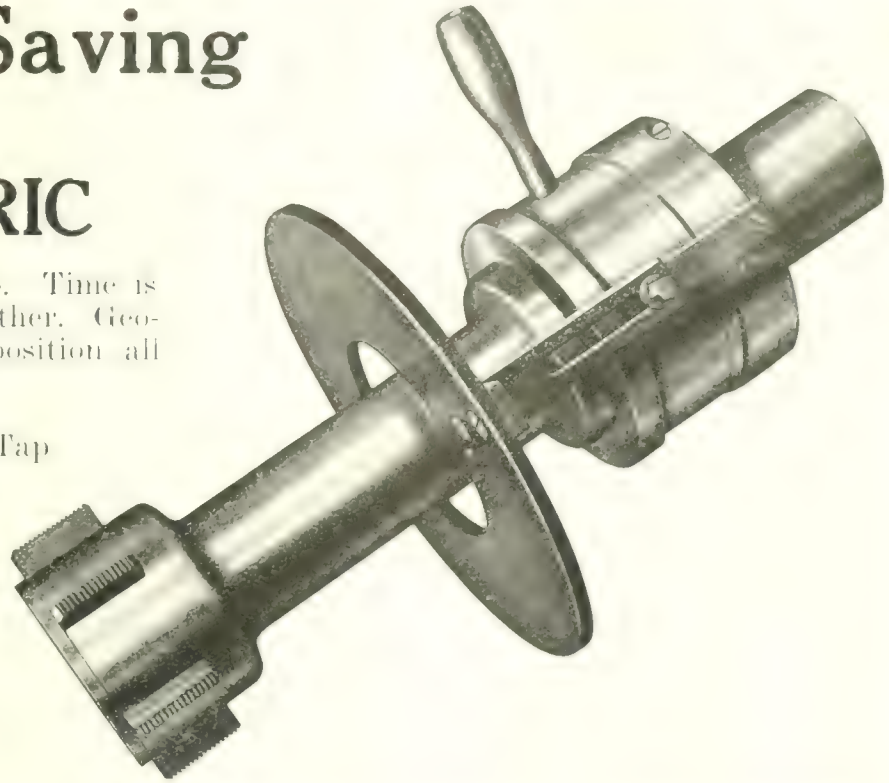
## with a

# GEOMETRIC

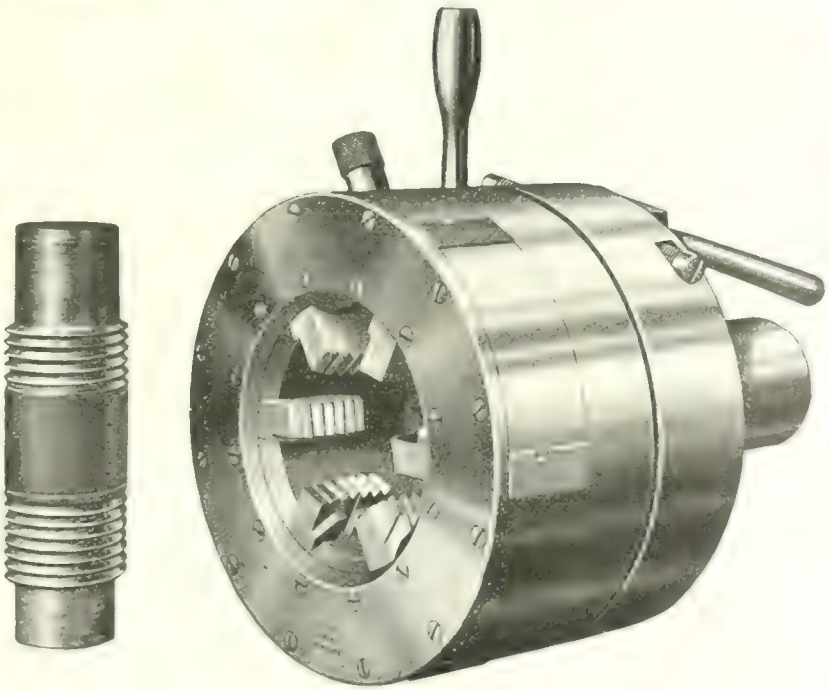
That is what it amounts to. Time is not the only thing saved, either. Geometrics are a saving proposition all around.

This Geometric Collapsing Tap is specially arranged for deep tapping in Projectile Caps.

All classes of thread tapping above $\frac{3}{4}$-inch diameter are taken care of by Geometric Collapsing Taps.



***Twenty-five years of specializing in Screw Thread Cutting Tools has made the name GEOMETRIC stand for all that could be asked in Screw Thread Production.***



When it is an outside thread, Geometric Die Heads cut every style from 1/16-inch size up to greatest required diameter.

A U.S. Navy Yard is using this 4½-inch size Style "D" Geometric Die Head. United States Navy Yards accept no second quality.

Do your Screw Machines and Turret Lathes swing Geometrics?

You have as much right to Geometric benefits as any other manufacturer.

## The Geometric Tool Company, New Haven, Conn., U.S.A.

***Canadian Agents:***

**Williams & Wilson, Limited, Montreal. The A. R. Williams Machinery Company, Limited, Toronto, Winnipeg, St. John, N.B.**

eral Shipbuilding Co., which will probably launch its first boat between now and June 10th, has come into the mar-

Much Equipment

Car builders, steel companies, fabricators, tool manufacturers and copper producers are in the market for cranes of various sizes and most of these plants have war orders of one kind or another. The Ordnance Department has issued a long list of tools to manufacturers in the Ohio Valley including 310 lathes running from 18 to 32 inches, all of which are wanted for shipment to Pittsburg plants. The Grant Motor Corporation is in the market for 20 turret lathes to execute a large order for 6-inch shells for the Government.

Many orders for small lathes, sensitive drills and tappers have been placed in the Central West following Government orders for hand and rifle grenades. Increased activity in the building of agricultural implements and tractors is indicated by the placing of larger orders for shop equipment by such manufacturers. About 40 overhead electric cranes are wanted for gun plants to be built at Neville Island near Pittsburg and at Nicetown, near Philadelphia. Two other large gun plants are to be constructed in the East for the Government, one of which will build guns of 18 inches calibre. The trade is much interested in the placing of large shell orders by the U. S. Government with Canadian manufacturers. It is understood that U. S. interests are about to build a munition plant at Toronto, equipped to manufacture larger shells than have hitherto been made in the Dominion.

### GERMAN TRADE CONDITIONS

Immediate action is demanded by students of German industrial conditions if the decline of German industries is to be avoided. A correspondent of the "Norddeutsche Allgemeine Zeitung" states that immediate action must be taken to develop those which depend on home raw materials, so that immediately after the war Germany may be in possession of commodities with which to pay for the foreign raw materials she will require—textiles, metals, rubber, and foodstuffs. The writer mentions as coming within the purview of his proposal the engineering, small iron, metal, glass, chinaware, brick, timber, potash and chemical industries. Manufacturers in these branches who undertake to push [illegible] should receive preferential treatment at the [illegible]

FROM thirty to forty crucible steel [illegible] in Australia, and steel castings are being regularly produced from fifteen of them. There are seven side-blown converter plants, of which two are owned by the government. One stock converter plant is already in operation and two or three others are being constructed.

## HAVE FIXED PRICES FOR MANGANESE ORE

**War Industries' Board Takes Action—Sliding Scale According to Quality**

WASHINGTON.—Prices for manganese ores produced in this country, as agreed by the American Iron and Steel Institute, have been approved by the War Industries Board. The prices are based on shipments from the west, f.o.b. at South Chicago, and are slightly higher than those that have prevailed in past months.

The prices range from 86 cents per unit of metallic manganese per ton for ore containing, when dried at 212 degrees Fahr., from 25 to 35.99 per cent. of the metallic manganese, to $1.30 per unit for ore containing 54 per cent. or more of metallic manganese. For ore shipped east of South Chicago, fifteen cents per unit of metallic manganese per ton are added to the unit prices.

## GERMAN HAD LIST OF MACHINE SHOPS

**And Had Been Free to Move About the West for Some Time Past**

NEW WESTMINSTER, B.C.—Fritz Bonn, a German, was arrested here and sent to Vancouver. It is said he was in possession of a permit from the Vancouver chief of police to go to Port Mann, and had been there two days. When arrested a list of machine shops was found in his possession. He claims to be a mechanical engineer. Papers found on him show that he had been in Saskatchewan up to May 3, and that he had seven brothers in the German army.

### GOVERNMENT SECURES RAILS FOR RENEWALS

ARRANGEMENTS whereby the need for rails for renewals on the Canadian Government Railways and the Canadian Northern system during the present year will be met have been practically completed by Hon. J. D. Reid, the Minister of Railways and Canals. The purchase of 355 miles of 67-pound rails, which were rolled in the United States under orders placed there by the Russian Purchasing Commission, has been completed and some of the steel is now on its way to Canada.

Negotiations for an additional 150 miles of rails, manufactured for Russia, have also been practically completed, making a total of some 500 miles available for replacement on the lines now owned or controlled by the Canadian Government.

There is also a possibility that 350 miles of 80-pound rails on the Hudson Bay Railway will be lifted for use on lines where traffic is more dense and will be replaced by the lighter rails being obtained from the United States.

From yards and sidings on the National Transcontinental Railway will be obtained about 100 miles of 80-pound rails, and from the St. John Valley Railway in New Brunswick, which is owned by the New Brunswick Government and operated by the Intercolonial Railway, some 120 or 130 miles of 80-pound steel may be secured.

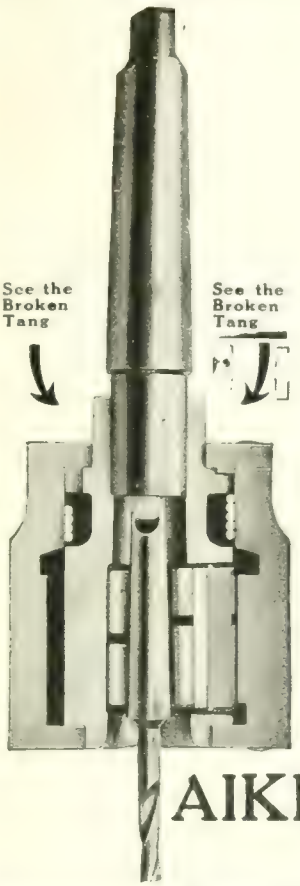
### HOW VESSELS ACT WHEN SINKING

By M. L.

In view of the very large number of vessels that have gone to the bottom of the sea in the last three years, more or less, it is of interest that each particular design of craft has its own peculiar way of sinking. The old single-bottom steamers for example, with a minimum number of bulkheads, almost invariably go down on a more or less even keel, which means that they do not stand on end, as did the Titanic and others since, before they disappear beneath the waters. Modern vessels, however, with numerous subdivisions, perform the feat of diving to Davy Jones' locker either with their bows or sterns high out of the water or by first showing a very heavy list to port or starboard. This is caused by the fact that while a sufficient number of compartments become filled to sink these vessels there are other compartments which remain watertight and prevent the water entering from seeking its level.

### THE ECONOMICAL RECONSTRUCTION OF BELGIUM

In view of the critical situation which will result for Belgium through the disasters caused by the depredations of the enemy—his removing of tools, raw materials, manufactured products, &c. — there has been created, with the co-operation of, and under the control of the Belgian Government, an organization having for its object the economical reconstruction of the country, and styled "Comptoir National Pour la Reprise de L'Activite Economique en Belgique" (Societe Co-operative). This organization has for its aim, by helping industry and trade, and by enabling the Belgian people to purchase tools and the necessary raw materials, not only to reconstruct the economical fabric of the country, but to put an end to the sufferings of the working classes by making it possible for them to start working in the reconstructed shops. In a letter which the newly formed body has issued it is explained that everything interests it, as everything has to be set up again: metallurgy, materials for construction of buildings, leathers, textiles, farming implements, chemical products, wood machines, electrical material, optical instruments, motor cars, vans, wagons, oils and greases of all kinds, refractory materials, &c. In order to enable it to place orders, manufacturers and merchants are requested to send their catalogues and price lists in triplicate to it at 110, Cannon-street, London, E. C. 4., England.

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Eliminates Waste Motion

# Wahlstrom Chuck

Automatic and instantaneous in action. There's no time lost in waste motion with the Wahlstrom Chuck. It paves the way for increased production and a reduction in costs.

You may use No. 1, 2 and 3 M.T. Shank Tools whether they have a shank tang or not—**the Wahlstrom grips by the entire shank.** Never slips! The cam action is such that the harder the tools take hold in the work, the harder the jaws grip the shank. The grip is smooth, uniform and positive.

**Grips by the entire Shank**

Wahlstroms are made in two styles—one for straight shank tools, the other for M.T. Shank Tools—and they are both automatic—changes are made while the spindle is running.

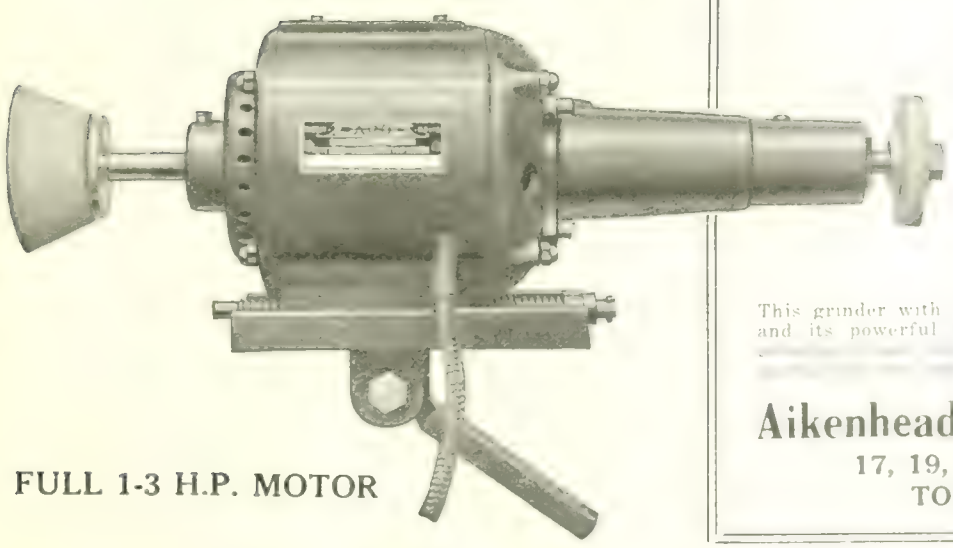
## AIKENHEAD HARDWARE LIMITED

17, 19, 21 TEMPERANCE STREET, TORONTO

LARGE SIZE GRINDER

Aikenhead's

No. U-2 Universal



FULL 1-3 H.P. MOTOR

# "ARO"

## Portable Electric Grinders

**Fitted With "D" Arm Attachment 5" Long**

"D" ARM ATTACHMENT

directly connected to armature which runs at 10,000 R.P.M.

other styles and length of arm

"B" ARM

B. ARM 10" Extension.
E. ARM 15" Extension.
F. ARM 20" Extension.

This grinder with its different lengths of extension arms and its powerful motor has found a ready market for

## Aikenhead Hardware Limited

17, 19, 21 Temperance Street
TORONTO, CANADA

# Current Events in Photograph—No. 2

## AN AMMUNITION DUMP

Every now and then in the official communications from the front comes the word that this or that ammunition dump has been bombed. Very few people have any idea just what an ammunition dump looks like. In the accompanying official Canadian photograph is seen one of these dumps behind the Canadian lines. It gives some idea of the havoc that might result from high explosive bombs dropped in such a location.

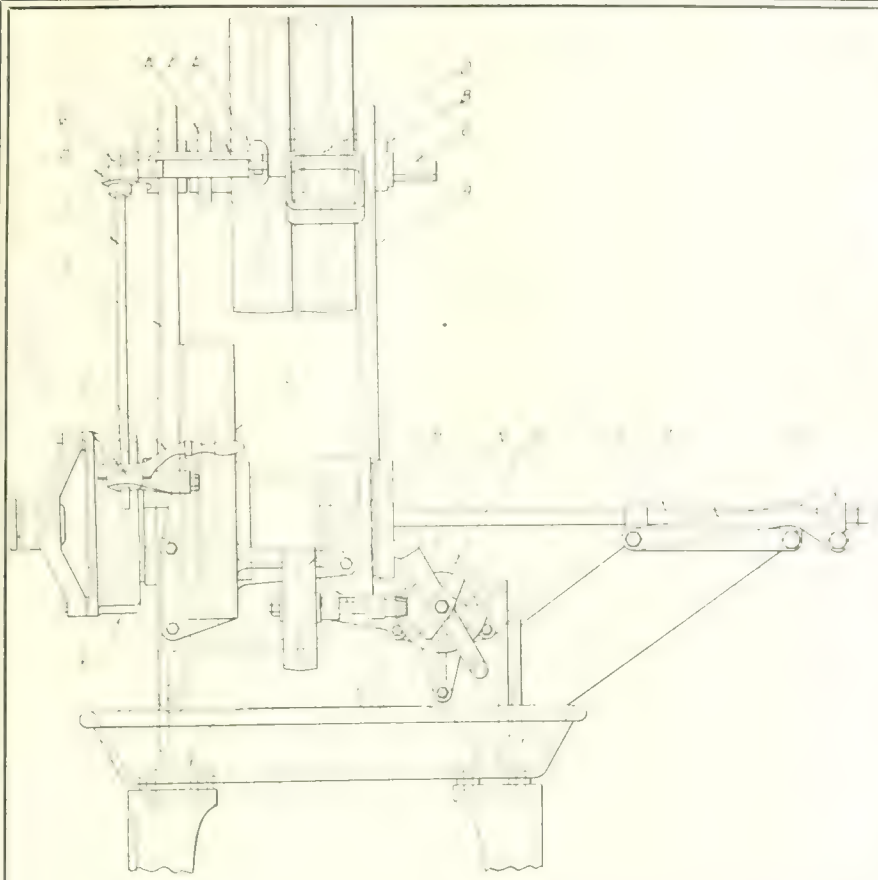
### NAVAL ORDNANCE

The development of naval ordnance was for several centuries practically at a standstill. There were no essential differences between the guns used in the Dutch Wars and those with which the ships of the Crimean period were armed. At the opening of the nineteenth century the heaviest naval guns were cast-iron pieces, throwing 32-lb. ball, while 20-pdr. carronades were in almost universal use. One of the few definite stages of progress was reached in 1821, when the first guns were specially designed for horizontal fire with shell, thus superseding the mortar and enabling explosive projectiles to be discharged with a much greater degree of precision. Eight-inch and 10-inch shell guns, made soon afterwards, were tried against the Undaunted, an old frigate, the projectiles being filled with molten iron. The frigate was speedily set on fire by this bombardment. During the Crimean War the heaviest guns carried in the British and French fleets were 68-pounders, most of which were mounted on primitive wooden truck carriages. A few, however, used as chase guns, had special slide carriages, traversing on metal radius plates secured to the deck. Twenty years later such extraordinary progress had been made that guns of 100 tons in weight, firing projectiles of 2,100 pounds, were in use, while Woolwich had prepared plans for a gun to weigh 160 tons, and intended to drive a shot through 36 inches of iron at a range of 1,000 yards. This sudden development in the construction of naval ordnance, following centuries of stagnation, was due, of course, to the advent of the ironclad, against whose iron plates the round shot from the light smooth-bore were useless. To circumvent armor it was necessary to enlist the services of the metallurgist, the chemist, and the mechanical engineer, none of whom had previously had much say in the production of ordnance. The results, as has been said, were amazing, and although the 100-ton muzzle-loader of 1878 may seem a cumbrous, and even primitive, piece beside the 15-inch breech-loader of the present day, it stands out as a marvellous example of mechanical genius when compared with the 68-pounder smooth-bore, the largest gun in existence only twenty years before.

These first 100-ton weapons were manufactured at Elswick for the Italian Government, and were tried at Spezia in 1878, a special (Fassano) powder being used. Results then considered prodigious were obtained. Propelled by a charge of 561 pounds of powder, the 2,500-pound projectile left the muzzle with a velocity of 1,725 feet per second, and an energy of 41,333 foot-tons, and fell into the sea 15,800 yards away. We can best appreciate the merit of this performance by remembering that the muzzle velocity of the Mark VIII. 12-inch gun, mounted in the Majestic class twenty years later, was 2.367 foot-seconds, or only 642 foot seconds more. Another very remarkable example of gun construction was furnished by the Armstrong 10-inch breech-loader, tested at Elswick, in 1879. Using a 300-pound projectile, it attained a muzzle velocity of 2,110 foot-seconds. The first 12-inch B. L. manufactured in England was tried at the Elswick works in 1877. It weighed 39 tons, was 22 calibres in length, and fired a projectile of 700 pounds. The breech mechanism was adapted from the French system, but with a novel type of obturator. With this weapon the initial velocity was 1,615 foot-seconds, and the muzzle energy 12,656 foot-seconds. Considerable attention was also paid at this time to guns of medium calibre, and Woolwich had the distinction of turning out some very successful models. The rifled 6-inch 70-pounder penetrated 8 inches of iron at a quarter of a mile, and with an elevation of 5 degrees the range was 3,795 yards. Elswick, however, continued to lead the way. An Armstrong 8-inch gun of 11½ tons proved capable of piercing 14 inches of iron at 500 yards, which was considered to be the best the 12-inch 35-ton Woolwich gun could do. But, in spite of repeated demonstrations of the fact that light guns could be given a power of penetration almost, if not quite, equal to that of weapons three times their weight, the craze for monster guns continued to prevail for many years, especially in Italy and England. *The Engineer.*

---

FOR etching brasses and bronzes, a few drops of a strong solution of hydrogen peroxide are added to a very dilute solution of chromic acid. The specimen is immersed and kept moving in the solution for a few seconds; it is then removed and washed immediately in running water. The reagent is said to be equally satisfactory for all brasses and bronzes, giving much better results than chromic acid alone.



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## ⅓ Greater Production

## ⅓ Less Floor Space

"Desy" Machines have proven their ability to "stand up" under greater production demands, and being a solid, compact machine of exceptionally small dimensions, a great saving can be made in space.

Inquire for delivery, price and specifications.

**Cutting-off, Boring, Facing, Centering Machines.**

**Sole Representative of the "Desy" Machines**

## J. R. BAXTER & CO., Limited

**102 St. Antoine Street** **Montreal, Que.**

## THE DEVELOPMENT OF NAVAL GUNNERY

It is a singular circumstance that [illegible] before the days of torpedo and [illegible] the gun was the warship's [illegible] means of offensive, the art [illegible] was neglected in the British Navy, states the *Engineer*. It is true that the superior rapidity with which the British gunners worked their pieces generally gave them the victory over French and Spanish opponents in the wars of the eighteenth and nineteenth ceturies, but at that time little attention was paid to markmanship, because it was not the custom to exchange broadsides until the enemy was practically alongside, and it was harder to miss than to hit. Here and there a captain with unconventional ideas spent time and (his own) money in teaching his men to shoot with accuracy at something beyond point-blank range, but such departures from convention were officially discouraged. The result was seen in the war of 1812, when a series of duels between British and American vessels of approximately equal power ended, for the most part, disastrously for the former. There was no secret about the American successes. They were won invariably by what at that time represented accurate long range gunnery. On two occasions, however, the advantage in this respect rested with the British. The Shannon defeated the Chesapeake, because Captain Broke had schooled his men thoroughly in the science of accurate fire, combined with great rapidity. Captain Hillier, of the Phoebe, similarly defeated the U.S.S. Essex. In his report of this action, Captain Porter, of the Essex, wrote: "The Phoebe, by edging off, was enabled to choose the distance which best suited her long guns, and kept up a tremendous fire which mowed down my brave companions by the dozen. The enemy, from the smoothness of the water and the impossibility of reaching him with our carronades, was enabled to take aim at us as at a target; his shot never missed our hull, and my ship was cut up in a manner never before witnessed." But it was long before the vital importance of cultivating marksmanship was generally recognized in the British service.

Treating of naval gunnery, in his "Fragments of Voyages and Travels" (published in 1833), Captain Basil Hall said: "Officers who have served much afloat in old times tell us that there was a great want of efficiency in that department of naval discipline which relates to the management of the great guns. Many ships, it is true, even during the early period of the last war, were brought into admirable fighting trim by dint of the spontaneous exertions of their commanders. But in these instances the result was generally due to the combined talents, experience, and industry of those particular officers, and owed hardly anything to the merits of [illegible] the fleet. In too many vessels of war, however, the exercise of the great guns was much neglected, or, at most, attended to just so far as the technical rules of the service rendered necessary. And this occurred not infrequently even where there could be traced no want of ability or of zeal on the part of the officers. A plain shore-going person might well ask how it came about that the art of handling the guns should ever be neglected in any man-of-war, when such prodigious sums were expended in equipping her in other respects with every possible requisite to enable her to cope with her enemies. Our ships are greatly improved in strength and every warlike quality, and there is no lack of supplies in any department. Why, then, to the education which is now so general in every other branch of the profession should not that of warlike science and gunnery practice be added?" In making recommendations as to the soundest methods of training, Captain Hall urged that the men be taught to consider it "irksome and disagreeable to make a blustering noise to no purpose," and should be impressed with "the paramount importance of taking such a careful aim, before pulling the trigger, that not a single shot should ever miss." A counsel of perfection, perhaps, but an excellent principle for all gunnery instructors.

It was not until 1830, when Lord Melville established a school of gunnery at Portsmouth, that scientific methods in the handling of naval ordnance obtained official recognition. Even then, however, the innovation was coldly received by the older generation of officers, whose influence outweighed that of the enthusiasts and rendered their attempts to improve naval gunnery more or less abortive. Training was perfunctory, many captains setting more store by paint and polish than straight shooting, and, as the chances of promotion were notoriously more dependent on the smart appearance of one's ship than on her gunnery record, officers had no incentive to over-work themselves in the last-named respect. All through the nineteenth century naval marksmanship was neglected, and it was not until 1898 that the first symptoms of revolution made themselves manifest. In that year the Spanish-American War came to emphasize the lessons of the Yalu with regard to the appalling effect of modern shell fire, and Captain Percy Scott, of H.M.S. Scylla, showed that nothing beyond careful and systematic training was needed to send those deadly projectiles with unfailing accuracy at a distant target.

It is not proposed to describe at length the subsequent stages by which the shooting of the British Navy was brought to an admirable degree of efficiency. In 1903 Captain Scott was appointed to command the gunnery school at Whale Island. Two years later Sir John Fisher laid down new rules of training, mostly directed to the substitution of actual practice for theory, and to putting naval firing on a competitive basis; but the new system did not come fully into operation until Captain Jellicoe was appointed Director of Naval Ordnance in February, 1905. From that time onward the efficiency of every ship was judged from the standpoint of her battle practice record, and it behooved every officer with professional ambitions to take a keen personal interest in the prowess of his ship's gunlayers. The wonderful progress made between 1898 and 1908 was set forth by Sir Trevor Dawson in a lecture he delivered in 1909: "The result of the development in the engineering side of artillery, in the optical accessories, and, in great measure, in the enthusiasm, training, and skill of the gunners, is a marked improvement in the battle practice of the Fleet. The target, which is towed at an unknown speed, course, and range, is only 90 feet long by 30 feet high, less than one-fifth the length of a battleship. One of the latest cruisers put in eighteen hits out of thirty-two rounds from 12-inch guns, and another fifteen hits out of eighteen rounds. Taking all guns in all British ships in commission, the percentage of hits to rounds fired in 1908 was fifty-six, under the new and more severe firing conditions. It may be taken that efficiency in gun practice has more than trebled in ten years."

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ACCORDING to "The Engineer," an interesting form of sparking plug for motor cars is being developed in the United States, utilizing 'catalytic combustion" to keep the carbon burned off the insulators. The method depends on the maintenance of a high temperature by burning part of the gas-air mixture by catalytic flameless combustion throughout the entire period of the compression stroke, when there is plenty of fresh air in the cylinder. The new plug is provided with a catalytic structure, in addition to the electrodes and inculators, which produces heat by oxxidizing the mixture above mentioned. The catalytic flameless combuston produced by this material is distinct from ordinary flame combustion of the kind that inflames and explodes the whole charge of gas and air. The insulator is kept nearly red hot, and therefore does not receive any deposit of soot, but it does not interfere with the electric spark.

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IN one of his journals, Camille Flammarion gives the heights at which sounds from the earth are heard from balloons. The shout of a man was heard distinctly at the height of 1,600 ft., the short note of a mole-cricket at 2,500 ft., and the croaking of frogs in a morass at 3,000 ft. At 3,255 ft. a man's voice and the rolling of a cart were distinguished; at 4,550 ft. the roll of a drum and the music of an orchestra; at 5,000 ft. the crowing of a cock, the sound of a church bell, and sometimes the shouting of men and women. Nine hundred feet higher still he heard the report of a musket and the barking of a dog. The noise of a railway train penetrated to a height of 8,200 ft., and the whistle of a locomotive engine to nearly 10,000 ft.

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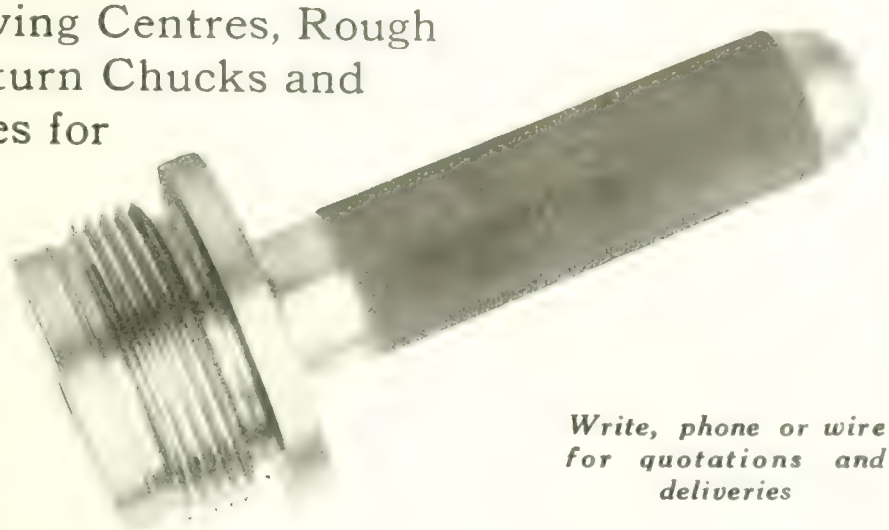

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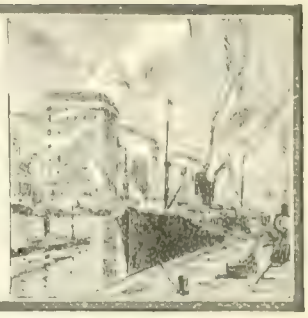
# INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES



## ENGINEERING

**Montreal**—Official notification was received at the headquarters of the Canadian Society of Civil Engineers that the bill amending their charter had received the assent of the Governor-General, thus legalizing the use of the name adopted at the last annual meeting here, as "The Engineering Institute of Canada," under which title the organization will in future be known. Under the new title, it was stated by the secretary, Fraser S. Keith, the association will extend its scope to include the entire engineering profession in Canada, with branches from Halifax to Victoria, for the mechanical, electrical, civil, mining and chemistry, etc., divisions, with sections for each, at the various provincial headquarters, and general headquarters at Montreal.

## MARINE

**Vancouver.**—The shipyard strike in British Columbia, which involved nearly 10,000 men, and which has been on for the last two weeks, is virtually ended, according to announcement by Senator Gideon Robertson, mediator. Eleven crafts of the Metal Trades' Council have agreed to the new scale, it is said, which includes a forty-four instead of a forty-eight-hour week, and fixes a minimum of $3.85 a day for common labor and $6 a day for basic trades. Boiler-makers and electricians are said to be holding out.

**Ottawa.**—"There is under construction in Canada," said Sir Joseph Flavelle, chairman of the Imperial Munitions Board, to-day, "one-quarter of the total merchant tonnage produced in the United Kingdom last year. Eighty per cent. of it will be completed this year. There is one British Columbia shipyard where ten ships of 8,800 tons each would have been built but for the recent serious fire. As it is seven of them will be built. If it had not been for the fire this one yard would have turned out an eighteenth of the total British production."

**St. John's, Nfld.**—The Marine Court of Enquiry which investigated the loss of the steamer Florizel at Horn Head ferry landing near Cape Race on February 24th, made public their findings. They find the mishap was due to faulty navigation by Capt. William Martin, who alone is held blamable, and they suspend his certificate as master for twenty-one months, but allow him a chief mate's certificate for that period because of his good conduct after the wreck. All the other officers and crew are exonerated, and the captain is commended on the manner in which he assumed all the obligation and gave the fullest evidence concerning the tragedy.

**A Pacific Port**—"She acted just like any other vessel," was the way Captain R. E. Connell, commanding the steamer Faith, the largest concrete ship in the world, commented on the vessel's behavior during her trial voyage from another Pacific port to this port, where she arrived. "We had some very rough weather and the Faith certainly stood the test," said Captain Connell. "She responded readily to her helm throughout the voyage." Two research engineers for the Emergency Fleet Corporation and a representative of the United States Lighthouse Service were aboard the Faith as obsedvers on this trial voyage.

## MUNICIPAL

**Endorce the By-law.**—At the last meeting of the Welland Board of Trade the action of the city council in bringing in a bylaw in regard to voting on the proposition to secure the Dillon Crucible Alloys Ltd., was endorsed.

**Hamilton.**—The rebuilding of the Market Hall destroyed by fire last year was endorsed by the Civic Property and License Committee. Plans prepared by F. W. Warren, architect, for the reconstruction of the building were accepted, the estimated cost including installation of a refrigeration system being $105,000. Chairman Cooper and Ald. Radigan and McIntosh wanted the endorsation of the plans postponed indefinitely, but Ald. Tait's resolution that the plan recommended by a special sub-committee, Controller Robson and Ald. Oheir be endorsed, and that construction be started at the earliest possible moment, was carried.

**Edmonton, Alta.**—A. W. Haddow, who has filled the position of acting city engineer since the retirement of A. J. Latornell, has been appointed by the city commissioners to the post of engineer, the full appointing dating from Saturday, May 18. M. Haddow first came to the city in 1909, and previously he was connected with an engineering firm in Northern Ontario. His home is at Simcoe, Ontario. At the outset he did instrument work for the city, and was subsequently made a member of the department. In 1911 he was appointed as assistant city engineer, and in July, 1915, on the retirement of the late A. J. Latornell, he was given the position of acting engineer, which post he has filled up to the present.

## PERSONAL

**Charles A. McCune** has resigned as chief engineer of the Commercial Acetylene Co., to become sales engineer with the Page Steel and Wire Co., 30 Church St., New York, where his efforts will be devoted to sales and service in connection with Armco Welding Rods.

**Milton and Prentiss** have formed a partnership in the business of engineering and machinery and power house brokers, with offices in the Trader's Bank Building, Toronto. A. G. Milton was formerly of the Lincoln Electric Co. and later did business under the name of Archibald G. Milton, his special line being electricity. J. M. Prentiss, his partner in the new business, was for several years secretary of the Chartered Trust & Executors Co., for which concern he had charge of the winding up of the Interurban Electric Co., Ltd. He was also with the Power Plant Equipment Co., organized the Interurban Engineering Co., Ltd., and built and equipped an up-to-date machine shop on Vine Ave., West Toronto. The new firm have the agency of Schaeffer & Budenberg, for recording and pressure gauges and recording thermometers, also for steam jet ash conveyors, and other lines of interest to industrial plants.

## TRADE GOSSIP

**Going to Windsor.**—The Driver-Harris Co., of Harrison, N.J., are going to establish a Canadian business, and Windsor has been selected for the purpose. The company are manufacturers of and dealers in alloys of all sorts. They looked over several Canadian centres before deciding to locate in Windsor.

**One Train Per Day.**—Deliveries of box cars under orders placed by the government are being made at the rate of sixty, or one big train a day. Of locomotives, 185 have been ordered. Work on them has been commenced, and it is expected they will be ready for the moving of traffic during next autumn and winter.

**Women Workers.**—Seven women commenced work in the Grand Trunk shops. This is the first time women have been accepted for this employment. Only the lighter tasks will be given them, but their pay will rank with that of the men. If the women employed at present make good other women will likely be taken on.

**Ten Times As Many**—In last week's CANADIAN MACHINERY reference was made to a dance under the auspices of the C. M. C. Mutual Benefit Society on May 17. In our report it was stated that 300 were in attendance, whereas the figures should have been three thousand. In this case at least it could well be said that "the half was never told."

**Gigantic Merger**—One Union Express Company for the United States was created by agreement between Director-General McAdoo and the Adams, American, Wells-Fargo and Southern Companies, whose transportation business will be merged under a new private corporation, with a capital of more than $30,000,000, to be known, probably, as the Federal Express Company. George C. Taylor, now President of the American, will be the head of the new concern.

**Will Build Factory.**— The "Fenelon Falls Gazette" says: "The Wood Turning Products Co., of Toronto, are to erect a factory in town. Two of their head men were in town last Friday and all final arrangements were made to have a factory located here. The building is to be completed by August 1, and in running order that month. It will be a one-story concrete block building, 120 feet long and 40 feet wide. This company will employ from thirty to forty hands at the start and a few months later will probably employ from 50 to 100."

**Start Nickel Plant**—Coincidentally upon the securing of the necessary raw material, the Port Colborne plant of the International Nickel Company will commence refining operations June 17. This is a month earlier than was at first planned. Necessary additions to the executive staff will be made in the next few days. About 140 workmen are already being employed by the company, and this number will be increased by 200 by the time operations commence. This force will be gradually increased during the next several months until as many as 500 will be included on the pay-roll.

**Getting Suitable Homes**—The John Bertram & Sons Co., of Dundas, are taking steps to overcome the difficulty of the lack of homes and boarding houses for their men. The firm have large contracts and find great difficulty in getting even boarding places for single men. To overcome this, in a measure, the firm have taken over the old basket factory in the west end which is being remodelled and a big dining room will be made in it. Adjoining it the firm will build a large home containing rooms or apartments which they will be able to rent at a reasonable figure to their men.

**Held a Conference**—Refiners of non-ferrous metals were in conference at the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A STRONG [illegible] —a man who will create sympathy and respect and support for the greatest factor in the upbuilding of Canada. A man who will curb the few selfish, the grafters, and the offensive combines which exact exorbitant profits, and bring the 95 per cent. decent Canadian manufacturers into disrepute, subjecting them to unfair and confiscatory legislation. A man who will work in unity with the press of the country, with the farmers, trade unions, and various journals, and finally and most important of all—a man who will organize Canadian industry for the greatest possible output of the best quality goods. Such a man can do more than any other to make Canada permanently prosperous. Such a man, says THE FINANCIAL POST of June 1st, should be secured as Manager of the Canadian Manufacturers' Association. You will find the article containing this and other powerfully constructive thoughts on page 1 of THE POST now on sale.

**Know Canadian Affairs**

News of Canadian Securities forms an important feature of THE FINANCIAL POST every week. In addition to the fifteen columns of the June 1st issue devoted to this department the following up-to-the-minute business articles appear:

How the Farmer Looks on High Tariff Policy.
Milling Company Report Not Made on Business Basis.
Banks Prepare for Abnormal Domestic Needs.
Maintenance of Foreign Trade a Necessity
Canadian Merchants Current Loans Millions Higher.
Effect of Victory Loan on Canadian Banks
Facts From Experts as to Frost Score in West.
Outlook for Record Crop Not Impaired
Bank Clearings Show Pre Falling Off
Drain on Bank Staffs Continues
Housing Question Acute in East: Remove Restrictions?
A Bewilder War Outlook and Why (By Lt.-Col. J. B. Maclean.)

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King Edward Hotel, Toronto, with the Dominion Council of Research, of which Dr. Macallum, of Toronto, is the chairman, with the object of arriving at improved methods through which the maximum amount of metal may be reclaimed. Refineries are operated chiefly in connection with Toronto, Montreal and Hamilton industries. The conference was called by Harry Bayne, Supervisor of Metals and Fibre for the Dominion. Prior to refineries being established in Canada, manufacturers sent their foundry refuse to the United States, where the metals were reclaimed. It was suggested some time ago that a Dominion refinery be established in Canada, but such a step was opposed by Mr. Bayne, who favors the development of the industry among the manufacturers.

**New Incorporations.** — Incorporation has been granted to the following joint stock companies: Lansdowne Park Company, Limited, Brantford, capital $250,000; Statesman Publishing Company, Limited, Toronto, capital $40,000; A. V. Fiola & Company, Limited. Verdun, Que., capital $45.000; Brantford Sales, Limited, Brantford, capital $100 000; Canada Plaster Board Company, Limited, Brantford, capital $100 000; Cluett. Peabody & Company of Canada, Limited, Montreal, capital $1,500,000; Atlee Ranching Company, Limited, Atlee, Alta., capital $100 000; Branham Dredging Company, Limited, Calgary, capital $500.000; United Grain Growers' Securities Company, Limited. Calgary, capital $100.000; Adanac Collieries, Limited, Winnipeg, capital $1,250,000; Ryan's Dry Cleaning Works, Limited. Montreal. capital $25.000; Union Engine Machine Works, Limited Montreal, capital $150.000.

**Western Business Men.**—The organization meeting of the Prairie Provinces branch of the Canadian Manufacturers' Association was held in Winnipeg, when the following officers were elected: Chairman, N. W. Warren; vice-chairman, E. Parnell; executive council, F. W. Adams, J. E. Wildman, J. W. Ackland, M. F. Christie, F. W. Drewry, Wm. Martin, T. R. Deacon, W. S. Fallis, W. R. Ingram, A. B. Stovel; executive committee, W. C. Fraser, D. J. Dyson, L. R. Barrett, F. J. C. Cox, A. Mihalko, Wm. McNealy, R. J. Henderson, Jas. Carruthers, J. Brockest, H. L. Wilson, Wm. Georgeson, H. B. Gordon, W. J. Fulton, L. Crossen, Chas, Watson, C. H. McAuley, L. J. Rumford. G. W. Murray. J. M. Thompson, H. C. Love. C. E. White; chairman transportation: W. R. Ingram; tariff committee: T. R. Deacon; legislative committee: E. Parnell; insurance committee, W. S. Fallis, membership committee, J. M. Thompson. The question of the West having to depend on Western coal this winter was discussed at length. The matter of co-operating with farmers' organizations for the purpose of getting in the harvest was also taken up.

**An Interesting Case.**—Judge Denton, in the County Court, reserved his judgment in a case of interest to contractors. In May, 1917, W. B. Graham submitted to the Board of Education a tender for $14,200 for carpenter work at Orde Street School. Next day he discovered that he had left out $3,500 for labor, and asked to be allowed to amend his tender. The Board refused to grant this request, and when Graham would not carry out the contract which was awarded to him, declined to return his deposit of $710. The contract was finally awarded to Crocker and Le Drew, whose tender amounted to $18,000. Graham claimed for the return of his deposit and a declaration that no contract existed between him and the Board of Education. The Board argued that a contract once accepted and sealed was irrevocable, and counter-claimed for $3,250, the difference between the tenders. Crocker, in the witness box, stated that in his contract he allowed $3,250 for labor, and when the question arose as to whether the Board's officials did not take special notice of the big difference in the amounts of the tenders, Superintendent of Buildings Bishop showed that the Board was accustomed to such variation, and recalled an instance where the lowest carpentry contract accepted and fulfilled was $5,477 and the next lowest $8,900, a difference of $3,450.

## CONTRACTS

**Ottawa.**—The Dominion Government, to relieve the scarcity of office accommodation for its purposes in Ottawa is to erect a nine-story office building covering a space of 200 by 150 feet. The contract was awarded to-day to Bate McMahon and Co., of Ottawa, whose tender of $1.969,000 was the lowest of several received from big contracting firms.

## BOOK REVIEWS

**Condit Electrical Protective Devices** is the title of a unit type of bulletin issued by the Condit Electrical Mfg. Co., Boston. As the title suggests the bulletin is devoted to the various oil switches and protective devices manufactured by the firm and includes current transformers, relays and other auxiliary apparatus. One section is devoted to unit panels for the controlling of induction and synchronous motors.

### SCIENTIFIC PRECISION

Sir Richard Glazebrook says that the work of the Engineering Standards Committee has been of untold advantage to the country. At every step of that work the committee have kept in close touch with scientific principles, and researches of the most varied character have been carried out, and are being carried out now, with a view to determine what standards to set up, what tests to prescribe.

Nor is it enough to say that much of this has been done and need not be carried further; the principles on which ammeters and voltmeters are made have been thoroughly investigated, the optical laws with which telescopes and lenses

must comply are well known; lay down your tests and specifications and train observers, analysts and testers to enforce them, and you have done all.

Stagnation and death, not life and progress, lie that way. It is not our object merely to apply with rigid fairness the laws laid down and to be pleased rather than otherwise, like the mythical examiner, when we plough every sample. The standards set must be reasonable, but they must tend to raise the quality of the product tested. Recurring defects must be watched and investigated, and the tests modified to prevent them: you must gain the confidence of the manufacturer and lead him to realize you are out to help him, and that you really know something, probably more than he does, of the strength and weakness of his goods. Nearly all Englishmen are anxious to maintain the reputation of their country, and welcome fair tests which show up bad work and make for its improvement. Our statistics show the improvement that is produced by tests properly carried out. —*Engineering.*

THERE is now being developed under the name of the Hunnewell hull a new type of ship's hull, consisting of a steel or wood middle body and concrete ends, especially designed for the rapid and economical building of sea-going cargo vessels, says "Marine Engineering." This new style of hull, for which patents have been applied, is the invention of Constructor F. A. Hunnewell, U.S. Coast Guard, and is receiving attention from both naval constructors and private ship owners and designers.

IN an article in "Motorship" on submarine activity, a writer says that if large numbers of camouflaged, mastless and funnelless, motor-driven freight and tank ships were engaged in the transatlantic service, Germany would need submarines stationed at least every ten miles north and south. In other words, she would need a maintained fleet of fifty U-boats effectively to operate a lane of 500 miles wide, instead of about twelve that she now needs. The article states that the Diesel-driven vessel will play a great part in this war.


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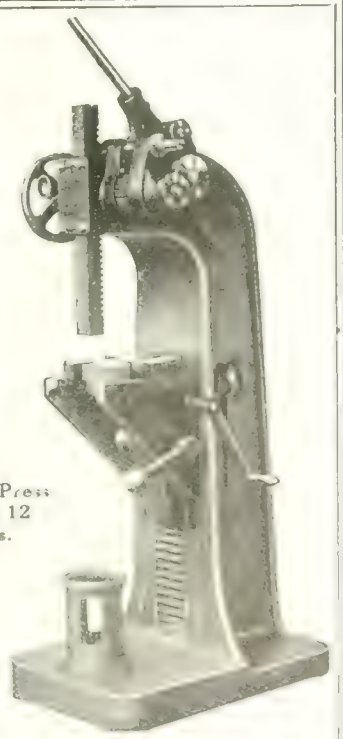

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*A weekly newspaper devoted to the machinery and manufacturing interests.*

Vol. XIX. TORONTO, JUNE 13, 1918 No. 24

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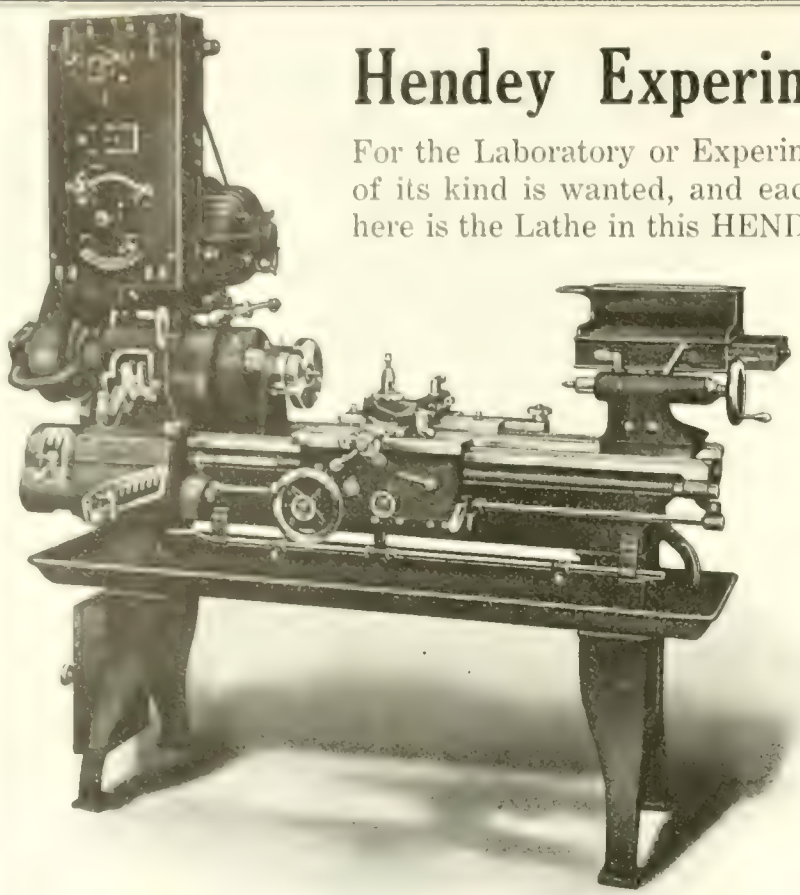

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CANADIAN MACHINERY AND MANUFACTURING NEWS

Volume XIX. No. 24 June 13, 1918

# Modern Belting Practice: Installation, Use and Care of Belts

## Choice of Belting Material—Arrangement of Drives—Proper Method of Lacing—Strength and Thickness Requirements—Useful Formulae

By M. H. Potter

IF possible to avoid it, connected shafts should never be placed one directly over the other, as in such case the belt must be kept very tight to do its work. For this purpose belts should be carefully selected of well-stretched leather.

### Arrangement Features

It is desirable that the angle of the belt with the floor should not exceed 45 degrees. It is also desirable to locate the shafting and machinery so that belts should run off from each shaft in opposite directions, as this arrangement will relieve the bearings from friction that would result when the belts all pull one way on the shaft.

In arranging the belts leading from the main line of shafting to the counters, those pulling in an opposite direction should be placed as near each other as practicable, while those pulling in the same direction should be separated. This can often be accomplished by changing the relative positions of the pulleys on the counters. By this procedure much of the friction on the journals may be avoided.

If possible machinery should be so placed that the direction of the belt motion shall be from the top of the driving to the top of the driven pulley, when the sag will increase the arc of contact.

The pulley should be a little wider than the belt required for the work.

The motion of the driving should run with and not against the laps of the belts. Tightening of guide pulleys should be applied to the slack side of belts and near the smaller pulley.

### Care of Belts

Belts made of coarse, loose-fibred leather will do better service in dry and warm places, but if damp or moist conditions exist then the very finest and firmest leather should be used.

Leather belts should be well protected against water, loose steam, and all other moisture, with which they should not come in contact. But where such conditions prevail fairly good results are obtained by using a special dressing prepared for the purpose of water-proofing leather, though a positive water-proofing material has not been discovered.

### Rubber Belting

The advantages claimed for rubber belting are perfect uniformity in width and thickness. It will endure a great degree of heat and cold without injury; it is also adapted for use in damp or wet places, or where exposed to the action of steam, it has great tensile strength, and when adjusted for service it has the most perfect hold on the pulleys, hence is less liable to slip than leather.

Rubber belting manufacturers claim that rubber belts will be improved, and their durability increased, by putting on with a painter's brush, and letting it dry, a composition made of equal parts of red lead, black lead, French yellow and litharge, mixed with boiled linseed-oil and japan enough to make it dry quickly. The effect of this will be to produce a finely polished surface. The best conditions are large pulleys and high speeds, low tension and reduced width of belt; 4,000 feet per minute, is not an excessive speed on proper sized pulleys.

### Sag of Belts

In the location of shafts that are to be connected with each other by belts, care should be taken to secure a proper distance one from the other. The distance should be such as to allow of a gentle sag to the belt when in motion.

A general rule may be stated thus: Where narrow belts are to be run over

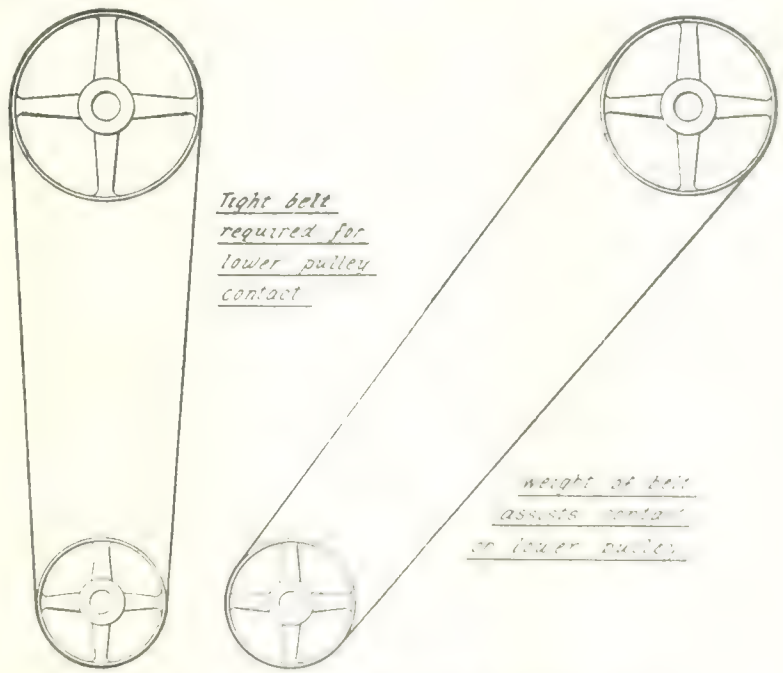



FIG. VERTICAL AND INCLINED BELT DRIVES

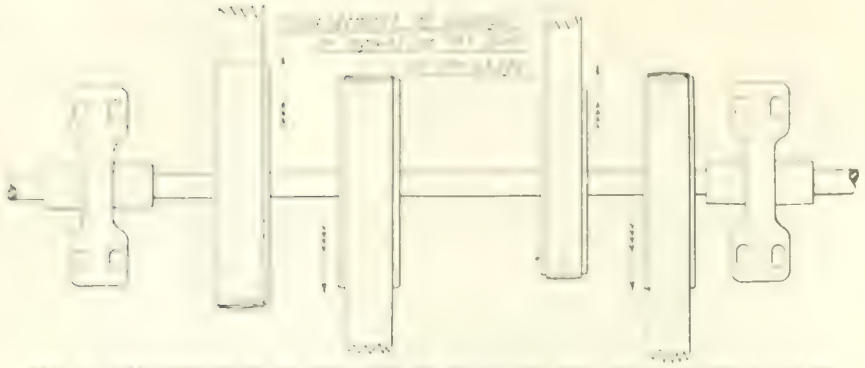


FIG. 2. ARRANGEMENT OF PULLEYS TO EQUALIZE THE PULL ON THE SHAFT

of each pulley at the extremity of the horizontal diameter where the belt will leave the pulley, and then set that point on the driven pulley plumb over the corresponding point on the driver. This will cause the belt to run squarely on to each pulley, and it will leave at an angle greater or less, according to the pulleys and their distance from each other. In quarter-twist belts, in order that the belt may remain on the pulleys, the central plane on each pulley must pass through the point of delivery of the other pulley. This arrangement does not permit of reversed motion.

### Tight Belts

To tight belts can be traced a large percentage of broken pulleys, hot boxes, etc.; the enormous and useless pressure thus put upon pulleys must in time break them, causing heating and consequent destruction of the bearings.

Clamps with powerful screws are often used to put on belts with extreme tightness, and with most injurious strain upon the leather. They should be very judiciously used for horizontal belts, which should be allowed sufficient slackness to move with a loose undulating vibration on the returning side, as a test that they have no more strain imposed than is necessary simply to transmit the power.

### Setting a Belt on Quarter-Twist

A belt must run squarely on to the pulley. To connect with a belt two horizontal shafts at right angles with each other, requires a quarter-turn. First, ascertain the central point on the face

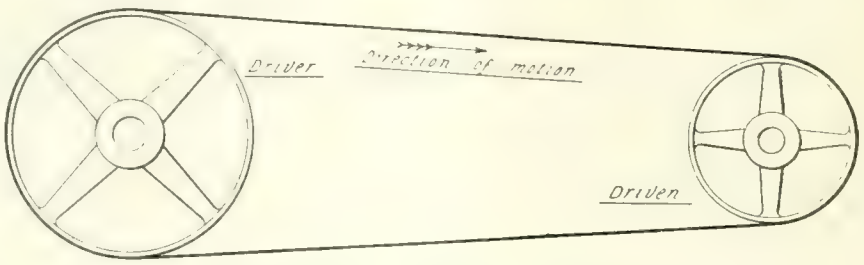



FIG. 3. PREFERABLE DIRECTION OF BELT MOTION.

### Lacing of Belts

In punching a belt for lacing, use an oval punch, the longer diameter of the punch being parallel with the sides of the belt. Punch two rows of holes in each end, placed zigzag. In a 3-inch belt there should be four holes in each end—two in each row. In a six-inch belt, seven holes, four in the row nearest the end. A 10-inch belt should have nine holes. The edge of the holes should not come nearer than ¾ of an inch from the sides, nor ⅞ of an inch from the ends of the belt. The second row should be at least 1¾ inches from the end. On wide belts these distances should be even a little greater.

Begin to lace in the centre of the belt and take care to keep the ends exactly in line, and to lace both sides with equal tightness. The lacing should not be crossed on the side of the belt that runs next the pulley. In taking up belts, observe the same rules as putting on new ones.

### Strength of Belting

The ultimate tensile strength of belting does not generally enter as a factor in calculations of power transmission. The strength of the solid leather in belts is from 2,000 to 5,000 pounds per square inch; at the lacings, even if well put together, only about 1,000 to 1,500. If riveted, the joint should have half the strength of the solid belt. The working strain on the driving side is generally taken at not over one-third of the strength of the lacing, or from one-eighth to one-sixteenth of the strength of the solid belt.

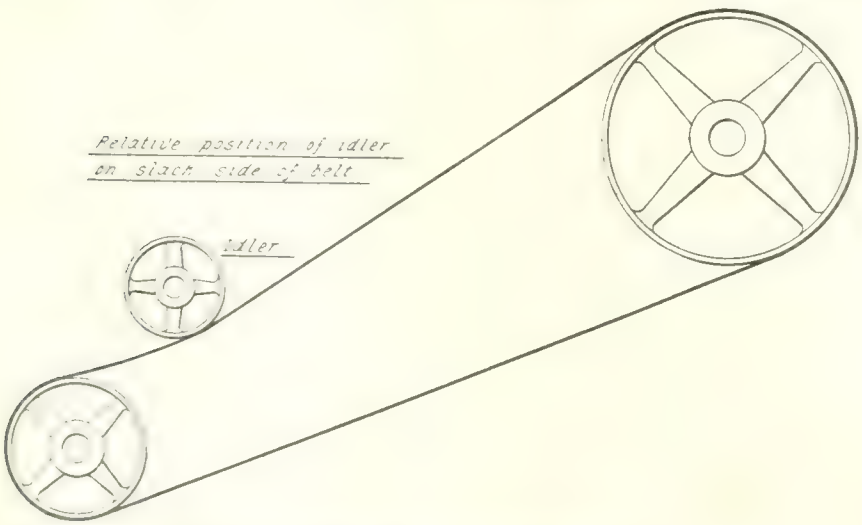



FIG. 4. INCLINED BELT DRIVE WITH IDLER.

### In General

The average double belt when running night and day in a machine shop will cause at least 26 interruptions to manufacture during its life, or 5 interruptions per year. The oak-tanned and fulled belts show themselves to be superior in all respects except in coefficient of friction to either the oak-tanned, not fulled, the semi-raw hide, or raw-hide with tanned face.

Belts of any width can be successfully shifted backward or forward on tight or loose pulleys. Belts running between 5,000 and 6,000 feet per minute and driving 300 horse-power are being daily shifted on tight and loose pulleys, to throw lines of shafting in and out of use.

The best speed for maximum economy should be from 4,000 to 4,500 feet per minute. Belts are more durable and work more satisfactorily made narrow and thick, rather than wide and thin. It is safe and advisable to use a double belt on a pulley 12 inches in diameter or larger, a triple belt on a pulley 20 inches in diameter or larger, a quadruple belt on a pulley 30 inches in diameter or larger. Double leather belts, when treated with great care and run night and day at moderate

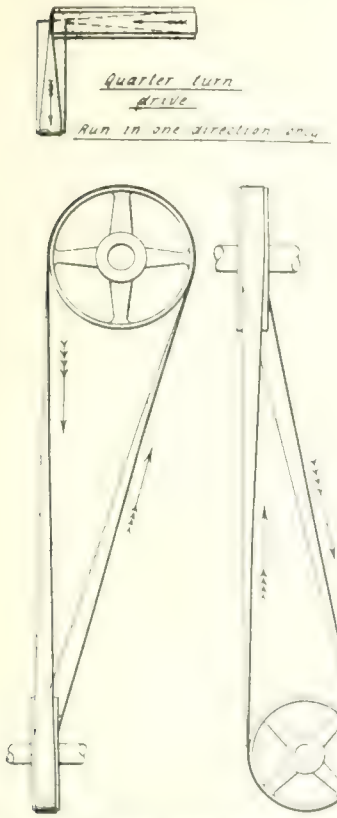



FIG. 5. QUARTER TURN DRIVE RUN IN ONE DIRECTION ONLY.

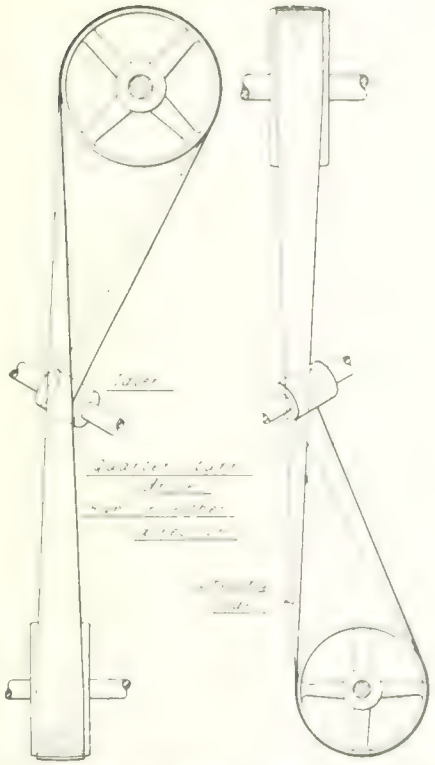


FIG. 6. QUARTER TURN DRIVE REVERSIBLE

speed, should last 7 to 18 years, depending upon the total load. In figuring the total expense of belting, and the manufacturing cost chargeable to this account, by far the largest item is the time lost on the machines while belts are being relaced and repaired.

By increasing the thickness of a belt, the power transmitted ought to increase in proportion; and for double belts we should have half the width required for a single belt under the same conditions. With large pulleys and moderate velocities of belt it is probable that this holds good. With small pulleys, however, when a double belt is used, there is not such perfect contact between the pulley-face and the belt, due to the rigidity of the latter, and more work is necessary to bend the belt-fibres than when a thinner and more pliable belt is used.

The centrifugal force tending to throw the belt from the pulley also increases with the thickness, and for these reasons the width of a double belt required to transmit a given horse-power when used with small pulleys is generally assumed not less than 7 10ths the width of a single belt to transmit the same power.

The most intimate contact of a belt with a pulley comes, first, in the smoothness of a pulley face, including freedom from ridges and hollows left by turning tools; second, in the smoothness of the surface and evenness in the texture or body of a belt; third, in having the crown of the driving and receiving pulleys exactly alike—as nearly so as is practical in a commercial sense; fourth, in having the crown of pulleys not over ⅛-inch for a 24-inch face, that is, that the pulley is not to be over ¼ inch larger in diameter in its centre; fifth, in having the crown other than two planes meeting at the centre; sixth, the use of any material on or in a belt, in addition to those necessarily used in the currying process, to keep them pliable or increase their tractive quality, should wholly depend upon the exigencies arising in the use of belts; non-use is safer than over-use; seventh, with reference to the lacing of belts, it is good practice to cut the ends to a convex shape by using a former, so that there may be a nearly uniform stress on the lacing through the centre as compared with the edges.

### To Find Length of Belt

When the length cannot be measured directly by a tape line, the following approximate rule may be used: Add the diameter of the two pulleys together, divide the sum by two, and multiply the quotient by 3¼, and add the product to twice the distance between centres of the shafts.

To find the length of belt when closely rolled: The sum of the diameter of the roll, and the eye in inches × the number of turns made by the belt and by .130 = length of the belt in feet.

To find the approximate weight of belts: Multiply the length of belt, in feet, by the width in inches, and divide the product by 13 for single and 8 for double belts.

### Driving and Driven Pulleys

The driving pulley is called the driver, D, and the driven pulley the driven, d. If the number of teeth in gears is used instead of diameter, in these calculations, number of teeth must be substituted wherever diameter occurs. R = revolutions per minute of driver, r = revolutions per minute of driven.

$$D : d :: r : R$$
$$d : D :: R : r$$
$$R : r :: d : D$$
$$r : R :: D : d$$

To find the angle of the arc of contact of a belt: Divide the difference between the radii of the two pulleys in inches by the distance between their centres, also in inches, and in a table of natural sines find the angle most nearly corresponding with the quotient. Multiply this angle by 2, and add the product to 180° for the angle of contact with the larger pulley or subtract it from the smaller pulley.

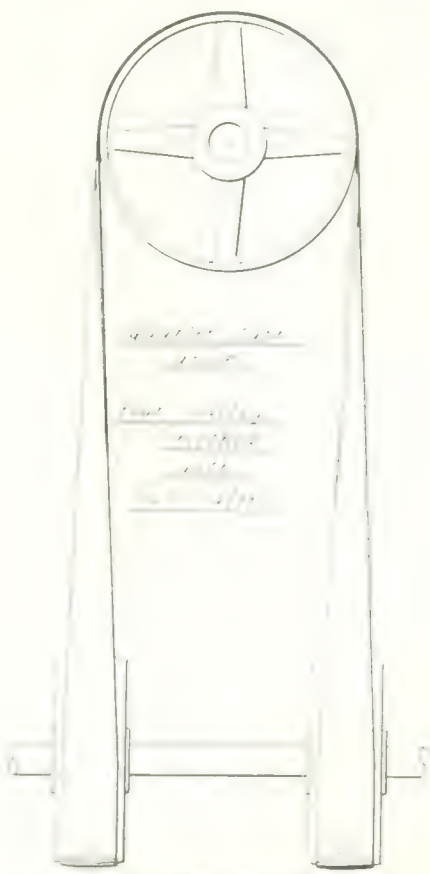
For example, let

R = radius of larger pulley.
r = radius of smaller.
L = distance between centres of pulleys.
a = angle whose sine is (R-r) ÷ L.
Arc of contact with smaller pulley = 180°-2a.
Arc of contact with larger pulley = 180°+2a.

To find the length of belt in contact with the pulley: For a larger pulley, multiply the angle a, found as above, by .0349, to the product add 3.1416, and multiply the sum by the radius of the pulley. Or length of belt in contact with the pulley =

$$\text{radius} \times (3.1416 + .0349a)$$

For the smaller pulleys length = radius × [3.1416 − (.0349a)].



QUARTER TURN DRIVE

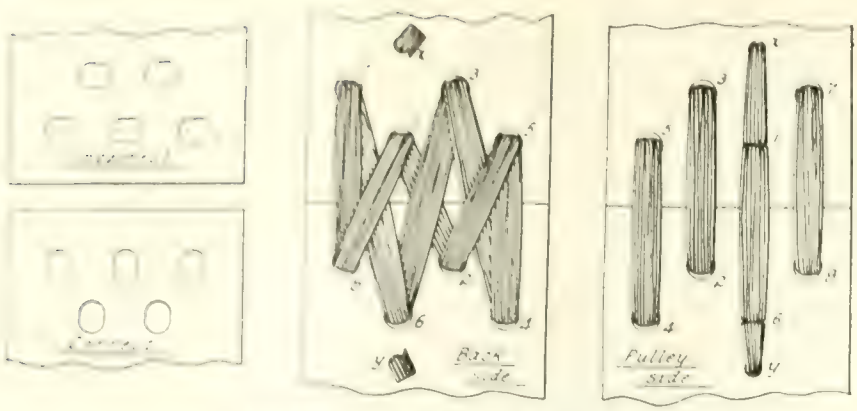



FIG. 8—METHOD OF LACING BELTS.

The above rules refer to open belts. For crossed belts the formula is:

$$\text{Length of belt} = 3.1416R\left(1+\frac{S}{90}\right)+3.1416r\left(1+\frac{S}{90}\right)+2L\cos S=(R+r)\times(3.1416+.0349S)+2L\cos S.$$

in which S = angle whose sine is $\frac{(R+r)}{L}$; $L\cos S=\sqrt{L^2-(R+r)^2}$; $L=\frac{(R+r)}{\sin S}$.

## OIL FLOTATION PROCESS INCREASES PRODUCTION OF METAL

THE good results of the policy of the Government in assisting leaders in the extractive and manufacturing industries to solve the problems which are too big for any individual or company, are being made manifest daily. The Cobalt mining camp has been a great producer, and in this time of war it is more than ever essential that this production be maintained and increased. One of the greatest factors in increased production has been the introduction of the oil flotation process of ore reduction, which process has in some ores resulted in the production of 20 per cent. more metal than could be secured by any other process. This process has, up to within the last few months, depended upon an oil which can be produced in comparatively small quantities only. It is known as "pine oil," and is produced by the redistillation of turpentine in the "hard" pine regions of the southern United States.

### Many Plants Erected

The great success of the oil flotation process caused the erection of many plants throughout the United States, with the result that Canadian reduction plants always had a most precarious supply and were in danger of being cut off altogether at any moment. The price was high because of the scarcity of the article, but it was not price but actual shortage which worried Canadian mining operators. In this situation some of the Cobalt mine owners began experimenting, but while they secured some results, they realized that mining and reduction was the business of the miner, not experimenting. They then applied to the Minister of the Interior to have the Forestry Branch take up the problem of ascertaining whether pine oil could be made from Canadian pine trees, and also whether a cheaper substitute could be discovered. The Forest Products Laboratories, which forms part of the Forestry Branch, took up the work and after three-quarters of a year of experimenting produced both a Canadian pine oil (extracted from red pine stumps) and a much cheaper substitute.

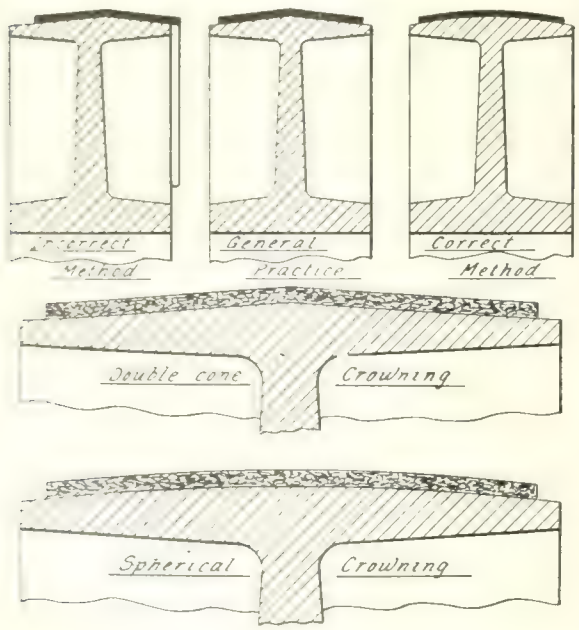



FIG. 10—VARIOUS METHODS OF CROWNING PULLEYS.

As each oil was extracted in the Forest Products Laboratories it was immediately tested by the Mines Branch in the ore dressing station at Ottawa to prove its efficiency with the different samples of Canadian ore. There was thus no time lost in ascertaining which blends of oils were most useful with particular ores; and this testing was another example of the ability and readiness of the different Government departments to do good "team work" in solving a problem for the good of the producers of the country.

### Shifted to the Substitute

The interest of miners naturally shifted from expensive pine oil to the substitute, which up to the present has been a waste product of the wood distillation industry. This is one of the creosote oils which come off in the distillation of wood alcohol, etc. It is being produced at the rate of about twelve hundred gallons per day in Canada, so that the owners of mineral reduction plants point out there is plenty for the expansion of our own mining industry and also some for export.

The discovery has naturally been received with great satisfaction by Canadian mining men, and it is no less satisfactory to the wood distillation industry. Thus by the Government's aid in handling the scientific part and setting its experts to solve a general problem two important industries have been

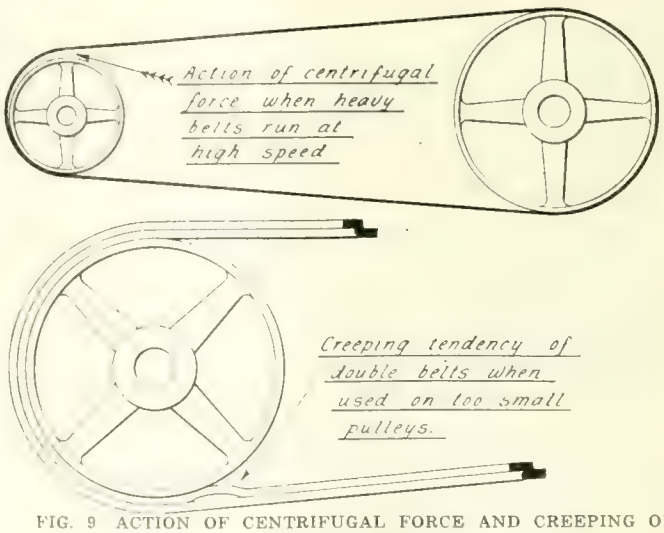

Action of centrifugal force when heavy belts run at high speed
Creeping tendency of double belts when used on too small pulleys.

FIG. 9 ACTION OF CENTRIFUGAL FORCE AND CREEPING OF DOUBLE BELTS.

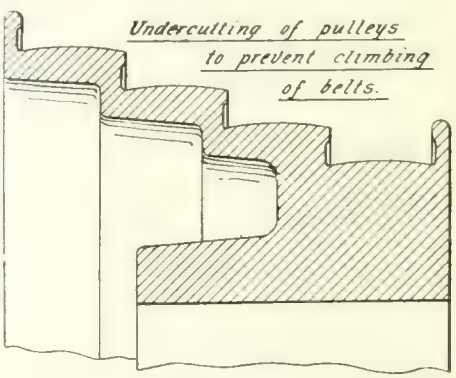



FIG. 11 UNDERCUTTING OF PULLEYS TO PREVENT CLIMBING.

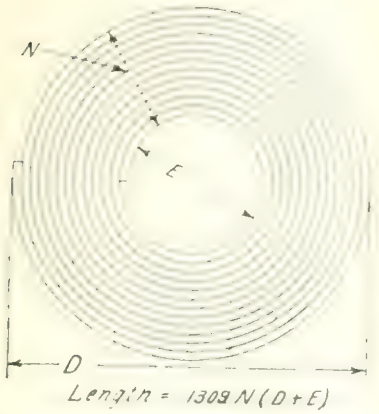



FIG. 1. TO DETERMINE THE LENGTH OF A ROLLED BELT

greatly aided and their managers set free to devote themselves to the particular problems of production; and through this the whole industry and commerce of Canada has been benefited.

## PRINTED COPIES OF PATENT SPECIFICATIONS

**Hanbury A. Budden, Montreal Patent Counsel, Submits Statement to the Minister of Agriculture**

Sir Robert Hadfield, president of the Society of British Gas Industries and head of the great firm of Hadfield Limited, Sheffield, in a recent address on Patent Law Reform made the following statement:

"As an example of the antedeluvian policy of our Empire on this question an Englishman in this country cannot get a copy of a Canadian patent without sending to Canada, and even then he gets only a typewritten copy, as patent specifications are not printed there."

This condition of affairs in the Patent Office, Ottawa, is one that demands immediate attention.

The Canadian Patent Office have issued over 180,000 patents and Canada ranks seventh among the countries of the world issuing patents for inventions.

A copy of a British patent costs eight pence, while the U. S. Patent Office sell copies at 5 cents apiece.

A copy of a Canadian patent costs on an average over two dollars and can only be obtained after considerable de-

In the U. S. Commissioner of Patents' report to Congress for the year ending December 31st, 1917, the following figures are given relating to this subject:

Printed copies of specifications and drawings of patents to the number of 2,511,082 were sold at five cents each, bringing to this office on this account $125,554.10. For 1,277,184 copies sold to libraries the office received $1,612.50. The total received from the sale of copies of patents was $127,166.50.

Copies to the number of 1,097,550 were shipped to foreign Governments and 142,640 copies were drawn for office use. The total number of printed copies of patents distributed during the year was 5,354,126.

These figures show that there is a great demand for printed copies.

The public is interested in the publication of patents because it has the right to know the terms of the grant of a monopoly in order to avoid infringement while the monopoly exists, and it has also the right to know what has become public property when that monopoly ceases.

The patentee is interested in the publication of patents as he would readily purchase a number of copies of his patent, to assist him in exploiting his invention.

The Patent Office is urgently in need of printed copies not only to supply the examiners' files, but also to fulfill an agreement with the U. S. Patent Office to exchange copies.

In Great Britain and the United States the libraries in all the great centres contain copies of patents for reference. In Canada it is necessary to go to Ottawa to make a search and even then the cumbrous typewritten copies, which are not properly classified, make a search difficult and tedious.

The Canadian Patent Act as it now stands provides for the printing of specifications and drawings in Section 63, subject to the approval of the Governor in Council.

Undoubtedly it will take a long time to print the 180,000 patents which have been already issued, but that is a matter for special consideration.

There is no doubt, however, that the system of printing specifications and drawings should be adopted at once and thus prevent the increase of arrears.

Canada has reached such a stage in her development that she should endeavor to be among the progressive nations particularly in matters that concern her intercourse with other nations. The present time of rapid industrial and technical advance demands a change from old methods which may have been suitable for a young country. The contrast between our methods and those of our neighbor of the south is very striking and great efforts should be made to reorganize our primitive system and bring it up to date.

## PRESERVING AND DRYING TIMBER ELECTRICALLY

WOOD, as soon as it ceases to exist as a growing tree, quickly becomes a prey to the germs enclosed within it. Therefore, as it constitutes one of the most necessary materials of industry, it is readily realized that it is advantageous to utilize the wood as quickly as possible after the tree from which it is taken has been felled, and to preserve it in perfect condition. The problem is one that has so far only been partially solved for the subject is extremely complex and comprises, apart from the technical difficulties, various very important economical and industrial requirements.

### Process Requirements

It is, primarily, necessary that the processes employed for the rapid drying of wood shall not be costly or difficult of execution. They should be applicable not only in suitable works but on the land, i.e., in woods and forests themselves. It is necessary also, that the results obtained shall be uniform throughout the whole mass of the wood, and that the constituents of the same shall be absolutely and permanently unalterable in character.

All these conditions are completely realized in the electric process recently patented and put into practice by M. Albert Nodon. So far back as 1896, M. Nodon devised a process for the "senilization" or aging of wood by electricity, but it required a somewhat complicated and costly equipment of vats, screw jacks, cranes, heating apparatus, etc., which rendered the cost of working too high. Not only so, but the method gave somewhat irregular results. M. Nodon, however, continued his experiments and at last succeeded in modifying the process to such an extent as to render it both practicable and economical.

Exhaustive tests carried out in the application of a current of electricity to the drying of wood show it to give rise to a triple action—chemical, physical, and aseptical. As a matter of fact the results achieved comprise (1) a total and rapid oxidation of the resiniferous materials contained in the sap, (2) a molcular transformation of the cellulose and the various derivatives which modify the mechanical properties of the timber, and (3) a complete and definite suppression of all the destructive germs contained in the wood.

### Details of Process

The very simple arangement for drying and preserving wood devised by Mr. Nodon consists of the employment of what is known as "carpet" electrodes, which may readily be transported for use at any place when previously rolled on a wooden core. The carpets are made of a flexible metallic "cloth," of galvanized iron, fixed between two large sheets of jute, which form absorbing mattresses. The carpets, after being extended over the wood to be treated, are saturated with water, thus rendering them good conductors of electricity.

If the process is to be carried out in a factory, a simple floor is made of joists and floor boards, on which the first wet carpet electrode is laid. On this a layer of green wood, that has been cut to the desired shape and size, in the form of baulks, sleepers, beams, planks, etc., is placed. This first layer of wood is covered with another carpet electrode, then another row of wood, and another electrode, and so on, until the pile has reached the desired height, say 1m. or 1½m. The metallic portions of the carpets are connected to conductors at the sides, the poles of the successive carpets being alternated in order that the current may pass through each layer of timber. In this way, the internal resistance of the pile is reduced to a minimum. The current passes through all the baulks in the direction of their thickness, owing to the conductivity of the electrodes and the sap in the green wood. The resistivity varies according to the thickness, the amount of essential oil, the degree of humidity and the time of felling, and ranges between 6 and 20 ohms per cubic metre, remain-

[illegible] the whole period of the treatment.

To cause a current of an intensity of from 5 to 6 amperes to pass through a cubic metre of wood in the form of baulks, the E. M. F. varies, according to circumstances, from 30 to 100 volts. An alternating current at 110 volts and 40 to 50 periods may be utilized, but it is preferable to adopt a lower frequency, say 15 to 20 periods per second, and a lower E. M. F. The latter is regulated to give the desired current by means of induction regulators or transformers. Continuous current at 110 volts may also be employed.

### Regulation

The results are the same as with alternating current, but the electrolysis that takes place quickly affects the carpet electrodes, necessitating a frequent reversal of the directions of the current flow through the pile of timber.

Regulation of the continuous current can only be effected by means of ohmic resistances, the efficiency of which is lower than that of the induction regulators. For these reasons, it is preferable to employ alternating current.

The process can also be carried out with great advantage in woods and forests when timber is in full sap, during the summer time, for it is in that period the wood possesses its maximum of vitality and industrial qualities. It is also the best season of the year for outdoor work. The trees can be advantageously cut up by portable electric saws worked by current from a portable steam-operated generating plant, the boiler of which can be fired with the waste timber resulting from the felling and the sawing. The piles of wood, with their carpet electrodes, are arranged on a small area of cleared land near where the trees are being felled, while the treated wood can be stored in any position where it is exposed to strong winds.

### Capacity

The time necessary for drying wood by the Nodon process varies from one to two full days, according to the nature of the timber and the results it is desired to secure. It may be noted that when the process is carried on too rapidly cracks or splits may be caused in the wood. The current should therefore be regulated to from 4 to 5 amps. per cubic metre for timber intended for carpentry and cabinetmaking work. For other uses such as railway ties, the strength of the current may be increased to 10 amps. per cubic metre. The sum total of the current which should be passed through a cubic metre of wood is 150 amps. hours, that is to say, the time varies from one to two days according to whether a current of 10 or 5 amps. is employed. The operation can be suspended at the end of the regular working day, and restarted the next morning without inconvenience or drawback. All that is necessary in such a case is to keep the carpet electrodes damp in order that the resistivity of the pile may not increase. If the timber is not stripped of its bark, an E. M. F. of from 80 to 100 volts is necessary; if, however, it is stripped, and in full sap, a pressure of 40 volts is sufficient.

### Effect on Wood

Wood dried by the Nodon process, or "nodonized" as it is rapidly becoming known in France, is deprived of starch, but retains the resiniferous materials throughout the whole mass, the cellules of the sap-wood have also a characteristically regular appearance which enables by means of reactions and micrographic examinations the wood that has been treated electrically to be distinguished from that which has not been submitted to the process. The cost of installation and working is restricted to the purchase of the carpet electrodes and the energy consumed. The electrodes are easily made, and their cost works out at an average of about 4 francs per square metre. The cost of electrodes per cubic metre of treated wood is approximately 40 francs, while they have an average life of twelve months, if the necessary care is taken to reduce the wear to a minimum. The depreciation, on this head, works out at approximately 2c per day per cubic metre.

### Industrial Uses

As for the industrial applications of the process, these are almost as numerous as those of wood itself. For carpentry and joinery work, perfectly dry timber that will not become moist or rot is necessary. Especially, also, is this the case as regards materials for the construction of boats, vessels of small tonnage, bridges, gangways, jetties, etc. Military authorities and public works departments also find it advantageous to employ perfectly dried timber.

Some official tests have recently been made on the application of the French Government, the results of which and the reports on the same have been entirely favorable to the process, and some further specific tests for Government Departments are at present in progress. The Nodon process can also be advantageously adopted for the rapid and complete desiccation of certain Colonial species, such as pseudo-mahogany, which comes from the African coast in the form of large bark-covered logs, and which, on arrival in France, are still full of sap, rendering their treatment in stoves unsatisfactory. Such material can be treated by the Nodon method not only efficiently but also at a much lower cost.

As regards wood paving blocks, the use of which is steadily increasing in large towns, it has been a general experience that, owing to their relatively short life, they have frequently to be renewed, the processes hitherto employed having failed to give the desired results. An official report, issued in January last by the municipal authorities of Bordeaux, shows, however, that electrically-treated wood gives full satisfaction as regards durability. Indeed, the official report, a copy of which lies before us, stated that one of the busiest roads in Bordeaux was partially paved in 1906 with wood blocks treated by the Nodon process, and that, although eight years have since elapsed, the part of the road so paved is still as level as on the day it was laid, while the other portions paved with blocks treated in the ordinary way have had to be relaid.

Finally, we may draw attention, among the other important applications, that of railway ties and pitwood, in addition to telegraph and telephone poles, and electricity and transmission masts. It will thus be seen, from the numerous directions in which it can be applied, that the Nodon process promises to effect a radical change in the methods of drying and preserving wood. It may be added in conclusion that the process is in the hands of Societe A. Beaumartin & Co., of 33, Rue St. Genes, Bordeaux.

## TWO KINDS OF SAFETY

By D. A. Middleton

Down in Schenectady almost every worker is either a G. E. or an Alco man. In the rush of war orders a couple of years ago one of these companies bought an unused factory building, and in a remarkably short space of time had machinery installed and an army of men at work. This gang had been at work about two weeks and in that time had turned out parts enough to kill off thousands of fearless men over there, when all of a sudden came the order to stop work.

It seems that in the rush of getting started such trifles as guards for belts and gears and other moving things had been entirely overlooked and might have gone on so had not an indemnity insurance man happened along just then on his semi-annual inspection trip. Insurance laws are very strict in New York State, and everything (almost) is guarded. The inspector's say-so was proof against persuasion so right then the plant took a four day rest while guards were fitted to the machines to make them safe for the industrial army —guarding against the possible loss of a finger—even the inspector was forced to smile when the superintendent pointed out in the consistency of the move and the grim purpose for which the product was intended.

## PRIZE OFFERED FOR METHOD OF DETERMINING HARDNESS

The Institution of Mechanical Engineers holds a sum of £200, presented last year by Sir Robert Hadfield, which, with any income therefrom, may be awarded at the discretion of the Council of the Institution as a prize, or as prizes, for the description of a new and accurate method of determining the hardness of metals, especially of metals of a high degree of hardness. The Council will consider annually all communications received, and may then award a prize or prizes. But in January, 1922, the offer of prizes will be withdrawn, and any unexpended balance of the Prize Fund will be diverted to any other purposes to be determined at the discretion of the Council. Particulars can be obtained from the Secretary.

### A NOVEL BOX CAR LOADER

The loading of such material as sand and gravel into box cars has been necessary on account of the shortage of gondola cars. Many shippers do not have a large enough plant to justify the expense of installing any of the large box car loaders which are on the market, but do not want to incur the loss of time and money required by hand power with shovels and wheelbarrows and there is also a shortage of laborers to contend with.

The box car loader shown in the illustration consists of an inexpensive portable belt conveyor, provided with electric or gasoline motor and receiving hopper, all self-contained and easily wheeled into the doorway of a box car, into a position where the material can be delivered from an overhead chute into the loader hopper, to be thrown by the rapid moving belt into any portions of the car by directing the discharge end of the loader accordingly.

NOVEL BOX CAR LOADER

The capacity of this labor saving device is 80 to 100 tons per hour and with this loader two men can load one box car in 35 minutes. On a recent test two men loaded 80 box cars in six days and it would have taken a great deal longer time if they had used shovels and wheelbarrows instead.

### ACCIDENT PREVENTION

By J. Hamilton

Industrial accidents must always be recognized as one of the possible factors in any mechanical development or enterprise. Much has been done during the past, particularly in recent years, to minimize the casualties resulting from inexperience, carelessness or accidental causes. It is safe to say that the greater proportion of accidents to industrial workers has resulted from individual carelessness or thoughtlessness, either on the part of the injured workman or some other party. Close study on the part of officials and safety supervisors —relative to the causes and prevention of accidents—has resulted in the adoption of many appliances that have assisted in reducing the size of the casualty lists in industrial establishments.

The efficiency of the majority of these devices, however, depends very largely on whether the same are acceptable to the workmen, who are required to adapt themselves to the changed conditions. It is invariably true that the application of a safety device will, for a time at least, prevent the operator from maintaining his accustomed production, and should he be working on a piecework basis, the loss very often develops an antagonistic feeling towards the appliance indirectly responsible, so that it will not receive the just trial it is reasonably entitled to. Frequently the device is discarded as an obstruction to production until another mishap demands its further application.

When guards are mentioned as a means of reducing or preventing accidents we naturally think of some tangible appliance for the purpose intended, but the most efficient guard for permanent results has been acknowledged as the better education of the workmen respecting the serious possibilities that may arise through careless or thoughtless performance of their respective duties. This does not imply that instruction should take the place of safety appliances, but rather that the adoption of such devices should be preceded by personal consultation with the workman upon whose machine the method is to be applied. The conversation should be such as to impress the operator with the need of the device, and at the same time make him feel that his interests are being considered; obtaining, if possible, any suggestions he has to offer in connection with the design or installation of the attachment. His constant operation of the machine may result in a suggestion that may have been overlooked by the designer, and a slight change made to meet the suggestion of the workman may not only remove an antagonistic tendency but would undoubtedly act as a stimulus for the operator to give the device every opportunity to prove its effectiveness.

### IMPORTANT RADIUM DEVELOPMENT

More than $180,000 worth of radium for use in the sciences has been delivered to the Bureau of Mines at Washington [illegible] National Radium Institute to develop a more efficient process for the manufacture of radium out of the carnotite ores of Colorado and Utah. It is stated that the amount of radium in question was procured for an expenditure of less than $38,000. In addition, under the agreement, the bureau has turned over to the National Radium Institute about 6½ grams of radium, and has given to the country a method for producing pure radium compound from the ore for one-third the current price of radium.

When the Bureau of Mines began this work in 1912, it found that the precious carnotite ores, constituting the largest known supply of radium ore in the world, was going to Europe, mainly to Germany where it was being turned into radium and sold back to the United States at fabulous prices.

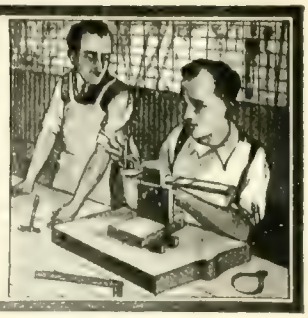
THE special physical and chemical properties of platinum render a perfect substitute a practical impossibility, but recent investigation has produced several alloys which are satisfactory for certain purposes. The only metals which come into consideration as useful alloys with platinum are iridium, palladium, gold and silver. Iridium and palladium are so rare and are so difficult to work that they are practically excluded and silver is too readily attacked by acids. Thus there remains only gold and palladium, but by alloying the three metals in various proportions a number of useful products have been given the name of "Rhotanium."

IT IS estimated that if the United States send overseas an army of 5,000,000 men and have as reserve 1,000,000 more in the training camps they must, at a conservative estimate, have four adult persons—men or women—in productive pursuits to equip and supply each one of these soldiers in uniform. That is, for the 6,000,000 soldiers in the fighting army they must have 24,000,000 adults in agriculture and manufacture. These two sums total 30,000,000 persons. Discounting the young and the aged, the sick and the infirm, the insane and the defectives, it is probable that these 30,000,000 persons will constitute at least one half of all the American population, that would be of any value whatever for the prosecution of the war.

A SWEDISH firm of Diesel motor builders has made successful experiments in the use of wood distillation products as a substitute for oil for use in internal combustion engines.

# FROM THE MEN WHO PRODUCE

Methods, Machining Devices, Systems and Suggestions From Shop And Drafting Room



## SPECIAL SHELL GAUGES

By M. H. Potter

THE following remarks pertain to some simple gauges, both for production and inspection, which have given satisfaction in service.

### Base Thickness and Over-All Length

Fig. 1.—Working gauge for thickness of base of shell (either for rough or finished thickness). A marking gauge that center punches the shell, enabling the operator on the cut-off machine or base-facing lathe to know exactly how much stock to remove. By means of the handle A the end of the gauge B is forced against the base (inside) of the shell, then by use of a hammer the shell is center-punched in three or four different places so as to enable the operator to locate one of the punch marks readily. The prongs C and D are bent circular to fit around the body of the shell. The center punch E is held in the gauge proper by means of set screws in a groove in the center punch as shown. By making the obvious changes, i.e., placing the center punch forward, this gauge can be used for the over-all length of shell from bottom of base.

Fig. 2.—Shows an inspection gauge to be used after the same operation as a check upon the operator. A similar gauge for the over-all length of the shell would be the same but have a notch cut forward in the required distance.

Fig. 3.—Shows a somewhat similar gauge for checking the over-all length. A similar gauge equipped with a center punch could be used previously for marking to length.

Fig. 4.—A different type of inspection gauge for the base thickness. The piece A is reamed to slide along B. The line C (on the gauge proper) being the high limit of base thickness and the line D (also on the gauge proper) being the low limit. If the base is machined to a correct thickness, the line E (on the slide A) will come between C and D.

### Gauge for Wall Thickness

Fig. 5.—A multiplying caliper gauge having a roller A at one end and a sliding pointer B at the other (the pointer is forced towards the roller by means of a coil spring wound around it (not shown in Fig. 5). The line C is the low limit of wall thickness and the line D the high limit. The pointer E comes between the lines C and D when the wall is machined to a correct dimension.

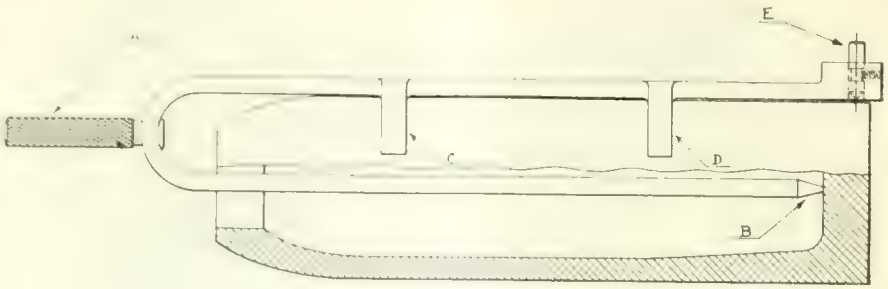



FIG. 1—GAUGE USED FOR MARKING BASE THICKNESS.

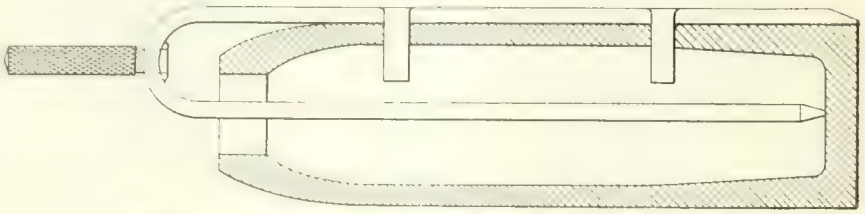


FIG. 2 GAUGE USED FOR INSPECTING BASE THICKNESS.

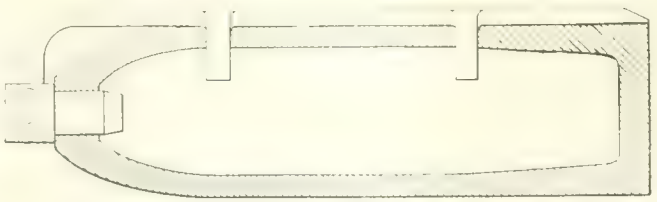


FIG. 3—GAUGE USED FOR CHECKING OVER ALL LENGTH.

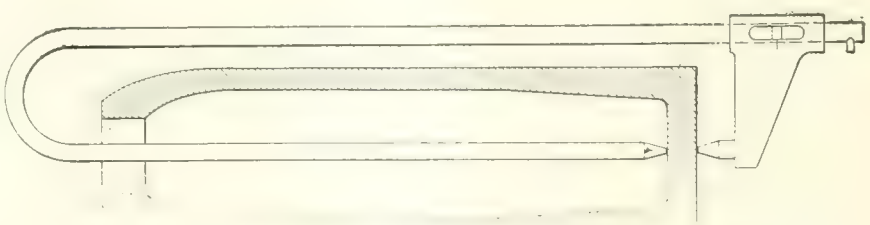


FIG. 4.—ANOTHER TYPE OF GAUGE USED FOR CHECKING BASE THICKNESS.

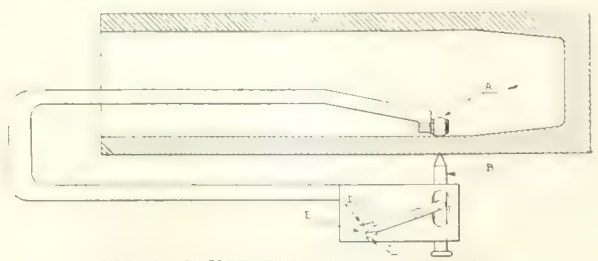



FIG. 5—GAUGE FOR WALL THICKNESS.

**Fuze Hole Concentricity (Before Threading)**

Fig. 6.—The shell is placed against the stop A on the rollers B, C, D and E. A blow, and to enable the workman to follow the taper or belly of the blank is provided by the screw passing through the frame F and acting on the [illegible]

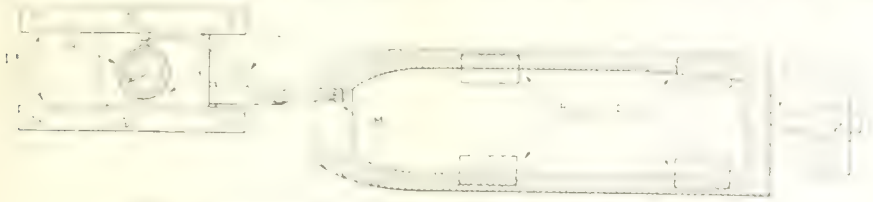


FIG. 6—DEVICE FOR TESTING FUSE HOLE CONCENTRICITY

A standard dial gauge G is mounted on the block H, which has a "V" machined at its base to match the "V" slide strips I and K. The multiplying lever L carries the roller M.

The shell is revolved slowly by hand, any variations from a true bore are indicated by the gauge.

A somewhat similar gauge to determine the concentricity of the bore (bore proper of shell) is a great help in terminating discussions as to eccentric-bored shells.

## INTERESTING WORK ON FILE MACHINERY

By H. Middleton.

File teeth are formed by rapidly driving a chisel into the steel blank which is carried along on a table at a rate proportionate to the spacing of the teeth The teeth might be termed the burr raised by the chisel, for that is what they are—ridges of uniform height thrown up by one face of the chisel point above the level of the blank. A view of the chief working parts of a file cutter is shown in Fig. 1.

Starting with the chisel A, a piece of flat high speed steel, it is seen almost touching the file laid on the half round swivel table B. The chisel is held in the lower end of the hammer H, which is a cast iron block of different weights for different sizes of files. It is the weight of this hammer driven down at a high

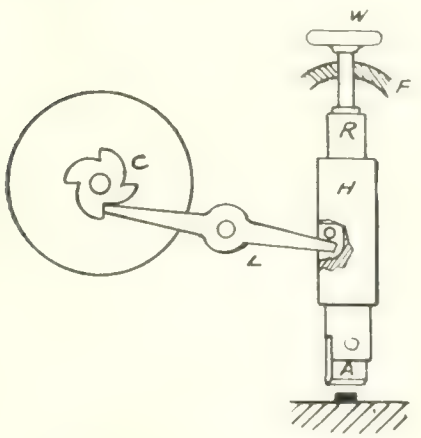



FIG. 1—PRINCIPLE OF FILE CUTTING MACHINE.

rate by the rubber spring R that gives the chisel power to penetrate the blank. A means of up and down adjustment to compensate for slight variations in thickness, to deliver a light or heavy blow, and to enable the workman to follow the taper or belly of the blank is provided by the screw passing through the frame F and acting on the [illegible] R. This is the mechanism of the blow.

To raise the hammer against the resistance of the spring and gravity, a recess is formed in the back of the hammer and a hardened wearing part inserted to receive the lift from the level L which in turn is actuated by the lobes of the cam C. When the lever drops off the highest parts of the cam, the spring R acts and the file receives the blow that forms another tooth.

Some idea of the speed of the machine may be gained when it is stated that the chisel makes nearly two thousand blows a minute on the smaller sizes of files and several hundred blows on the heavier machines where the hammer may be of a hundred pounds weight and the spring correspondingly stiff. The cam, lever, and pin therefore have to be perfectly sound and glass hard to bear up under such conditions.

In one plant where this type of file cutter is used, trouble was experienced with the files showing a slightly wavy appearance though not so bad as to condemn anything but the appearance. A machinist with an investigating turn of mind put some of the files under his magnifying glass and found that every fourth tooth was deeper than its fellows. Tracing this back, he decided that the cam was at fault. When the cam and shaft were put in the lathe the shaft was perfectly true and the rises on the cam very nearly uniform, but a test indicator showed one to be a few thousandths higher than the rest. With a tool post grinder, this high part was taken off, and all made exactly alike, after which the machine did perfect work again. Three of the lobes had been a little softer than the fourth one, which hadn't worn off the fraction that made such a difference in the blow of the hammer.

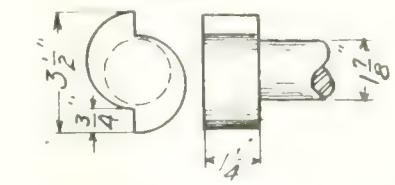
### Types of Hammers

The type of machine previously mentioned is a Hess make. Another type, the Weed, has the cam let in the back of the hammer and raises the latter without the interposing of the lever. Typical dimensions of one of the larger cams and shafts (integral) are given in Fig. 2. Well made in the beginning, they last as long as any part of the machine. Once in a while the machinist is called on to make a new one which he does readily and cheerfully up to the point of hardening.

But the thought of getting the cam not so soft that it will wear, not so hard that it will chip, and at the same time free from warping or a section of strain just back of the cam that will give way during the first week of running—that makes any man think seriously of how to harden the cam and not scrap thirty or forty dollars' worth of labor and material in an instant. Selection of the proper steel, proper treatment during the upsetting of the end, and care in machining go to make up the preliminary precautions. A jobbing shop that has successfully hardened a number of these cam shafts without any special equipment does the work as pictured in Fig. 3.

A pan of water about two feet in diameter is so placed that it comes under a faucet and after the pan has been two-thirds filled the faucet is shut off so it runs in a little stream hardly more than a drip. An overflow hole keeps the water level. A block B is laid in the bottom of the pan to keep the cam off the bottom and accessible to water all

FIG. [illegible]



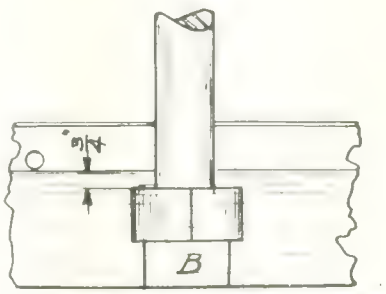




FIG. [illegible] METHOD OF HARDENING CAMS

around. It will be seen that the water extends a little over the cam—enough to insure hardening for the entire width but not preventing the heat in the shaft running down and "drawing" the shaft free from snap and presumably drawing the filleted corner and adjacent centre of the cam.

Some of these cams so hardened have been in daily service for a number of years raising hundred pound hammers and their lasting qualities give silent proof of the correctness of the hardening method.

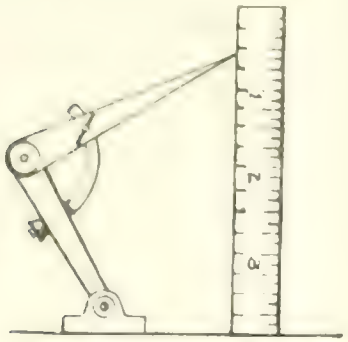
## A SETTING TOOL FOR THE AUTOMATIC

By D. A. Hampson

On many screw machines it is difficult to make a direct setting of tools from certain working faces. For instance, it is desired to set a turning tool ½ in. ahead of a drill and two other tools at definite distances from these, but because the tool holder in the slide is larger a rule cannot be used, for the eye does not span the gap with sufficient accuracy. Often a surface gauge is used in setting up, resting the base on the machined face of either the head or the tool slide and setting the

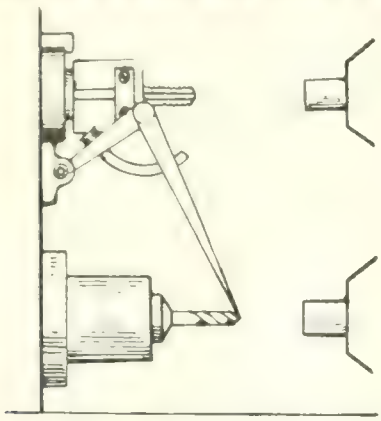
face plate first.

... enough to give footing for the surface ... in Fig. 2. The tool is a converted car- ... in. is drilled and slotted to receive one leg which has been formed into an eye



SETTING THE TOOL TO A RULE

and a binder screw supplied to tighten in any position desired. A base of this size is broad enough to provide stability yet is of a size and shape to slip into a working position between tool holders or the nose pieces of the head if used from that side. In Fig. 1 the divider is ... set to a rule, and in Fig. 2 the



SETTING A DRILL WITH THE TOOL

drill is being located the proper distance out to bring it in the desired relation to the other tools.

## CENTRES IN GRINDING WORK

By Howard W. Dunbar.

The importance of the centre hole in grinding work demands more than passing attention, in fact these holes should be made as accurately as the centre itself in the machine. Too much importance cannot be placed upon the refinement in the centre holes for ground work. The angle of the hole should agree exactly with the angle of the centre that the hole is to rest in. The shape of the hole should be as perfect as it is practical to make it, for no work can be ground any more perfect than the holes that fit the centres the work revolves on while grinding. If they are incorrectly balanced, out of shape or poorly made, the quality of work will correspond with the inaccuracies in the centre holes. The surface that rests on the centre points in these centre holes should be as smooth and as free from chatters and imperfections as they can be made. Slight chatters in the centre holes will be reflected in the ground surface.

Depressions and lumps on these surfaces will tell their story every time in the ground piece. The hole should be deep and the drill relief at the bottom should extend far enough in to give ample clearance for the centre point, so that the centre point will not bottom on the centre hole while grinding.

Foreign substance in the lubricating medium used in centre holes should be entirely removed. Dust, dirt, grit, chips, small pieces of steel, etc., that find their way into white lead, red lead, oil or lubricating compounds will spell disaster in much of the ground work where exceptionally fine finish is desired. The burrs on the edges of centre holes, after the centre hole has been machined and reamed, should be entirely removed for frequently these little burrs are turned over into the centre hole and are the cause for failure when the grinding machine operator attempts to finish.

The size of the hole should come in for due consideration. In all instances the size of the hole should correspond to the size of the centre used in the machine. If a 1-inch centre is placed in a machine, the centre hole in the work should, in a great many instances, be as large as ½-inch, the size of the piece, of course, playing an important part in deiding just what size holes are neessary. Heavy work should not be supported on the points of centres but weli back on their bodies.

Refinement in practically all instances comes from attention to these small details.—*Grits and Grinds.*

## 7-IN. STEEL PLATE IN ROLLS

By L. Street.

It is practically certain that before long thin steel plates, and what is generally known as "tinplate" will be obtainable in continuous rolls of any required length for roofing, lining and other purposes. A power-driven automatic soldering press has been devised whereby sheets of metal can be joined, soldered and wrapped into a roll similarly to the operation performed by a paper or felt-tarring machine. The machine in its present form consists of two presses or dies that act simultaneously. One of these is heated by either gas or electrical energy, according to whichever is the more convenient, whilst the other is provided with a water-cooling arrangement. Both these dies are mounted in a single frame, and are provided with rollers working on cams which bring the does together at intervals. The moment they come together they are acted on by a toggle with enormous force. The sheets are first passed through a subsidiary press, which turns the two opposite angles into a lock. They are then fed into this big press, the edges being locked in place by the machine minder by merely hooking the lip of one plate into that of the one which is at the moment in the machine. The cycle of operations is that the first locked edge comes between the hot dies and is clamped home and soldered if tinplate is being dealt with. The moment this is done the sheet passes on throughout its width and the joint just made is then between the water-cooled dies, by which it is thoroughly cooled. At the moment that this is being done the second joint has arrived between the hot dies, and is being clamped together. This operation is continuous, so long as the sheets, hand-locked together, are fed into the machine. The movement of the sheet is controlled by a stop that holds it stationary whilst the dies come together and allow it to move on the requisite distance so soon as the pressure is removed. After the seam is made the sheet passes through a pair of rollers which give it an upward curve. It is then pressed against spring controlled rollers, which force it into a roll. In another form of machine the sheet passes through drawing rollers on to a reel, by which it can be wound up into bobbin shape. One man can work the machine, and when soldering is going on the flux and solder is applied automatically to the joint in the same manner as in the can-making machines. The capacity of the machine is four seams per minute or twenty boxes of tinplate per day. It is claimed that by the use of this machine a better and more durable seam can be made than by hand, and when soldering is done the metal penetrates the seam uniformly and makes an even and durable joint. It would not seem a difficult matter to produce a machine that would electrically weld together the edges of plates passed into it. It might be suggested that the edges of the plates could be each reduced 50 per cent. in thickness for a quarter, or three-eighths of an inch, where they overlapped, in which case the weld would be the same thickness as the rest of the plate and the whole roll produced would be perfectly smooth and even.

WITH the revolving smooth steel discs now being used for cutting metals, the actual cutting is, says the "Ironmonger," not effected, as was formerly understood, by removing the metal, but by the heat generated by the friction which is so great that the metal is melted at the point of contact. The disc has consequently only to discard the molten metal, and by doing so clears the dividing groove. Naturally the steel disc also becomes heated in the operation, but as the greater part of its circumference is always out of contact, and continuously being cooled by air, and as friction for each point of the disc circumference only lasts for a minute fraction of a second, its own heat remains always below melting point.

**A. J. Reid** has been appointed Hamilton representative for the Armstrong, Whitworth Co., of Canada.

# Corrosion of Iron and Steel, and Its Prevention--V.

By Abe Winters

RUST-proofing by the immersion of iron or steel in phosphorized solutions has proven very satisfactory for many purposes, but, as is the case with many other very excellent ideas, the process is not adapted to all requirements met with in the various industries. The process of phosphorizing iron or steel surfaces consists of two essential operations, namely: (1) Preparing the iron or steel surface. All scale or non-metallic substance must be removed and the surface must be as clean as for high grade enamelling. All metal coatings, such as nickel, copper, brass, zinc, tin, etc., must be removed. The surface of the article to be treated must be ferrous and chemically clean. Sand blast or pickle is used for this purpose; sand blast is preferable; (2) The rust-proofing process consists of immersing the iron or steel in a very dilute aqueous solution of phosphoric acid, manganese dioxide and ferric oxide. The solution as employed is 90 per cent water. The solution is maintained at 212 degrees Fah. during the entire processing of metal. Boiling increases the action of the solution on the metal by reason of agitation. Baffle plates are used in the tanks to obtain a proper circulation of the solution over the metal surfaces being treated.

When the iron or steel is first immersed in the solution a very copious flow of gas issues from the pores of the metal. The amount of gas liberated depends upon the quantity of chemicals in the solution, the temperature of the bath, and the porosity of the metal being treated. The evolution of gas continues until the surface of the metal is entirely converted into a mixture of the ferrous and ferric phosphates, then the action ceases and the operation is finished.

### Proportions of Chemicals Used

The proportions of chemicals required for a bath are 75 per cent phosphoric acid to 1 per cent manganese dioxide and ferric oxide mixture, the latter chemicals accumulate at the bottom of the tank under the baffle plates from which it is removed and thrown away; the phosphoric acid employed by firms operating certain patented phosphorizing processes weighs 22½ oz. per pint. One pint will acidify one thousand gallons of water to 1 point as per NaOH test for acidity; 14.5 points is considered normal acidity, or 20.35 lbs are required to raise 1,000 gallons of water to 14.5 points.

The first chemical cost per 1,000 gallons equals $3.67. Additions of fresh acid must be made before beginning each batch. Then the solution is tested for acidity and the normal point acquired. The average cost of operation approximates $40.00 to $50.00 per ton if chemicals are purchased from the patentee, but this would be greatly reduced if they were procured in open market.

The time of treatment varies from 1 hour to 8 hours. No electric current is used, the process being one of simple immersion in a boiling solution of the proper quantity of previously mentioned chemicals. The processing solution is tested as follows: 10 c.c. of processing solution is taken in a beaker, 5 drops phenolphthalein added as an indicator and the solution filtrated with a one-tenth normal solution of sodium hydroxide (NaOH); 8 oz. of manganese dioxide ($MnO_2$) is required to each pint of the acid solution.

### Penetration

When iron or steel is immersed in the boiling solution an action takes place upon the surface of the metal and is indicated by the liberation of hydrogen, the treatment continues until all action ceases or the hydrogen is no longer liberated. The theory of this action is that the ferrous surface is gradually converted to a ferric condition and becomes coated with an insoluble basic phosphate of iron. The action of the solution upon the metal or at least the evolution of hydrogen is much more pronounced in the case of cast iron than with sheet steel, and the harder the steel the less intense is the action, and the time required for processing is increased. A penetration of .004 inch is claimed for this process. The writer has conducted several tests to determine the accuracy of this claim and has failed to obtain a case which verifies the statement. A magnification of 330 diameters does not reveal any appreciable penetration. Furthermore, the temperature of the metal in process is never more than 215 degrees Fah., and we fail to understand how this temperature can open the pores of hard steel sufficiently to permit of a .004 penetration by the acid solution. A penetration of .004 inch may be possible in grey iron castings if the treatment were given under ideal conditions.

These phosphorized metal surfaces are not resistant to friction, running boards of automobiles, handle bars of bicycles, etc., quickly becomes a prey to rust where worn by the feet and hands of the persons using the vehicles. The phosphorized rust-proofing treatment is said to prevent the spread of rust if a portion of the metal surface is exposed. Tests by responsible persons in various localities do not confirm this claim, and as the penetration in average cases does not exceed .001 inch it is obvious that there is no resistance to spread of rust at points where the surface coating has been removed by a sharp-edged article.

### Electro-Plating Impossible on Phosphorized Surfaces

Certain promotors of phosphoric acid rust-proofing have emphatically declared that phosphorized surfaces can be electro-plated. This claim has naturally attracted the manufacturer of plated wares as it appeared to be a short cut to durable and rust-proof plated surfaces on iron and steel. To any who have been thus informed we would say, go slow, as iron or steel surfaces which have been processed by immersion in rust-proofing solutions containing phosphoric acid, manganese dioxide and ferro oxide cannot be electro-plated with any metal in any solution, because the film produced over the surface of the metal is a non-conductor; the iron or steel is very effectively insulated and absolutely protected as far as electrolysis in the plating bath is concerned.

If the surface film is removed electro-plating is possible, but the protection afforded by the rust-proofing is destroyed, as no appreciable penetration is effected, therefore the phosphoric acid and manganese dioxide treatment of iron or steel is not adapted to such goods as are to receive a subsequent coating of metal by electro-deposition. We are not aware of any firm using the phosphoric acid process for rust-proofing steel and relying on the simple process alone for efficient protection to iron or steel.

In every case the processed metal is given a final coating of either oil, wax, paint, japan or enamel, the most enthusiastic advocate of phosphorized metal surfaces which the writer has met admitted that all processed metal should be given the protection afforded by the previously mentioned substances. As stated previously the rust-proofing of iron or steel by treatment in solutions of phosphoric acid, manganese dioxide and ferric oxide has proven very satisfactory for many purposes, but is not adapted for the general requirements of metal protection. The process is expensive if operated efficiently. Stove

manufacturers have regarded the process with considerable doubt for several [illegible] are practically condemning [illegible] of no value as a prevention against rust on stoves, ovens or cast iron which is subjected to excessive heat

Strong Solutions Detrimental

Another objection to the process is the inefficient protection which results from treatment in solutions which have been loaded in excess of the chemical capacity, [illegible] fully 50 per cent of their product was thus treated. The process does not require a skilled operator but it is essential that he should be [illegible] of a fair degree of horse sense.

The writer has pieces of steel undergoing atmospheric exposure tests, these have been treated by various rust-proofing processes and the result of the test is at present favorable to no particular method where phospheric acid is used. At present our conclusions relative to these phosphorized surfaces is as follows.

That the repellant nature of the surface of iron or steel toward rust is increased by proper treatment in aqueous solutions containing phosphoric acid, manganese dioxide and ferric acid is unquestioned, wrought iron and steel of various methods of manufacture are greatly influenced in corrodibility by the amount of phosphorous contained in them. With one per cent. of phosphorous present the corrosion is a little over one half as great as in cases where the iron is free from phosphorous. If two pieces of steel containing different percentages of phosphorous are immersed in salt water, in contact, the low phosphorous specimen will corrode more rapidly that the high grade metal. Iron alloyed with chromium, cobalt or nickel will resist corrosion in a similar manner.

If phosphorous acts as a deterrent to corrosion when introduced into an alloy it is reasonable to expect that an insoluble film of basic phosphate of iron over the surface of ferrous metals would repel corrosion more or less. The effectiveness of such films naturally depending upon the nature of the vehicle in which the film was produced, the manner of treating the metal and time allowed for processing. "Rust once established, carries within itself the elements of a ceaseless life; even in a glass bottle rust begets rust."

## HEAT-RESISTING PAINTS

By Mark Meredith.

The best heat-resisting paints are made from hardened asphaltum or pitch, dissolved in a fluid solvent; whilst for temperatures below the boiling water, casein, animal albumin and alkali silicates have given good results, writes a German authority. Pyroxylin varnish is very durable, but browns when heated, and can only be used when in admixture with black body colors. The following preparations are worthy of mention.

Roman Prasser's Recipe.—Equal parts (40) of pigment and spirit varnish (composed of 1 part of bleached [illegible] 7 parts of spirit) are intimately mixed with 1 part of camphor and 5 parts of bleached oil varnish. The article to be coated is brushed over several times with a mixture of gypsum and spirit varnish, flatted and painted over with the above preparation, being finally polished lightly with shellac varnish. This paint will stand the heat of boiling water for some time, but browns on prolonged exposure and peels off.

G. M. Neisel's Recipe.—Solid fats or fatty acids are distilled at 250 to 300 deg. C. with superheated steam. The residue being mixed with about 10 per cent. of red lead and 2 per cent. of litharge, treated with superheated steam at 400 to 500 deg. C. and thinned down at 150 to 200 deg. C. to workable consistency with linseed oil. As an alternative method the dilution with linseed oil is replaced by blowing in 25 per cent. of petroleum vapor, and then diluting with the crude benzol or other dilutent when sufficiently cool. The product is said to dry with a glossy surface, and to stand a dry heat of 500 deg. C. or damp heat up to 250 deg. C. As a matter of fact, an asphaltic substance and especially the distillation residues from fats (bone pitch, etc.) are capable of resisting high temperatures, and are used for stoving enamels.

Meyer's Recipe.—Residues from the distillation of fatty acids are heated to about 500 deg. C. with lead oxide and lead peroxide for three to four hours until thoroughly combined, the mass being dissolved in mineral oil and thinned down with turpes.

Bethisy's Recipe.—The mass consists of nitro-cellulose and a solution of calcium chloride in amyl acetate, with an addition of ether, alcohol, alum, talc, asbestos or mica, elasticity being imparted by vaseline oil or lavender. Celluloid varnishes are capable of standing a certain amount of heat.

Selmay Meyer's Recipe.—A heat-resisting varnish for iron ware, especially iron stoves, etc., is prepared by mixing powdered liver of sulphur, cyanide of potash, bicarbonate of soda, and sufficient cassel brown to give the desired color, and the mixture is saturated with alcohol. The pulp is passed through a sieve to remove coarse particles, and after being applied to the metal is exposed to a temperature of 200 to 300 degrees C. Other fireproof pigments may be submitted for the brown. This preparation is an enamel rather than a paint, but will stand heat very well.

Syracuse Tar.—A mixture of finely ground alum, asbestos and borax or boric acid is stirred into melted coal tar, the proportions being 60 to 65 or 40 to 50 parts of tar, 8 to 4 to 2 to 8 of alum, 20 to 5 or 38 to 30 of boric acid, 12 to 5 or 20 to 13 of borax, and 5 to 8 of asbestos. The idea seems to be that the salts will sinter together under the influence of the heat, the tar being presumably carbonized.

Avenarius' Recipe.—Ten parts of alkali silicate are heated under pressure with 25 parts of casein, a pasty mass being formed. This liquid is mixed with 0.2 part of carbonate of magnesia and 0.1 parts of borax, to increase the heat-resisting properties, whereupon 0.15 part of zinc oxide, 0.3 part of sodium phosphate and a suitable quantity of lime and earthly pigment is added to give covering power. For use, the mass is thinned with boiling water, and is said to stand a temperature of 100 deg. C. (212 deg. F.).

Fairweather's Recipe.—Equal parts of silicon carbide and semi-fluid alkali silicate are mixed together, 3 to 10 per cent. of chalk being added.

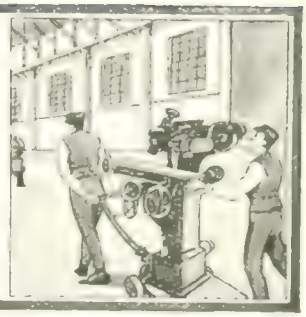
Hall's Fireproof Recipe.—This paint consists of moist silicate of magnesia, 5½ of dextrin, 5½ of gypsum, 2 of chalk, 2 of alum, and 1 of common salt. Four parts of this powder are mixed with three of boiling water for use. This preparation and the preceding one owe their "fire-resisting" properties to the sintering of the salts when heated.

Eymer's fireproof varnish is compounded of a mixture of alkali silicates with asbestos or other fireproof material and vegetable or mineral oils, or oily substances like glycerine.

Give a couple of coats of a good washable distemper, upon which should be given two coats of oil paint, the first somewhat flat and the last with a little oak varnish added to it. Painting on galvanized iron is at all times difficult, and there are various preparations on the market specially made for the purpose. If you do not care for the water paint plan try the following:—First go over the work with a wire brush so as to roughen the surface, then apply a coat of red lead well brushed out and mixed thin with boiled oil and turpentine. You will, of course, only mix just sufficient quantity of the red lead for the job, and will take care to stir from time to time while in use, as the red lead sets quickly. If there is much of the work to be done, we should recommend you to use orange lead instead of red lead, as although the two are practically of the same nature, the orange lead is a good deal lighter, and hence does not settle so quickly. You may take it that everything despends on the priming coat, and if this is satisfactory, the two or three coats upon it will hold well. The washable distemper in our experience gives as good a result as anything, and is much cheaper than the red lead system, but you might—having decided upon which you will use—paint just a small portion by the other method for the sake of experiment, and see how they look at the end of the year or so.

THE INTAKE conduit for an air compressor should be made of non-conducting material such as wood, brick or concrete, and should draw air from the coolest place available, never from the compressor room itself. The cross-sectional area of the conduit should be equal to at least one half of the area of the piston in order that the air may flow with perfect freedom. In hot and dusty localities it has been found beneficial to draw air from the interior of a framework continuously drenched with water. This arrangement not only cools the air but removes the dust at the same time.

# DEVELOPMENTS IN SHOP EQUIPMENT



*Makers of equipment and devices for use in machine shop and metal working plants should submit descriptions and illustrations to Editorial Department for review in this section.*

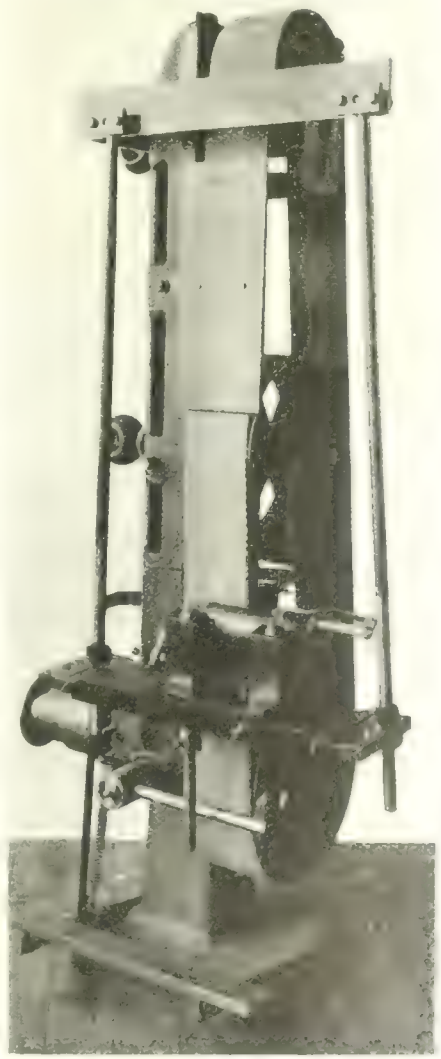
## POLISHING AND FINISHING MACHINES

THE polishing and finishing machines developed by the Blevney Machine Co., Greenfield, Mass., make use of a two-belt system of finishing with an abrasive cloth belt running at high speed over a heavy corrugated leather cushion belt. Skilled labor is unnecessary and the process results in a remarkably high rate of production.

The Type A machine is built up on a heavy cast iron column providing the necessary rigidity for a high-speed machine. Steel ways are attached to the column and the sliding frames in which the idler pulleys operate travel on these ways. The main belt pulley is attached to a shaft running in suitable boxes in the lower part of the column of machine and the driving pulley is attached to the other end of this shaft. The patent cushion belt is run over the main pulley and the idler next above, travelling at a speed of 7,000 feet per minute. The cloth abrasive finishing belt is placed over the cushion belt running from the main pulley to another idler pulley operating in frame at top of machine. The idler pulley frames in both cases are governed by weighted levers having a fulcrum journaled wheel, and a steel pinion forms connection with a steel rack attached to the frame. These weighted levers should be in a horizontal position when the machine is in operation and to bring the levers to this position a spring is provided holding the pinions in engagement with the rack. By pulling the fulcrum against the action of this spring the pinion will become disengaged and the lever may be moved to any desired position, the spring restoring the engagement between pinion and rack.

The alignment of the two belts may be controlled by means of hand wheels operating on the idler pulley boxes, these wheels serving to tilt the pulleys so that the position of the belts may be changed as desired.

A suitable table or stock rest is provided for holding the stock and for the application of fixtures and attachments. A spring platen or pressure bar is applied back of the cushion and finishing belts. The action of this pressure platen is controlled by a foot treadle and stops are furnished to limit the forward and return movement. The face of the platen is made to suit the work to be finished, thus, for plain flat work the platen has a plain face, while for finishing tubes or round pieces parallel strips are placed at top and bottom of platen, causing the belt to curve around the circumference of the stock being finished. Where desired the platen may be made sectional at a slight additional cost over regular construction, or special rotating platens with yielding centres can be furnished.



TYPE A PARALLEL [illegible] AND FLEXIBLE [illegible] MACHINE

The adaptability of this machine to a wide variety of work is illustrated in the accompanying engravings. Fig. 1 shows the machine set up for the finishing of tubing.

Fig. 2 shows the machine set up for the grinding of the bourrelet on shells, resulting in exceptionally fast production.

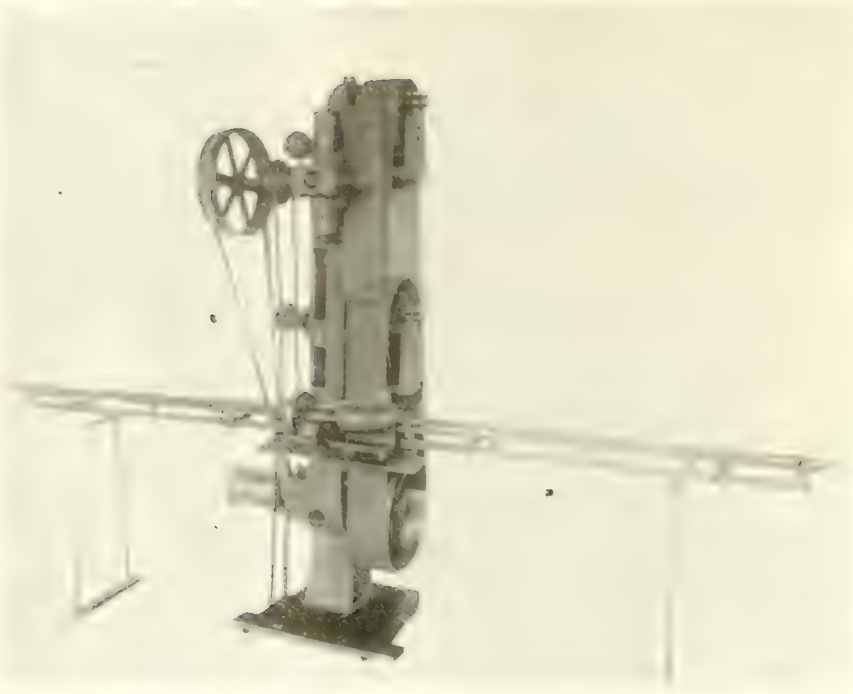
A special set up is shown in Fig. 3 for the grinding of torpedo heads and afterbodies, this method having reduced the finishing time from 17 hours to less than 50 minutes.

The production of these machines is obtained through the medium of the two-belt system. The corrugated leather cushion belt runs at 7,000 feet per minute and the abrasive finishing belt which runs over it runs at a slightly increased speed, due to the enlargement of the effective diameter of the driving pulley amounting to twice the thickness of the leather cushion belt. The increased travel amounts to about 1½ inches on each revolution of the main pulley.

The increased speed of the cloth abrasive belt is neutralized in operation when pressure is applied behind the belts, with the result that the travel of the abrasive belt is somewhat retarded at point of work so that it must curve into high and low sections following the corrugations in the cushion leather belt. In this manner are obtained high points for cutting and low points for chip recess. After the belt passes point where work is held it expels the chips and resumes its normal position.

The chips are disposed of immediately as generated or cut, while in other processes the chips are rolled along over the face of the work, thus scratching or damaging work already done and causing unnecessary friction and heat. It will be seen that the two-belt system of polishing and finishing does away with unnecessary friction and thereby immediately provides for faster finishing, and at the same time a higher and more satisfactory finish.

A jointing machine is used in making the abrasive belts endless and the method employed is such that the thickness is practically no greater at joint than at any other part of the belt, this process not only makes an exceedingly strong belt, but one which runs



TYPE A MACHINE FITTED WITH TUBE TABLE AND POWER FEED

smoothly and evenly and does not jump over the work at the joint.

The abrasive belts as they become used are later dressed down for finishing in various stages until they are finally used for greased belts for the finest finishing. In this manner the life of a belt is extended to where the item of cost is hardly a point for consideration.

The cloth abrasive belts as compared with an ordinary buffing wheel do away with all centrifugal action upon the finishing grains where they are under strain and as compared with the disc grinder they provide a uniform speed for each cutting grain, the disc grinder grains being subject to different speeds on account of their location at different points from centre of disc. It is also well to note that there is no loss in abrasive material through the use of the cloth finishing belts, while a considerable portion of the abrasive grain is lost in operation on the ordinary hard wheels and discs.

## HIGH GRADE PLANERS

The Liberty Machine Tool Co., Hamilton, Ohio, have recently completed their new plant and one of the recent products is illustrated herewith.

The 36-inch planer shown has been designed to meet the requirements of modern practice and includes the safety appliances and conveniences necessary for safe operation. The machine has no parts extending below the floor line; therefore no special foundation is necessary.

The bed extending to the floor affords a solid foundation for the machine. The top is closed between the vees except at the gearing section which is heavily reinforced by heavy girts. All holes are drilled from jigs, insuring accuracy.

The gearing is placed inside the bed and is easily accessible from the top. The gears are pressed onto the hubs of the pinions, relieving the shafts of all torsional strains. Heavy shafts support the gearing and journal in wick oil bearings. The pulley or driving shaft is journaled in bronze oiling bearings and has an additional support outside of the pulleys. The driving pulleys are made of aluminum. The loose pulleys have wick oiling bronze bushes and solid web instead of arms, to insure the safety of the operator. Wide belts insure ample driving power.

The table of liberal proportions is provided with excellent oiling facilities. A simple and efficient shifting mechanism responds to the will of the operator.

The housings, substantially built, extending to the floor (with large taper plugs for alignment and bolts for fastening to the bed) are of box section and capable of withstanding the strains peculiar to this member. Pads are provided for attaching motor brackets at any time.

The rail is of deep box section and is made long enough for two heads. The heads are made right and left for close range, and are provided with graduations for swivelling up to 90°. The down feed screws under strain are in tension instead of in compression, as is usually the case.

The feed is independently adjustable on either rail or side head and the operator can change the feeds with the machine in motion. A direct reading index dial conveniently located enables him to set the feed to the required amount.

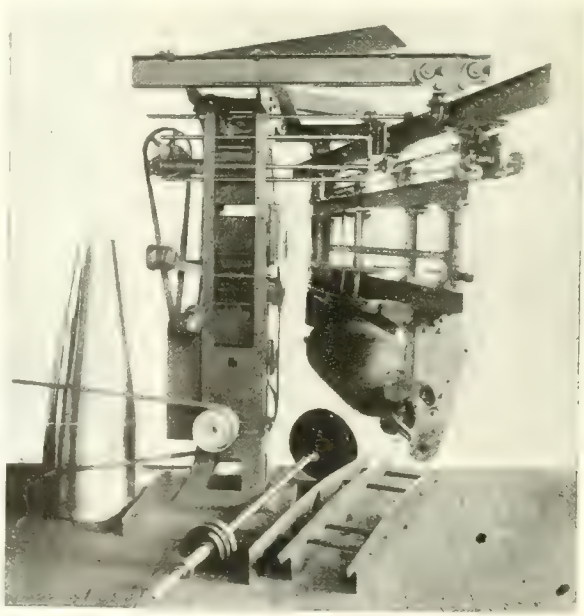
The elevating device is centrally located on the top brace and is operated by a long handle at the side of the housing. All gears are idle when not in use. The side heads are provided with independently adjustable feed, and can be provided with micrometer index collars.

## 20-IN. CRANK SHAFT FLANGE-TURNING LATHE

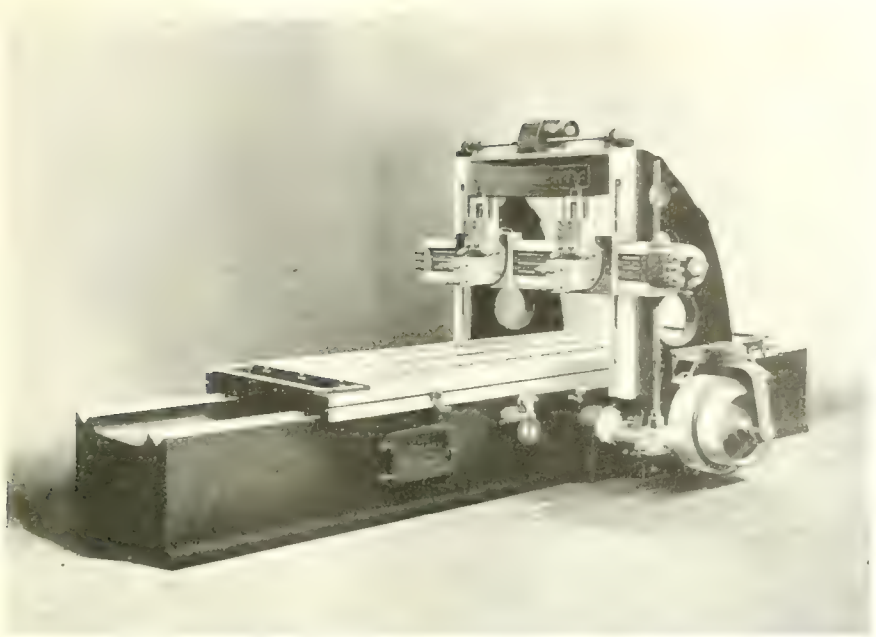
This is a special purpose machine, designed to turn and face the fly-wheel flange of an automatic crank shaft. The spindle is a large iron casting, with a 7 in. hole through its entire length. Properly located in this hollow spindle is a positive dead-center to support the front end of the crankshaft. In order that this center can be located quickly a cone-shaped piece is pressed in the spindle which immediately directs the crankshaft on to the centre.

The shaft is rigidly and accurately held to the face-plate by an adjustable chuck, which is clearly shown in the illustration. The flange end of the crankshaft is supported on a tailstock centre. The tailstock is extra heavy and is fastened to the bed by four large bolts.

A compound tool block is fitted to the rest. Three tools are placed in the required position to turn the flange to its predetermined thickness. These tools face both sides of the flange and turn the fillet at each end of main bearing. There is a secondary tool block, cam mounted, which turns the outside diameter of the flange, while the three other tools are facing. The lathe here pictured is driven by a Westinghouse type SK motor of 10 h.p., 1,100 r.p.m., reduction being accomplished through heavy gearing.



SPECIAL MACHINE ON TORPEDO HEADS AND AFTERBODIES.



HIGH GRADE PLANER

The one-speed and one-feed system is used, as the most advantageous speed and feed have been determined for the work at hand. This machine was designed and manufactured by the Reed-Prentice Company, of Worcester, Mass.

## UNITED STATES IMPORTERS MUST FURNISH IMPORT LICENSE NUMBERS TO CONSULS

THE United States War Trade Board, through its Bureau of Imports, has issued a ruling to United States Consular Agents throughout the world, that on and after May 27, 1918, no consular invoices for any commodity are to be consulted unless the shipper furnishes the consul the number of the United States import license covering the shipment. The only exception to this rule is the case of shipments covered by general import licenses. Already it is necessary for importers to communicate to their shippers abroad the number of the United States import license for articles on the restricted lists before consular invoices can be obtained and shipments started from abroad. The present ruling extends this regulation to all articles, both restricted and unrestricted, except such as are covered by general import licenses. This means that import licenses must be obtained for the importation of all commodities before they leave foreign points. It is believed that this will avoid much uncertainty in the minds of both importers here and consular agents abroad as to what import license numbers must be communicated abroad. It will also give the War Trade Board an opportunity of passing upon all importations from a standpoint of enemy trade connection before shipments are put in transit.

The United States Bureau of Imports will pass promptly on all applications for import licenses, so that, if the license is granted, the importer may be informed immediately of its [illegible] and sent it by mail or cable to [illegible] per abroad.

As intimated above certain classes of importations are permitted to enter under general import licenses; and where these licenses exist it is unnecessary for importers to apply for individual import licenses. These general licenses are designated as "PBF" licenses."

## SPECIALIZATION AND STANDARDIZATION IN GERMAN INDUSTRIES

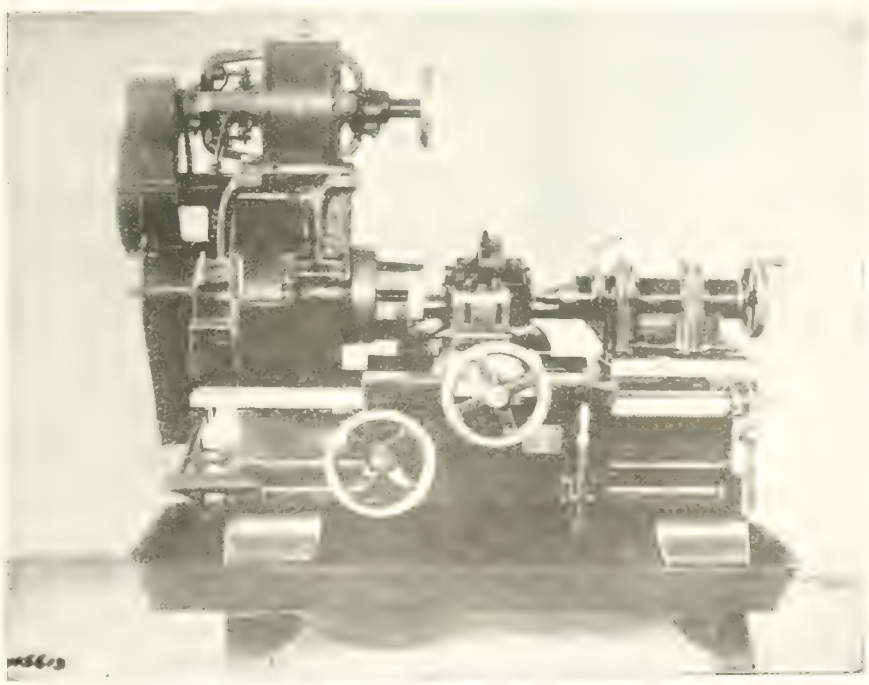
The Association of German Engineers, on the instigation of the Imperial Ministry of Economics, has declared itself ready to form a Research Committee to investigate the technico-economic questions connected with standardization and specialization in German engineering. The Imperial Ministry of Economics will be represented on this Committee, and will contribute to the costs of it. According to the principles agreed upon between the Association, the Ministry, and representatives of the engineering associations, the committee will occupy itself solely with technico-economic questions to the exclusion of all purely economic problems, such as the distribution of quotas, formulation of prices, etc. Its work will be limited to the sifting, collection, and utilization of the available material on behalf of industrial associations whose members in great majority consider standardization and specialization not only possible but also desirable. The execution of improvements proposed by the committee will be left to the associations themselves.—*Nord-[illegible]*.

## NEW ELEMENT NAMED AFTER PRESIDENT

The first element to be discovered in American ore is a rare radio-active substance which was isolated last year by Roy Franklin Heath and has been found in the sand from the Yukon and British Columbia. It was first discovered and isolated from Montana monazite and granite sand.

The new substance is the 86th element to be discovered and was named Wilsonium in honor of the President of the United States. It resembles radium in some respects but is essentially distinct. So far two grams have been recovered, costing more than $25,000; radium costs are more than double.

The principal uses of Wilsonium so far are in medicine and experimental science.



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## PATENT LAW REFORM AN URGENT NECESSITY

"AN Englishman in England cannot get a copy of a Canadian patent without sending to Canada, and even then he gets only a typewritten copy, as patent specifications are not printed there." These are words used by Sir Robert Hadfield, the prominent British manufacturer, in the course of a recent address on Patent Law Reform.

Sir Robert Hadfield is a great enough man to be able to make such a statement without deprecating Canada individually. The breadth of view which he really holds and which he was endeavoring to impart to his hearers was inspired by and limited to the subject of his address.

Uniform patent law throughout the British Empire is a much to be desired state of affairs, and one which would be very influential in its effect upon the future progress of industry, especially such as will be called upon to bear the brunt of future German competition.

The value of judicious patent laws is amply demonstrated by the tremendous inventive activity of the United States, and while the ultimate existence of a patent system of world-wide uniformity is perhaps not practicable nor altogether desirable, the development of a scheme confined to the British Empire and incorporating the most desirable approved features of American practice would work toward the upbuilding of the Empire's components in a most desirable manner.

Mr. Hanbury A. Budden, of Montreal, has addressed the Minister of Agriculture on the subject of Canadian patent specifications and drawings, and his letter, published elsewhere in this issue, sets forth in plain figures a few salient facts concerning the shortcomings of Canadian patent law.

> "A copy of a British patent costs eightpence, while the United States patent office sells copies at five cents apiece.
>
> "A copy of a Canadian patent costs on an average over $2 and can only be obtained after considerable delay."

The shortcomings of Canadian patent law are not widely recognized except among those who have had occasion to touch patent work, but it is in the nature of a national reflection that printed copies should be needed, not only to supply the examiners' files, but also to fulfill an agreement with the United States patent office to exchange copies.

Proper patent laws are as effective in stimulating industrial development as the best industrial commissioner who ever boomed a city. They are more so because their efforts are on behalf of the entire country; they attract foreign capital, they stimulate native genius, they encourage raw material development, and are a continuous and growing advertisement of the country amongst foreign nations.

Intensified competition in the near future will result in a crop of inventions whose benefits will go principally to those nations whose laws encourage their assimilation. At the present day there are more mechanics and manufacturers alive to the value of patents than at any previous period of our history.

Now is the time to bring conditions in line with the most approved ideas. A large percentage of the country's brains keeping the patent future in mind as an active factor in trade competition will do much to insure our successful surmounting of after-war problems. The time to start is now, the harvest is ripening daily.

## REGISTRATION, A DEVELOPMENT OF WAR-TIME CONDITIONS

THE approach of June 22 with the necessity for registration by everyone sixteen years and over brings home to many the seriousness of the times. The taking of a census every ten years is a normal event, but the numbering of a nation as a result of conditions brought about by the war will impress the present occasion as none before.

Industries generally have been in a continued state of apprehension since the demand for men became insistent and the frequent dislocations suffered as a result have borne hardly in several individual cases.

Just how the results of registration will be utilized by the Government have not been made clear. One object, donbtless, is to map out a comprehensive scheme of victualling and fuel supply.

Probabilities of famine on a large scale in Europe during the coming winter are great enough to justify any degree of preparation, and it will be a case, not of how little we can use in Canada, but of how much we can send abroad.

Saturday week's registration is somewhat parallel to the late postal census of manufacturers, and the Government should receive every support in making it as well as in applying the data at a later date to the direction of the country's activities.

## PRACTICAL METHODS OF FUEL CONSERVATION

FACTORY owners in the United States are being actively assisted by the Federal Fuel Administration in the matter of effecting fuel saving.

The question of how much coal a factory can get is not any more important than knowing how to get the most heat from the coal after it is receivel.

The mode of operations is on somewhat similar lines to the "greater production" propaganda recently carried out. A board of competent engineers is recommended to be attached to a conservation committee in each State, while a corps of lecturers will be employed to arouse public interest and disseminate engineering information.

A fifty-minute film of moving pictures will demonstrate good and bad methods of operating steam plants while methods of testing boilers, fuels, etc., will be similarly dealt with.

The prospect of possibly harder times regarding fuel will make all factory owners and power users approve of such missionary work. Despite the prevalence of electric power in most Canadian provinces, the consumption of coal is plenty high enough to make imperative every possible economy of fuel. Where the fuel is used for heating a few degrees less in temperature mean a large difference in the coal consumption.

Many factories are over-heated in winter, necessitating the discard of some clothing by employees. Such conditions are criminal and their continued existence is a betrayal of the country's welfare. Such propaganda as outlined above should bring all parties to a sterner realization of conditions as they will actually be in the coming winter.

Preparedness and Efficiency are indeed the watchwords of the hour.

# HELPING WOUNDED MEN TO EARN THEIR LIVING

**Russell Motor Company, in Co-operation With Government, Have Vocational School in Operation at Present**

MUCH has been said and much has been written about the problem of dealing with the men returning from the front—men who will not be able, by reason of their wounds, to return to their former walks in life. Any person who has had occasion to see the number of returned men already in the country, and who will take the time to think of the numbers who will be coming after them, can easily see that there is a big problem here. The big thing is to avoid training these men in occupations that afford only fitful occupation, or in taking up their time in a line of vocational work for which they have no liking or aptitude.

The Russell Motor Co., acting in conjunction with the Military Hospitals Commission, is doing a very creditable piece of vocational training at one of their branches on Adelaide St. west, where at present some twenty-five machines, commonly used in the ordinary run of shops, are in operation, the idea being to teach returned men under actual working conditions.

### Making Munitions Parts

Arthur Kirky, of the Russell Motor Co., is the instructor in charge of the establishment. Mr. Kirky has had a wide experience as an expert mechanic, and the men coming under his supervision are fortunate. The production of the shop is not the main consideration here, the basic idea being the training of the men, although the work turned out is accurate enough to be used in the filling of munition contracts. Hand screw machines, engine lathes and universal grinders are in operation, and it is on these at present that the efforts of the men are chiefly directed. They are not simply taught the operation of the machine, but the making and setting of their own tools, and the general upkeep of the machine.

### Many Trades There

None of the men at the Russell vocational shop have had previous machine shop training. They have come from other walks in life, and from the nature of their injuries find that they cannot return to them. For instance, among the number at present in the shop are two roofers, plumbers, bricklayer, laborers, etc. The men have all been overseas and through the hospitals. They are now granted vocational training by the government, through the Military Hospitals Commission, as the first step toward fitting them for a return to private life, so that they will not have to depend on any person for charity. Just now the men are turning out base plates for six-inch shells and nose plugs for shrapnel. The pay given to the men is arranged in the first place according to the schedule of the government, regulated by the family, etc., depending on the man. The Russell Co. maintain the shop, pay for power, light and instruction, and when the men have attained a reasonable degree of efficiency in their work they are paid a bonus by the company.

### How it Works Out

It is perhaps too soon to speak definitely of the degree of success that is likely to attend the efforts of the company and the hospital commission. Already three or four men have left the establishment, and two of them are doing general machine shop work now at the Russell plant. The course granted in the first place is from four to six months, and if a man shows any marked aptitude for the work, the instructor applies for an extension to his time, and it is almost invariably granted. In this case he puts the man on to more particular work, and teaches him the rudiments of the tool-making business.

### Using One Arm

Difficulty has been found in securing employment for men with only one arm. In the past the tendency has been to look for clerical or similar work for such a person, but there are a large number of them not fitted for these positions. In one department of the Russell plant an instructor is teaching the one-armed men the making and trueing of bicycle wheels, and the way these men are getting along with this class of work is surprising. Of course once they have mastered the job they do not need to depend on the making of bicycle wheels entirely, as they can turn their hand to making wheels for airplanes and automobiles, in both of which the same principles are applied. The rims, spokes and hubs are applied, and it is up to the students, under the instructor, to assemble and adjust them all properly. One of the returned men was making particularly good use of a mechanical arm, which was doing service for the one he had lost at the front. Of course the movements he was able to make with it were crude as compared to the other member, but he was using it, and with use he will become more expert in its manipulation. Already some of the men who have learned the wheel building are holding positions in the city, and although their speed is less than that of a man with two arms, very favorable reports are being returned to the instructor from the places where they are now employed.

## Recognizing Canada's Position

THE feeling of some of the large American companies toward Canada is well conveyed in actions that come to our notice from time to time. Just last week the Vanadium-Alloys Steel Co. forwarded to the manager of CANADIAN MACHINERY a cheque for $2,500, with the request that it be placed to the credit of the Canadian Red Cross or Patriotic Association. CANADIAN MACHINERY has had the pleasure of forwarding the cheque to the Red Cross. This is not the first time that the Vanadium-Alloys Steel Co. have shown their sympathetic interest in Canada's war efforts, other cheques for similar purposes having been forwarded to this paper and turned over to the proper authorities.

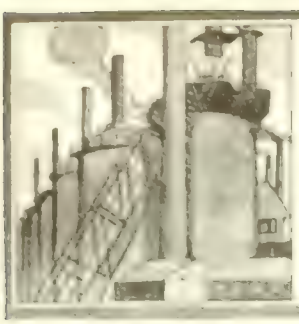
Although the connection of the Vanadium-Alloys Steel Co. with Canada is largely a commercial one through their distribution here of their familiar "Red Cut" high speed steel, there is a deeper feeling than one of business dealings and transactions. This Pittsburgh firm realize and say so openly that Canada was fighting the United States' battle for two years or more before the Republic entered the struggle. It is in plain recognition of this fact that the firm wishes to make a contribution that will strengthen the hands and more freely equip those whose errand of mercy calls them to minister to the hurt and wounded men of the Canadian armies.

The Vanadium-Alloys Steel Co. do not desire to have any publicity attached to the matter. That was their expressed wish, but CANADIAN MACHINERY, realizing the sincerity of their motives, and knowing that they would not be misconstrued by the Canadian public, has taken the privilege of giving this measure of publicity and appreciation to the gift.

The idea that there was always big money made on shell contracts probably got its start from the fact that the men who lost heavily did not care to say very much about it.

* * *

There's not much use trying to get anything in the line of steel without an order, a permit, a license and a certificate. If you go into the market without the full regalia you get poor treatment and poorer service. And the end is not yet by any means. Probably in a month or so from now it will be necessary for the domesticated husband who wants to buy a package of tacks to lay the carpet on the front stairs to show that this is going to aid in the winning of the war.



# MARKET DEVELOPMENTS

# U.S. Will Not Take Over The Steel Plants

## Apparently Satisfied With the Output From the Mills—Canadian Business For War Purposes Will be Protected Under the Latest Ruling—Sheet Prices Tighten This Week as Stock Runs Low

THE hope that has been held out in some quarters that after a month or so of intensive effort on war work at the United States rolling mills there would be steel for commercial purposes is simply vanishing into thin air. Every day sees the war appetite grow, and as the war demand has the undisputed preference, the prospects for commercial interests getting a chance are very poor.

Canadian orders being placed in United States now are feeling the application of the embargo. More than that items that are not on the embargo are being made to feel the ruling, the evident intention being to keep the spirit as well as the letter of the regulations.

Production of basic materials at United States points is proceeding satisfactorily. Of course there are local features that work against the maximum, but in the aggregate it can be said that right now the plants are consistent performers and are registering a full 95 per cent. of their possible capacity. More can not be expected, especially with the warmer weather coming on.

Prices tightened up a little more in the steel trade this week, sheets being the item to feel the tendency. Billets are not being supplied freely to the sheet rollers now, as the great drive is from the open hearth direct to the plate mills. In fact the rolling of ship plate is the great national business of commercial United States at the present moment. The United States Government is apparently satisfied with the manner in which the steel mills are acting, as it is announced now that there will be no further effort to take over the mills, as long as the entire output is handed to them for disposal. Canadian business for war orders will still be protected, according to the last announcements handed out from the conferences which have just concluded.

Makers of machine tools in Canada are finding it difficult to keep up with their orders. They have promised the delivery of equipment for new munitions shops on certain dates, basing their promises on the calculated capacity of the shops to which they had farmed out their work. In many cases there is a decided discrepancy between promised dates and the dates on which actual delivery will be made. There are bound to be delays in consequence in the delivery of shells on new orders.

The supply departments are busy. They have all the business they can handle. Deliveries are coming along in good shape, although some lines on which there is a continued run are rather short in stock.

## MONTREAL DEALERS FINDING IT A HARD MATTER TO FILL THE ORDERS

Special to CANADIAN MACHINERY.

MONTREAL, Que., June 11.—Industrial activity continues at a steady pace with developments enlarging in connection with shell contracts. Good progress is being made on several new shell plants and others are increasing their facilities for greater production relative to American contracts. Considerable difficulty has been experienced and is becoming more emphasized in obtaining machine tools as dealers report a marked scarcity of equipment suitable for shell making. Several local firms are actively engaged in constructing special tools for various sizes of American shells. The steel situation is still acute and promises to be more so in the near future. Metals are much firmer as a result of the better demand. Business generally is very steady with the greater volume confined to essential war requirements.

### Steel

Little relief has been given to the Canadian steel situation by the recent negotiations between the American producers and the War Industries Board. It is assumed that the restrictions upon the consumption of iron and steel will be further regulated, with the result that domestic requirements will only receive consideration after all essential demands are taken care of.

Ship construction is absorbing practically every ton of heavy plates, and although Canada has arranged for present and future requirements there are frequently times when delays are occasioned through the non-delivery of material. Some shell makers are also complaining of lack of steel which is being obtained from the States for American shell contracts. In the case of recent orders, however, it will be a few months before operations will develop to the point of production and manufacturers are hopeful of an improved situation.

One of the points that is not clearly defined in relation to essential needs is that of materials necessary to maintain plant equipment in the proper state of efficiency. Dealers here anticipate some anxiety over the higher cost in transportation on United States roads effective next month, and this circumstance may create a situation necessitating stronger Canadian prices.

### Metals

The situation is generally resuming a firmer tendency and the market is more stable since the announcement from Washington that copper prices would continue unchanged. This has helped to steady the other metals and the market has taken on a less nervous tone. Copper is unchanged on steady demand for government requirements. Tin is declining abroad but is stronger here. Spelter and lead are in better demand, and together with antimony are advancing.

**Copper.**—Opinion is becoming more general that the reaffirmed price of 23½ cents on copper is one that will tend to

stabilize this market to such an extent that at the expiration of the present term a further renewal will be effected. Little but government business is being accepted. Local dealers continue to ask 29 and 30 cents on a steady market.

**Tin.**—The Canadian situation is still acute but the easier market abroad has given a more optimistic tone and dealers are hopeful of relief in the early future, reporting better supplies in sight. Absence of immediate stocks however has forced the price up and dealers here are quoting $1.35 for spot metal.

### Machine Tools and Supplies

Machine tool activity continues to develop in considerable volume as a result of the steady placing of shell orders with Canadian firms, the supply of the necessary equipment is inadequate to the manufacturers' requirements, and dealers are experiencing considerable difficulty in acquiring the tools for their customers. As one dealer says, "we will soon have to advertise for machinery instead of machinery for sale." Steady progress is being made by those firms securing American shell contracts and machinery is being secured as rapidly as possible; several months must necessarily elapse, however, before production can be realized. Delivery of material and tools is frequently so uncertain that no definite prediction is possible as to actual time of starting on new contracts. No dealer and few producers will guarantee a specified date for receipt of materials, whether machine tools or supplies.

### Scrap

Activity in old materials is not pronounced and the interest of the trade does not appear to be of a character where developments may be anticipated. Dealers are not anxious to stock material that cannot be disposed of at an early date. Local transfers are good but heavy buying is receiving little attention. Dealers report a quiet week with business steady at unchanged prices. Old materials with lead as a basic metal are a little stronger.

## TONNAGE GROWING IN BRITISH YARDS

**Increase Noted of 85,741 Tons Over the Output Registered in April**

LONDON.—Merchant tonnage completed in United Kingdom yards and entered for service during May, 1918, was 197,274 gross tons, the highest figure for any month during the past year.

Official figures published to-day show that the completions for May marked an increase in tonnage over April, 1918, of 85,741 tons.

The next highest figures for any month in the past year were 161,674 gross tons in March, 1918.

The total completions for the twelve months ending May 31, 1918, were 1,406,838 gross tons. The corresponding figures for the year ending April 30th, 1918, were 1,270,337.

Commenting upon these figures, the controller-general of merchant shipbuilding says the satisfactory output for May reflects great credit on the whole industry, particularly on the firms engaged in fitting out vessels. The average time for fitting out has been reduced considerably. In one instance during May, a 5,000-ton steamer was completed for service within nineteen days of its launching.

## POINTS IN WEEK'S MARKETING NOTES

**U. S. iron and steel industry is running at only about 5 per cent. below the best it could do if all conditions were favorable.**

**Transportation facilities from Pittsburg are now referred to as being "adequate."**

**U. S. Government will not take over the steel mills of the republic, being satisfied to take the entire output.**

**New regulations will not interfere with the shipment of steel supplies to Canada for war purposes.**

**The hope that there would soon be a supply of steel for commercial purposes is vanishing into thin air as the war orders increase.**

**Canadian users cannot get coal orders filled in U. S. beyond former demands.**

**Machine tool dealers are behind in deliveries in many cases to firms having war business. They find trouble securing machine shop capacity to handle their orders.**

**The scrap metal market is just now at a standstill. Little trade is moving, as the material offering is not of a class called for in war work.**

**Orders for materials against which there has been no embargo are having to furnish minute details now before they are considered by the U. S. firms.**

**There has been an advance in the prices of sheets this week. Stocks are low and the demand for them is very keen.**

**Chain prices are up. Canadian mills are booked past capacity, and American mills are not getting any too great a supply of bars from the furnaces.**

## KEEPING THE SPIRIT OF EMBARGO LISTS

**Articles Not Listed Are Subjected to the Same Scrutiny as Others**

TORONTO.—Every day now sees the tightening up of business against the non-essential lines. There has been quite a time determining what is really means by "non-essential" lines. No man who has an organization around him and a factory behind him wants to come along and admit right off that his line is a non-essential. A customer came into a Toronto establishment this morning to fill out blanks for an order he had telephoned in previously. He was told not to lose any time in getting the forms returned, as every day means that it was that much harder to get his business through the War Board at Ottawa. Shipping has preference absolutely just now, and the turning of ingot production over almost entirely to the plate rollers is having a very marked effect in numerous ways.

Sheets show an advance again this week, and it may be that still higher figures will obtain for these.

Dealers in scrap metals are not doing a very great volume of business. The embargo against shipping to U. S. points still remains in force, and dealers claim they could do good business in lines that are not being seriously called for here at the present moment.

Machine tool dealers who have not the machine shop capacity to handle their own work are having a hard time securing the completion of war purpose machine tools. They have to "farm out" their stuff wherever the capacity can be found to handle it, and the result is that in not a few cases the dealers are behind on their promised deliveries to the firms who have taken on war business. These firms, in order, are behind in starting or the making of deliveries.

The demand is good for supplies of all kinds. Prices remain firm, and carbon and high steel goods are at the levels of last week.

### The War Grip

One feature has stood out in the steel market for some weeks now, and that was the manner in which the appetite of the war industries was increasing. The war business has elbowed its way up to the steel table and has practically crowded out the rest of the group. And chiefest in the war group is shipbuilding. That has the preference over all else, apparently, in the placing of orders. Munitions is also a favored line, and goods required for the production of electrical energy are also looked upon with favor. Outside of that it is a hard matter to classify. Only a week or so past a Canadian railroad placed an order for goods in the United States market. The order was of a nature that it could classify for the upkeep of the transportation system. But there has been all sorts of delay in the matter, and it is doubtful if it will be looked after for some time. The tendency in this narrowing of business is clearly apparent every day now. Dealers locally have been quite

[illegible] orders passed [illegible] Dept. This went out as far as [illegible] anything that is [illegible] war, and in very few instances do they have business returned to them that has been forwarded to headquarters.

[illegible] has been a rule that the embargo list was the guide by which to work, but the manner in which things are shaping now makes it certain that [illegible] the embargo list are being subjected to the same treatment. One Toronto firm placed an order in Boston for material against which there was no embargo, and they promptly received a request from the Boston firm asking for a Government order, and a description of the exact purpose to which the material was to be put.

### Prices Are Firmer

Prices of sheets are up slightly this week. There is a rush of orders and the stock on hand is small. When this condition comes to pass it is an easy guess that higher values are not far off. There is also the added fact that ingot production is going almost exclusively to the plate rollers and in consequence the sheet production is going to be smaller.

Higher prices are also given on chains, for either electric or fire weld. It is a hard matter to get shipments of American chain in here at present, as the United States Government has complete control of the plants, and the supply of bars going for the manufacture of chains is very limited. The Canadian [illegible] are also booked to and beyond capacity, so there does not appear to be very much relief in sight for some time to come.

### Scrap Market Quiet

There is very little business moving in the old metal market this week. There is a feeling almost of stagnation in the entire business. Supplies are not sought after by the buyers, as there are few buyers who want the class of material coming in. The American embargo is still on practically against all lines, although there are cases where shipments can be released under permit. Prices are not showing any changes, and the whole situation is dull at present.

### Delays in Delivery

Dealers in machine tools are in danger in some cases of being well behind in delivery dates that have been mentioned to firms putting in war plants. They have based their dates on promises made to them by machine shops scattered all over the country, and they are finding out now that the work is not going on at the rate they had expected, and as a result the whole delivery estimate is out of kilter. The dealer is the man in this case who has to stand the process of making continual explanations to his customer, although he can in turn hand it along to the man who is holding his sub-contract.

The supply business remains brisk locally. Houses have all the business they can conveniently handle.

# URGING FULL CO-OPERATION IN GIVING WAR ORDERS PREFERENCE

CANADIAN dealers who have reason to pass on business to firms in the U. S. are receiving daily circulars urging that there should be the fullest co-operation with the Government in its effort to turn the entire steel output of the country over to the War Board. The following is a sample, being sent by Joseph T. Ryerson & Son of Chicago:

Important Letter Refer to Buyer.

To All Customers:

Supplementing our general letter of December 8, 1917, there have been certain developments in the steel situation, during the past few days, which would be of vital importance to you. The shortage of steel in all lines has become much more acute than generally anticipated, due to the constantly increasing demands of the Government.

A representative of the Government has most emphatically stated to the steel manufacturers that the entire steel output of this country must from now on be devoted to the needs of the United States Government and its Allies in the prosecution of the war. This means that all business not intended for direct or indirect Government work must be subordinated to Government orders. We have joined with the steel industries in an agreement to carry out this policy as long as it may be necessary to assist in furthering the Government's war programme.

We will do our utmost to handle the legitimate requirements of our customers, as in the past. Orders for material required for war work and public necessities will have prompt and immediate consideration, but all others must be subordinated to them. In order to avoid delay we ask that you send with all orders and inquiries all the information possible as to ultimate use of the material. If needed for Government use, please advise Government order number and state, also, under which of the following classifications the work comes: Ships, Aircraft, Munitions, Military and Naval Supplies and Operations. If material is not for Government use, give us accurate and detailed information as to its ultimate use, as there are many most essential industries, necessary to the welfare of the country to-day, whose requirements should be given every consideration after the needs of the Government.

We earnestly ask your full co-operation in this matter, as it is an obligation resting on all of us to join in any movement which may help in winning the war. Yours very truly,

JOSEPH T. RYERSON & SON.

# U.S. WILL NOT TAKE OVER STEEL PLANTS

### But Entire Output Must Go Directly for the War Work of Government

Special to CANADIAN MACHINERY.

WASHINGTON, June 11.—Absolute Government control of the steel output of the United States has been accomplished this week through a voluntary agreement reached between the American Steel and Iron Institute and Bernard Baruch, chairman of the War Industries Board. The agreement is understood to have been an alternative to the taking over of the steel plants of the nation by the Government. Under the plan now arranged the steel plants will still remain private plants, privately operated, but the entire output will be at the direction of the Government.

Under the formal agreement drawn up all steel products must be devoted to those industries for which priority certificates have been issued. The War Industries Board will issue priority certificates with steel orders placed with the plants and each plant will be required to turn its entire production over to filling those orders accompanied with priority certificates. With these priority certificates filled the agreement then calls upon the steel manufacturer to devote his efforts to what is known as "preference" work. This includes all businesses which may be classed as war work and a list has been issued setting forth the relative importance of each industry to the conduct of the war. With "preference" orders filled the steel plants will then devote the remainder of their production to business which may be classified as non-essential. All non-essential shipments of steel must be subject to the approval of the War Industries Board and the Steel Director, however. The purpose of the agreement, as stated by Mr. Baruch, is to insure the steel needs of the United States and its Allies and then to equalize the distribution of the remainder of the steel product among those businesses which are not directly connected with the winning of the war.

### Regarding Canada

Shipment of steel to Canada will not be interfered with except in those cases where the steel is being used for non-essential purposes. Canadian manufacturers will receive the same consideration as manufacturers in the United States. The Canadian War Mission in the United States will work in conjunction with the War Industries Board and will advise on the issuing of priority certificates to those Canadian manufacturers doing war work and will also advise the War Industries Board as to the shipment of steel to preference industries and non-essentials.

For some weeks it has been planned to gain more complete control of the steel industry for the Government. It has been known that the proposition of the Government taking over the steel industry has been seriously considered by Chairman Baruch of the War Industries

Board. The present proposition, however, is understood to be that of the steel plant owners who desire to keep their plants under private control.

### Little Left Over

In conjunction with the issuance of the statement as to the agreement reached between the War Industries Board and the American Steel and Iron Institute there has arisen some difference of opinion among experts as to the available supply. The official view is, however, that the supply of steel is such that the demands of the United States and the Allies will not leave a very large supply of steel for use in non-essential industries.

In order that there may be a checking up each manufacturer of steel will be required to file a weekly statement of his shipments with the War Industries Board.

### Coal Orders

The coal problem is again cropping out in the United States. The past week has been designated as "coal week" and efforts have been made to secure orders for all coal necessary during the coming winter. The success of the week is still doubtful, however. The Fuel Administration during the week has issued a statement as to the estimated demands for bituminous coal during the coming season and this estimate shows that there will be an increased demand for 79,866,000 tons. This will mean that there must be an increase in production of 14.4 per cent. Thus far this season the increase in production has not consistently approached this figure. The Fuel Administration has issued orders for the restriction and conservation of bituminous coal and it has decreed that there shall be no increased exports of bituminous coal. This will mean that Canadian manufacturers who have received their bituminous coal from the United States will be forced to keep to the same amount which they have used in previous years. A general reduction of bituminous coal rates to North-west and Great Lakes points has been ordered by the Fuel Administration, however, which will work to the advantage of Canadian purchasers of American coal. This reduction of price is estimated to offset the increased freight rates and to maintain the stable price on bituminous coal. Because of the possibility of a shortage in anthracite coal, Canadian users have been ordered to cut their demands. The shipments of anthracite coal to Canada last year have been ordered reduced 6.59 per cent. this year.

The month of May was the record month for shipbuilding in the United States. During that month 44 steel and wooden vessels were delivered to the United States Shipping Board. This meant an aggregate tonnage of 263,571 tons. The best previous record was for the month of March of the present year, when 21 steel and wooden vessels, with an aggregate tonnage of 172,611, were delivered. The Shipping Board has announced that more than a million tons of steel vessels have now been delivered that body. So well pleased with the production of ships now is Charles Schwab, director of shipbuilding, that he has proposed a competition in ship production between the Hog Island yard at Philadelphia and any three of the English yards.

The Bureau of Mines has just issued a statement showing that the production of smelter copper in the United States during the past year has decreased 2.18 per cent.

## FIGURES THAT MAKE THE READERS DIZZY

### Enormous Amounts Still Being Spent on War Equipment by U. S. Government

Special to CANADIAN MACHINERY.

NEW YORK, June 11.—All of the steel produced in the United States is now under complete control of the United States Government, in accordance with an agreement entered into between a committee of the Iron and Steel Institute and a committee representing the War Industries Board. Although the Government does not assume direct control of the manufacturing plants, it does direct the distribution of all products, and even has a voice in the management of production, as the Director of Steel Supply, in conjunction with a committee of the Iron & Steel Institute, is now making a study of war requirements with a view to stimulating production to the utmost. If any surplus of rolled steel exists after full requirements of the United States and its Allies have been met it will be distributed in accordance with a preferential list of industries engaged indirectly in the manufacture of war munitions, but no shipments can be made until approved in writing by the Director of Steel Supply.

Expansion of shipbuilding facilities continues to make a heavy draft upon the resources of all manufacturers of machinery. A new plant is to be built adjoining the present yards of the New York Shipbuilding Corporation, to cost $10,000,000. The funds will be furnished by the United States Government. McClintic Marshall Construction Co. will furnish the 20,000 tons of fabricated steel required for the various buildings. Several million dollars will be spent for cranes, conveying machinery and shop equipment.

Other shipbuilders are also in the market for machine tools. The Carolina Shipbuilding Co. has closed several important contracts for its Wilmington, N. Carolina, yards, but has not yet let the contract for the fabrication of 30,000 tons of steel plates and shapes for the twelve boats it will build for the Emergency Fleet Corporation. The officers of this company will be transferred from New York to Wilmington July 1st. The Newport News Shipbuilding & Drydock Co., in addition to improvements to its shipbuilding plant at Newport News, Va., will construct a plant at Richmond, Va., for the manufacture of marine boilers, turbines and auxiliary ship propelling equipment. A large list of cranes and tools for equipment of these shops has already been sent out. The General Electric Co., as well as the Westinghouse Electric & Manufacturing Co., is preparing to increase the output of marine turbines, for which additional machinery is needed. The Lester, Pa., plant of the Westinghouse Co. will be increased 40 per cent. The American Steel & Forge Corporation, Philadelphia, is expected to build a new plant for making crank shafts and other large ship forgings.

Several large shipbuilders on the Pacific coast are in the market for machinery and tools of various kinds, which will cost approximately $5,000,000. The Skinner & Eddy Corporation, Seattle, Wash., is building a dry dock and ship repair plant, to cost about $2,000,000. The Hewitt Drydock & Shipbuilding Co., Tacoma, Wash., will construct 20 shipways for the building of steel ships, and the North-west Steel Co., Portland, Ore., is expanding its plant on the Willamette River, where four additional ways will be built.

Several large contracts for guns and shells recently placed by the Ordnance Bureau of the War Department are revealed in the demand for machine tools. The New Home Sewing Machine Co. has a contract for small shells, and a manufacturer in New York State, who has received an order for 6-inch guns and 6-inch shells, will build a new plant requiring large tools. The Peninsular Shell Co., Saginaw, Mich., has been given an order for 1,000,000 trench mortar shells. American mills have received heavy specifications for shell steel to be shipped to Canada. A gunmaker on the lakes is calling for 30,000 tons of steel ingots, and a Cleveland manufacturer of munitions is seeking 10,500 tons of electric steel blooms.

## MAY REOPEN THE ROSS RIFLE PLANT

### Negotiations Are On Now Looking to That End—Splendid Works There

Special to CANADIAN MACHINERY

MONTREAL, June 11.—It is reported that negotiations are under way for the reopening of the factory of the Ross Rifle Co., at Quebec. Interested parties are in touch with the Canadian government for the utilization of this plant.

On a recent visit to the City of Quebec the Minister of Marine inspected the works and was surprised that such a splendid plant with its modern equipment should be practically idle at this time, and he intimated that the near future would see the place in active operation again.

**May Raise Rates.** The Railway Board has granted the application of the Brantford & Hamilton Electric Railway Company [illegible] the same increases in freight rates as have been authorized in the case of steam railways [illegible] the railway had no agreements with municipalities so holding down the limits of freight rates as in any way to conflict with the application.

# WITHIN FIVE PER CENT. OF CAPACITY

## Good Showing of American Factories is Still Being Well Maintained

Special to CANADIAN MACHINERY

PITTSBURGH, Pa., June 11.—A per[illegible] for the distribution of [illegible] was [illegible] to [illegible] the [illegible] of the War Industries Board of June 6. The arrangement differs in form, but not materially [illegible] that has been in vogue since the producers took their pledge of 100 per cent. efficiency for war work as a result of the meeting [illegible] Director of Steel Supplies and representatives of the industry.

There are three classes of pig iron and steel products. Material for war, material for more essential industries, and material for less essential industries. The last named term is a euphemism, used in place of "nonessential," because it is admitted that in the last analysis there is no material that would not in some slight degree help in winning the war, at least according to the arguments of those who desire the material.

The first class has been regulated for months past by the issuance of priority certificates by the priorities division of the War Industries Board. The second class has all along been given more or less special recognition by the manufacturers, of their own volition, and lately some industries using material of this class have been given special recognition by the mills as a result of the direct instructions by the War Industries Board.

The decision reached June 6 followed the temporary arrangement that existed under the 100 per cent. pledge (which of course remains in effect as to its general tenor) whereby the producers were distributing material to the more essential industries according to their own judgment, but it greatly amplifies the list of more essential industries. The decision also settles the somewhat vexed question as to the machinery by which material should be distributed to the more essential industries. There was a possibility at one time that the War Industries Board would distribute this material by a system of priority certificates. These, as in the case of war material, would refer to specific lots of material. If it did this it would be regulating the distribution of all pig iron and steel products, ton by ton, except such material as might be left over and could be shipped to anyone irrespective of the use to which it would be put. This possibility is now removed.

The arrangement now adopted is this, that all war material is to be controlled by priority certificates as formerly, and that material for the more essential industries is to be distributed by the producers themselves, but in accordance with precise regulations of the Board, decreeing the "purposes" which are to be given preferential treatment. If there is any material left over, it can go where the producers prefer to ship it.

While the resolution, which is quite lengthy, is entirely explicit in general form, it leaves one thing with respect to which there may be much divergence in practice from time to time. That one point is this, that "priority certificates" are dismissed with a few words, while the "schedule of purposes entitled to preference treatment" is quite lengthy. Thus there is no pronouncement as to the items for which priority certificates will be issued. Railroad requirements are named in the "schedule of purposes" and yet priority certificates can of course be issued for specific lots of material—for instance, for a given lot of locomotive cars, or a given lot of rails. In general, however, the priority certificates cover war material ordered directly or indirectly by the United States Government for itself and its Allies.

The "schedule of purposes," which take preference after priority certificates are filled, includes shipbuilding, aircraft, fuel, food and collateral industries, clothing, transportation and public utilities.

### Exports

It is, perhaps, not altogether clear whether the "schedule of purposes" contemplates the supplying of material for export as well as for use in the United States. This will probably be referred to in more detail in subsequent regulations. Steel for Canadian shell factories of course, would be the subject of a priority certificate. Steel for an agricultural implement is included in the "schedule of purposes," and as the agricultural implement makers have been put under license, the specific regulations laid down for them will doubtless cover the matter of what products they may export, and in the case of that industry the steel mills may have nothing to decide. Containers of food are included in the schedule, but the exportation of tin plate for making food containers may be controlled simply as formerly by export permits issued by the War Trade Board.

### How Industries Will Fare

In the past few weeks there has been a distribution of pig iron and steel products much the same as that now provided by the new regulations, which are, however, more explicit and comprehensive. There has been opportunity therefore to observe in a measure how the system will work. Many consumers are of course incommoded because they have been denied steel entirely, but the total tonnage involved is not large by any means. If the present system had been imposed in 1913, or even in 1916, it would have created the most profound changes, but since the United States entered the war there has been a great diminution in the steel used for certain purposes, as, for instance, in building, while the great majority of manufacturing consumers have changed their products so that they are making war material instead of "less essential" things, and thus the dislocation is not so great after all. When building disappears and the railroads are given preferential treatment, it can be seen that would-be buyers who are denied material do not represent any very large percentage of the total output.

### Production

Production of pig iron in May was at the rate of about 40,900,000 gross tons a year, or somewhat less than was estimated in many quarters, estimates of the average rate running up to 42,000,000 tons. However, the May rate was the greatest on record, barring October, 1916. On the basis of pig iron, it may be estimated that the output of steel ingots was at the rate of at least 43,000,000 tons a year. Under the new order of things, brought about by the 100 per cent. pledge for war efficiency, the production of ingots is stimulated while the production of finished rolled products is curtailed, relative to ingots. This comes about by the mills melting up as scrap such material as shell discard steel and sheet bar crop ends, whereby this material is weighed over again in ingot form whereas under former practice the material was rolled into merchantable form, shell discard steel making light rails, concrete reinforcing bars, bedstead angles, etc., while sheet bar crops were piled and rolled into sheets suitable for certain purposes, not particularly exacting.

Manufacturing conditions in the iron and steel industry as a whole are fairly satisfactory, and somewhat better than was expected last winter could be the case at this time. Transportation facilities are practically adequate. Coke supplies to blast furnaces are a trifle scant, but the large amount of new by-product coking capacity about to come in should entirely right that situation. Labor supply is not altogether adequate and is probably restricting production by a very few per cent. The iron and steel industry, however, is running at only about 5 per cent. below the best it could do were all conditions altogether favorable.

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**Anodes are Scarce.**—Trades using Cobalt anodes are finding them a little scarce at present, and the price on a higher level than for some time past. Cobalt metal is quoted now at around $2.50 to $3.50 per pound. This means, of course, that on fairly large orders manufacturers would be prepared to quote a price of $2.50 ,while a deall where a smaller amount was involved would be based on the $3.50 scale. Cobalt anodes are now worth from 25c to 50c per pound in excess of these prices, according to the shape in which they may be required by the customer. The difference between the cost of the metal and the cost of the anodes would be absorbed in the process of manufacture.

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PLATINUM deposits have been discovered in Germany, according to a report from Hamburg which states that numerous veins of blue quartzite containing platinum in quantities to repay exploitation have been located in a stone quarry at Ober-Rosbach (Taunus).

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago | 37 50 |
| Standard low phos., Philadelphia | ..... |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 32 00 |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | ..... | ..... |
| Victoria | 50 00 | |

## FINISHED IRON AND STEEL

| Per lb. to Large Buyers. | Cents |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 5 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 5 75 |
| Chequered floor plate, 3-16 in. | 12 20 |
| Chequered floor plate, ¼ in. | 12 00 |
| Staybolt iron | 9 00 |
| Bessemer rails, heavy, at mill | .... |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | *3 50 |

F.O.B., Toronto Warehouse

| | |
|---|---|
| Steel bars | 5 50 |
| Small shapes | 5 75 |

F.O.B. Chicago Warehouse

| | |
|---|---|
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

## FREIGHT RATES

Pittsburgh to Following Points

| | Per 100 lbs. C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 38.1 | 50.5 |
| Halifax | 39.1 | 51.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

## METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $30 00 | $28 50 |
| Electro copper | 30 00 | 28 50 |
| Castings, copper | 29 00 | 28 00 |
| Tin | 130 00 | 125 00 |
| Spelter | 10 00 | 9 50 |
| Lead | 9 50 | 9 00 |
| Antimony | 15 00 | 16 00 |
| Aluminum | 50 00 | 50 00 |

Prices per 100 lbs.

## PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¼ to ½ | $10 00 | $10 00 |
| Heads | 10 00 | 10 25 |
| Tank plates, 3-16 in. | 10 50 | 10 10 |

## WROUGHT PIPE

Effective Feb. 5, 1918.

| | Base | Guaranteed |
|---|---|---|
| **Standard Buttweld** | Per 100 feet | |
| ⅛ in. | $ 6 00 | $ 8 00 |
| ¼ in. | 5 16 | 7 29 |
| ⅜ in. | 5 16 | 7 29 |
| ½ in. | 6 55 | 8 12 |
| ¾ in. | 8 28 | 10 41 |
| 1 in. | 12 24 | 15 39 |
| 1¼ in. | 16 56 | 20 82 |
| 1½ in. | 19 80 | 24 89 |
| 2 in. | 26 64 | 33 49 |
| 2½ in. | 42 72 | 53 53 |
| 3 in. | 55 85 | 70 00 |
| 3½ in. | 70 84 | 87 86 |
| 4 in. | 83 93 | 104 10 |
| **Standard Lapweld** | | |
| 2 in. | $ 29 60 | $ 36 08 |
| 2½ in. | 44 46 | 54 70 |
| 3 in. | 58 14 | 71 53 |
| 3½ in. | 72 68 | 90 62 |
| 4 in. | 86 11 | 107 37 |
| 4½ in. | 97 79 | 122 56 |
| 5 in. | 114 00 | 142 82 |
| 6 in. | 147 80 | 185 28 |
| 7 in. | 192 80 | 241 57 |
| 8 L in. | 202 50 | 253 75 |
| 8 in. | 233 30 | 292 32 |
| 9 in. | 279 50 | 350 18 |
| 10 L in. | 259 20 | 324 80 |
| 10 in. | 333 70 | 418 18 |

Prices—Ontario, Quebec and Maritime Provinces.

## WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

## OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 22 50 |
| Copper, heavy | 22 50 | 22 50 |
| Copper wire | 22 50 | 22 50 |
| No. 1 machine composition | 22 00 | 21 50 |
| New brass cuttings | 16 00 | 14 00 |
| Red brass turnings | 18 00 | 17 00 |
| Yellow brass turnings | 12 50 | 12 50 |
| Light brass | 10 00 | 9 50 |
| Medium brass | 12 00 | 12 00 |
| Heavy brass | 15 00 | 14 00 |
| Heavy melting steel | 24 00 | 21 00 |
| Steel turnings | 12 00 | 12 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 27 00 | 20 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 23 00 |
| No. 1 machine cast iron | 34 00 | 30 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 22 00 | 17 00 |
| Car wheels, iron | 26 00 | 30 00 |
| Steel axles | 38 00 | 35 00 |
| Mach. shop turn'gs | 9 00 | 8 50 |
| Cast borings | 12 00 | 12 00 |
| Stove plate | 19 00 | 19 00 |
| Scrap zinc | 6 00 | 5 50 |
| Heavy lead | 7 00 | 7 00 |
| Tea lead | 5 00 | 5 75 |
| Aluminum | 21 00 | 21 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent |
|---|---|
| Carriage bolts, ⅜" and less | 10 |
| Carriage bolts, 7-16 and up | net |
| Coach and lag screws | 25 |
| Stove bolts | 55 |
| Plate washers | List plus 20 |
| Elevator bolts | 5 |
| Machine bolts, 7-16 and over | net |
| Machine bolts, ⅜ and less | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | 10 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | add 25 |
| Nuts, square blank | add $1 50 |
| Nuts, square, tapped | add 1 75 |
| Nuts, hex., blank | add 1 75 |
| Nuts, hex., tapped | add 2 00 |
| Copper rivets and burrs, list plus | 30 |
| Burrs only, list plus | 50 |
| Iron rivets and burrs | 25 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 37½ |
| Wood screws, O. & R., brass | 32½ |
| Wood screws, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

## MILLED PRODUCTS

| | Per Cent |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil. Head Cap Screws | net |
| Flat But. Hd. Cap Screws | plus net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. & Semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2 in. | plus 10 |
| Studs | net |
| Taper pins | 40 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | list plus 20 |
| Collar screws | list plus 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | 65 |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add 7 00 |

## BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $47 50 |
| Open-hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.

F.O.B. Pittsburgh.

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails | $5 25 $5 20 |
| Cut nails | 5 70 5 65 |
| Miscellaneous wire nails | 60% |
| Spikes, ¾ in. and larger | $7 50 |
| Spikes, ¼ and 5-16 in. | 8 00 |

## ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 41 |
| Plumbers' oakum, per lb. | 8½ |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila rope | 0 33 |
| New Zealand hemp | 0 33 |
| Transmission rope, Manila | 0 45 |
| Transmission rope, ½ in. and up | 62½ |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | net |

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | 0 50 |
| [illegible] | 0 53 |
| [illegible] metals | 18 to 70 |
| [illegible] coppers, lb. | 0 53 |
| [illegible] wool, per lb | 0 16 |
| Putty, 100-lb. drums | 4 75 |
| White lead, pure, cwt. | 16 05 |
| [illegible] lead (100 lb. keg), per cwt. | 15 50 |
| Glue, English | 0 35 |
| Tarred slater's paper, roll | 0 95 |
| [illegible] per gal., bulk | 0 33 |
| [illegible] per gal., bbls. | 0 32 |
| Pure turpentine, single bbls., gal. | 0 71 |
| Linseed oil, raw, single bbls. | 1 95 |
| Linseed oil, boiled, single bbls. | 1 98 |
| Plaster of Paris, per bbl. | 2 50 |
| Sandpaper, B. & A. | list plus 20 |
| Emery cloth | list plus 20 |
| Sal Soda | 0 03½ |
| Sulphur, rolls | 0 05 |
| Sulphur, commercial | 0 04½ |
| Rosin "D," per lb. | 0 03 |
| Rosin "G," per lb. | 0 03½ |
| Borax crystal and granular | 0 12 |
| Wood alcohol, per gallon | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

### CARBON DRILLS AND REAMERS

| | Per Cent. |
|---|---|
| S.S. drills, wire sizes up to 52 | 35 |
| S.S. drills, wire sizes, No. 53 to 80 | 40 |
| Standard drills to 1½ in. | 40 |
| Standard drills, over 1½ in. | 40 |
| Fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 |
| Bit stock | 40 |
| Ratchet drills | 15 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 40 |
| Sleeves | 40 |
| Taper pin reamers | net |
| Drills and countersinks | list plus 40 |
| Bridge reamers | 50 |
| Centre reamers | 10 |
| Chucking reamers | net |
| Hand reamers | 10 |
| High speed drills, list plus | 75 |
| High speed cutters, list plus | 40 |

### COLD ROLLED SHAFTING

| | |
|---|---|
| At mill | list plus 40% |
| At warehouse | list plus 50% |

**Discounts off new list. Warehouse price at Montreal and Toronto**

### IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 8 00 | $ 8 00 |
| Sheets, black, No. 10 | 10 00 | 10 00 |
| Canada plates, dull, 52 sheets | 9 00 | 8 65 |
| Can. plates, all bright. | 9 50 | 9 50 |
| Apollo brand, 10¾ oz. galvanized | ..... | ..... |
| Queen's Head, 28 B.W.G. | ..... | ..... |
| Fleur-de-Lis, 28 B.W.G. | ..... | ..... |
| Gorbal's Best, No. 28 | ..... | ..... |
| Colborne Crown, No. 28 | ..... | ..... |
| Premier, No. 28 U.S. | ..... | 9 20 |
| Premier, 10¾ oz. | ..... | 9 50 |
| Zinc sheets | 20 00 | 20 00 |

### PROOF COIL CHAIN

B

¼ in., $12.35; 5-16 in., $11.85; ⅜ in., $11.50; 7-16 in., $10.90; ½ in., $11.20; $11.00; ⅝ in., $10.90; 1 inch, $10.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $13.00; 3-16 in., $12.50; ¼ in., $11.75; 5-16 in., $11.40; ⅜ in., $11.00; 7-16 in., $10.60; ½ in., $10.40; ⅝ in., $10.00; ¾ in., $9.90.

**Prices per 100 lbs.**

### FILES AND RASPS.

| | Per cent |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 40 |
| Black Diamond | 40 |
| J. Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 37½ |
| Disston | 50 |
| Whitman & Barnes | 50 |

### BOILER TUBES.

| Size | Seamless | Lapwelded |
|---|---|---|
| 1 in. | $36 00 | $..... |
| 1¼ in. | 40 00 | ..... |
| 1½ in. | 43 00 | 36 00 |
| 1¾ in. | 43 00 | 36 00 |
| 2 in. | 50 00 | 36 00 |
| 2¼ in. | 53 00 | 38 00 |
| 2½ in. | 55 00 | 42 00 |
| 3 in. | 64 00 | 50 00 |
| 3¼ in. | ..... | 58 00 |
| 3½ in. | 77 00 | 60 00 |
| 4 in. | 90 00 | 75 00 |

Prices per 100 ft., Montreal and Toronto.

### OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | |
| Rovalite, per gal., bulk | 18 |
| Palacine | 21 |
| Machine oil, per gal. | 26½ |
| Black oil, per gal. | 15 |
| Cylinder oil, Capital | 49½ |
| Cylinder oil, Acme | 39½ |
| Standard cutting compound, per lb. | 0 06 |
| Lard oil, per gal. | $2 60 |
| Union thread cutting oil antiseptic | 88 |
| Acme cutting oil, antiseptic | 37½ |
| Imperial quenching oil | 39½ |
| Petroleum fuel oil | 13½ |

### BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30-5% |
| Standard | 40% |
| Cut leather lacing, No. 1 | 1 95 |
| Leather in sides | 1 75 |

### TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 3½ to 05 |
| Emery glue | 28 to 30 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 45 |

**Prices Per Lb.**

### ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | .08½ |
| Grits, 80 and finer | .06 |

### BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 38 |
| Brass sheets, 24 gauge and heavier, base | 0 43 |
| Brass tubing, seamless | 0 46 |
| Copper tubing, seamless | 0 48 |

### WASTE.

| White. | Cts. per lb. | | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 18½ |
| Peerless | 21 | X Empire | 17¼ |
| Grand | 19¾ | Ideal | 17¼ |
| Superior | 19¾ | X press | 16 |
| X L C R | 18½ | | |

**Colored.**

| | | | |
|---|---|---|---|
| Lion | 15 | Popular | 12 |
| Standard | 13½ | Keen | 10½ |
| No. 1 | 13½ | | |

**Wool Packing.**

| | | | |
|---|---|---|---|
| Arrow | 25 | Anvil | 15 |
| Axle | 20 | Anchor | 11 |

**Washed Wipers.**

| | | | |
|---|---|---|---|
| Select White. | 11 | Dark colored. | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING.

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

### ANODES.

| | |
|---|---|
| Nickel | .58 to .65 |
| Copper | .36 to .40 |
| Tin | .70 to .70 |
| Zinc | .23 to .25 |

**Prices Per Lb.**

### COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | 42 50 | 43 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 46 00 | 44 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 48 00 | 48 00 |
| Copper sheet, planished, 16 oz. base | 57 00 | 45 00 |
| Braziers,' in sheets, 6x4 base | 45 00 | 44 00 |

### LEAD SHEETS.

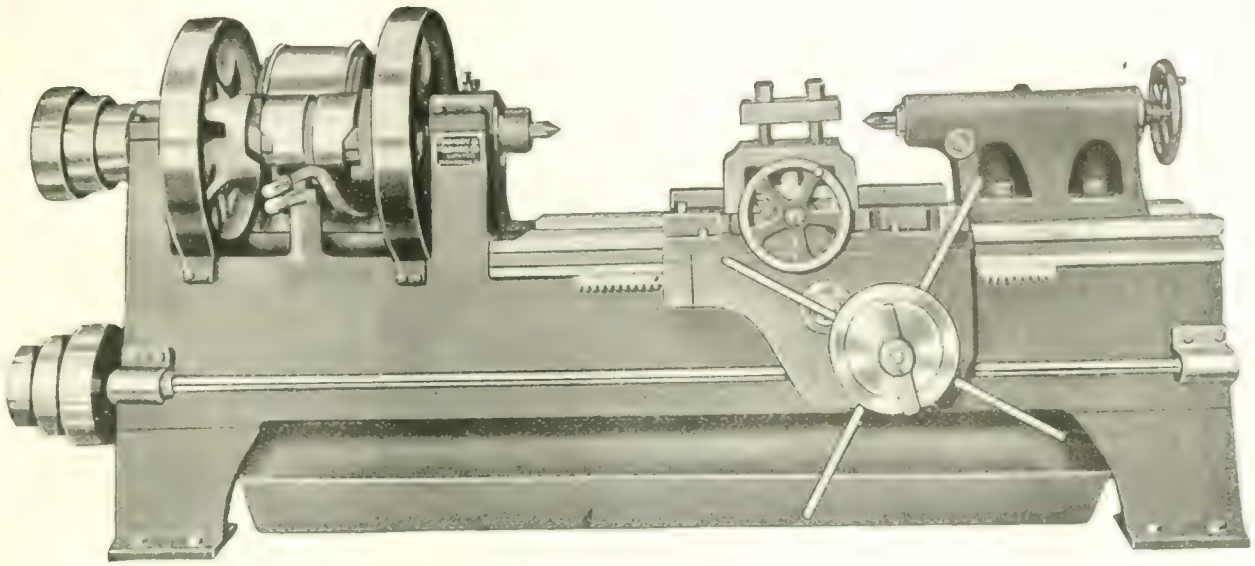
| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $13 25 | $13 25 |
| Sheets, 3½ lbs. sq. ft. | 13 25 | 13 25 |
| Sheets, 4 to 6 lbs. sq. ft. | 12 50 | 12 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS.

| | |
|---|---|
| Acid, boracic | $ .22 |
| Acid, hydrochloric | off |
| Acid, hydrofluoric | .09½ |
| Acid, nitric | .10 |
| Acid, sulphuric | .03½ |
| Ammonia, aqua | .14¾ |
| Ammonium carbonate | .20 |
| Ammonium, chloride | .40 |
| Ammonium hydrosulphuret | .50 |
| Ammonium sulphate | .30 |
| Arsenic, white | .25 |
| Copper, carbonate, anhy | .45 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .90 |
| Iron perchloride | .20 |
| Lead acetate | .35 |
| Nickel ammonium sulphate | .25 |
| Nickel carbonate | .65 |
| Nickel sulphate | .35 |
| Potassium carbonate | 1.50 |
| Potassium sulphide (substitute) | .20 |
| Silver chloride (per oz.) | .85 |
| Silver nitrate (per oz.) | .75 |
| Sodium bisulphite | .25 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .50 |
| Sodium hydrate | .18 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | .18 |
| Tin chloride | .85 |
| Zinc chloride | .90 |
| Zinc sulphate | .18 |

**Prices per lb. unless otherwise stated.**



# *Speed Up Production*

## *with the*

# MONTREAL LATHE

for the economical production of 4.5", 6" and 155 MM. shells. If you are interested in obtaining maximum production at minimum labor expense, investigate the records of the MONTREAL lathe in plants of the largest producers of shells in Canada.

The MONTREAL lathe is wonderfully simple in operation and construction, yet every worth while improvement has been embodied in the design.

A powerful machine—designed to transmit all the power that the cutting tools will stand—with large broad ways, liberal wearing surfaces and unbreakable apron. The MONTREAL lathe comes to you equipped as you need it—with carriage for rough turning —with rigid single bar for boring, or with swivelling bar for inside profiling.

***Write Now for Prices and Delivery.***

## The A. R. Williams Machinery Co.

LIMITED

**64 Front Street West - . - TORONTO**

*If any advertisement interests you, [illegible]*

### TENDERS FOR POWER PLANT

[illegible] Sydney, New South Wales, has in operation an electricity supply system. By means of this system electricity is supplied to more than 25,000 separate premises where it is used for lighting and for the driving of machinery in factories of all kinds, heating, cooking, etc. Among other establishments supplied with electricity are the Royal Naval Repair Dockyard, the board dealing with the water and sewerage of the metropolitan area, many factories principally employed at present in making material to the order of the Defence Department of the Commonwealth of Australia for the use of the naval and military forces. In addition to the above uses the council's supply of electricity provides artificial lighting for some hundreds of miles of streets and roads.

"It has been suggested that the Canadian manufacturers are just now in a much better position to undertake contracts for the supply of heavy engineering plant than British manufacturers.

"Following is a rough description of the principal items of power-house plant which the city council would require if it is decided to proceed immediately with the extension of the power-house:

"1. Boiler-house plant, consisting of water tube boilers of the Stirling or Babcock and Wilcox type, complete with economizer super-heaters and automatic stokers, forced and induced draft fans, etc., each boiler to evaporate up to about 50,000 pounds (actual) of water per hour at a steam pressure of, say, 225 pounds to the square inch; the number of boilers to be dependent on the size of turbo alternator, about one boiler for each 2,000 kilowatts in output of turbo alternator (see below).

"2. Electric generating plant. One steam turbo alternator, three-phase preferably, of about 12,000 kilowatt capacity but not less than 6,000; the turbines to be suitable for a steam pressure of about 200 pounds per square inch and a steam temperature of 600° Fahr., the alternator periodicity to be 50 complete cycles per second, and voltage to be 5,000 to 5,300. The set to be complete with condenser, circulating pump, air pump, etc.

"3. Cranes. One electric overhead travelling crane for a working load of 80 tons with a span of about 45 feet.

"4. Steam turbine-driven feed pumps, say, two, each sufficient to feed the boilers referred to above.

"5. Steel pipe work to couple up the boilers referred to above to the turbine referred to above.

"6. Switchgear. One remote electrically controlled switch to control the current from the alternator described above.

"7. Copper boiler feed pipes with brass flanges."

The city council of Sydney would be prepared to order this plant from Canada if assured that the work could be proceeded with immediately and quickly completed.

Firms in a position to tender should communicate with the Commercial Intelligence Branch, Department of Trade and Commerce, Ottawa, referring to file No. 17986.

### BRITISH STEEL FOR SHELLS

THE British investigation of an acid open-hearth heat for making high explosive shells, reviewed in a recent issue of the "Iron Age," presents some interesting facts. It demonstrates the high degree of uniformity obtainable from the practice of casting the ingot large end up with a hot top. Not only is the percentage of discard largely reduced, but defects from segregation and pipe are at a minimum. It would be interesting to know to what extent this is the practice in England. Without doubt some such procedure is desirable to meet the rigid specifications. It is admitted that in the United States early in the war some steel-makers had great difficulty in satisfying foreign inspectors with steel cast in ingots with the small end up with no hot top or even with one. To what extent this American practice has been altered to meet new war conditions is not generally known, but in some cases decided changes are believed to have been necessary. It is certain, however, that the British method referred to is superior.

It is also interesting to note that in the heat under discussion additions of manganese and silicon were made in the bath and not in the ladle, and also that no ore was added after the percentage of carbon reached 0.70 per cent. Both of these points are vitally important in the production of the best steel, but their value is not always recognized or lived up to in tonnage production.

The manganese content of the slag for the heat reported is illustrative not only of the loss of manganese, but also of the importance of the slag as a by-product. It is hoped that steel making will some day reach the stage where so large a loss can be eliminated. It is claimed that this has been done in the electric furnace. It is also not at all impossible that a way may yet be worked out for reclaiming the manganese, silicon and iron content in acid slags in the shape of a silico-manganese alloy. Important work on this is now being done in this country.

### GROWTH OF STEEL AND IRON INDUSTRY IN NEW SOUTH WALES

B. MILLIN, Canadian commercial agent for New South Wales, writes from Sydney as follows in regard to the growth of the steel and iron industry in that State:

"A second blast furnace is now in operation at the Broken Hill Proprietary Co.'s works at Newcastle, New South Wales, and the equipment for producing plates for shipbuilding has just been completed. The rolling of these plates will supply a long-felt want in Australia, as at present they are almost unobtainable. A rod mill has also been erected, and this plant will roll wire rods, from which fencing wires and other wires are to be drawn. The total number of employees now employed at the works is 3,000, and this number will be shortly increased.

"As the steel works progresses it is becoming more and more apparent that subsidiary industries will be attracted to the district, because of an assured steel and iron supply, as well as cheap coal and adequate railway and shipping facilities.

"It has been decided to establish extensive works for the purpose of manufacturing galvanized iron at an initial expenditure of about £150,000.

"Another industry that is likely to be established as soon as the necessary machinery comes to hand is a steel products works, and a large nail manufacturing company also contemplates establishing works in the near future."

### Production of Platinum in New South Wales

The New South Wales Mines Department reports the discovery of an important deposit of platinum in this State, and it is stated to be the most important alluvial find for some years.

Platinum in small quantities occurs in several districts, but platinum mining, in comparison with other branches of mining, is unimportant. The productive deposits are, however, only of comparatively recent discovery. The quantity of platinum produced to the end of last year was 13,676 ounces, valued at £34,274.

In the recent discovery the metal has been found associated with gold in washdirt and occurs in coarse, shotty grains.

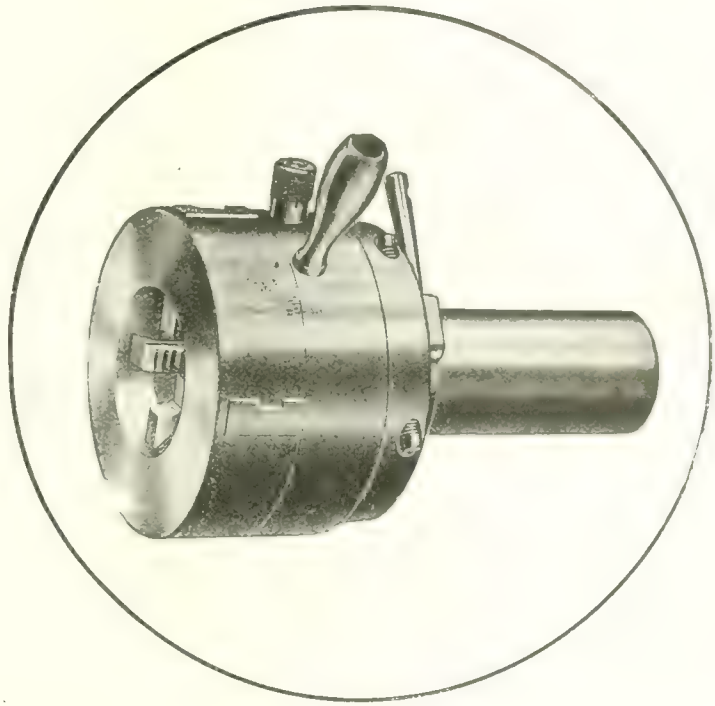
## NO END TO WAY OF RIVET DRIVERS

### Over 12,000 Rivets Were Driven in a Nine-Hour Day

To drive in 12,209 ⅞-in. rivets in nine hours into a standard ship was the feat accomplished at the yards of Workman & Clark at Belfast by John Omir, who last week beat the hour record for the United Kingdom. In his work Omir drove in more than a thousand rivets every hour, and on two occasions passed the 1,400 mark. In his best minute he drove 26 rivets. Omir used about two and one-half tons of metal.

**New Incorporations.** — Incorporation has been granted to the following joint stock companies: Carter, Wood Shipping Company, Limited, Montreal, capital $40,000; Midland Iron and Steel Company, Limited, Midland, Ont., capital $1,000,000; Canadian Northern Rolling Stock, Limited, Toronto, capital $100,000; British Columbia Coal & Land Company, Limited, Hamilton, Ont., capital $750,000; Bird & Son, Limited, Hamilton, Ont., capital $750,000; Halifax Shipyards, Limited, Montreal, capital $6,000,000; Clyde Engineering Company, Limited, Montreal, capital $100,000.

# GEOMETRIC



**"Around the Geometric Die Head we draw a circle and claim that no other can touch it for quality and quantity production."**

*That is the claim of the Manufacturer.*

*This is the claim of the User:*

> "We purchased four sets 9 16 -18 chasers from you four months ago, and are pleased to state that the first set is still in use and doing perfect work, although it has been used almost daily since purchased, and threading better than a thousand pieces per day."

From 1,000 to 4,000 threaded pieces, according to work conditions, is the reputation of Geometric Die Heads. Unless you know what GEOMETRIC experience is, you have yet to learn what can be accomplished in the production of screw threads.

*We are ready to help you. Ask us about it.*

## THE GEOMETRIC TOOL COMPANY

NEW HAVEN, CONN., U.S.A.

*Canadian Agents*

Williams & Wilson, Ltd., Montreal; The A.R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.

### ALUMINUM GOODS FOR BRAZIL

There is in Brazil a market for as much aluminum as can be supplied, which material has been scarce for some months past having been completely exhausted. This dearth of supplies is entirely due to the cessation of shipments of German consignments through neutral ports, which continued for some time after the outbreak of war. Although some small shipments of aluminum manufactures were sent to South America from the United Kingdom, three-fifths of the imports of articles of this class came formerly from Germany and Austria-Hungary. The demand among the Brazilians—and, incidentally, in all other South and Central American countries—for cheap cooking utensils. German goods, when obtainable, have been invoiced at very low figures, against which it has been difficult for either British or American manufacturers to compete. Small saucepans and frying pans sold at 3½d. to 7½d. each, and a larger size at 1s. 1½d. Eggcups and strainers are retailed at between 1½d. and 2½d. each, spirit-lamps at 7½d., timbales, cups, and stoppers at prices from 4d. to 9½d. each. It should be worth while for British manufacturers of such aluminum articles to send out a full range of samples, making the wholesale prices as low as possible, and affording a reasonable amount of credit to the larger and safer importers. These, in making distribution for up-country sales, have to allow credit between six and twelve months. Even the retailers seldom sell for actual cash, credit being the rule in all parts of the country. The value of the German trade in these goods with Brazil amounted in normal times to over £16,500; Argentina took shipments worth £6,400, Chile £8,100, and Mexico £3,100. The trade of the United Kingdom was almost negligible excepting with Brazil. It is worthy of attention that the United Kingdom itself took goods from Germany—including those of aluminum crude, wrought and spun, and aluminum wire—worth over £25,800, while the United States, where there are manufactures of such a nature, purchased from Germany to the value of £53,000. Manufacturers may be interested to know the principal reason that the Germans can sell their aluminum hardware. The German articles are "spun" instead of being, as is the case with British goods, "cast." It would therefore be advisable to attempt some method which would allow of their supplying "spun" articles at a low price. It is apparently possible, as the Germans have succeeded in doing it. In addition, South American purchasers prefer the dull, silvery appearance of the German-made aluminum articles to the polished, tin-like appearance of the British-made goods. Finally, the Teutons have been in the habit of allowing their South American customers a discount of 45 per cent. upon all aluminum ware, and 2½ per cent. discount on aluminum wire. The more saleable of the aluminum hardware articles exported to Brazil include meat-dishes, pudding-bowls, colanders, pie-dishes, forks, spoons, stewpans, milk-boilers, kettles, saucepans (the latter in all sizes and with or without lids), spirit stoves, etc.

### TRADE INQUIRIES

THE following trade inquiries have been received by the Department of Trade and Commerce, Ottawa. Further particulars may be obtained from the inquiries branch of the department.

242. **Automobiles and mining Supplies.**—A firm in Bulawayo, Rhodesia, South Africa, which has mail, transport and cartage contracts with the Government of Rhodesia and with a number of mines, wishes to correspond with Canadian manufacturers in various lines, especially automobiles and mining supplies, with a view to representing them in Rhodesia either immediately or after the war.

243. **Electric lamps, parts and acessories.**—A firm of London importers wish to get in touch with Canadian wholesale houses who can export electric lamps, parts and accessories.

249. **Hoop-iron, etc.**—A manufacturer of barrels engaged also in the fish-packing trade in Newfoundland asks for the names of Canadian exporters of hoop-iron, 1¾ inch to 2 inches wide, 16 gauge, flanged and cut in lengths of 62 inches. Also coopers' rivets.

259. **Electric and pneumatic machine tools.**—Agent at Naples seeks agencies for electric and pneumatic machine tools and instruments, bolting, etc.

267. **Engineering articles, leather belting, etc.**—Turin commission agent would handle engineering articles, leather belting, files, mineral oils, etc.

268. **Mild steel for shipbuilding, emery cloth and wheels.**—Commission agent at Genoa wishes to represent British firms: Mild steel for shipbuilding, emery cloths and wheels, engineering sundries, cutlery, tools, belting, glass paper. (N.B., fluent English.)

275. **Electric apparatus.**—Turin merchant is interested in electric apparatus.

280. **Beaten metalware.**—Turin agent would handle beaten metalware, engineering articles, machinery for metal-working.

281. **Industrial sundries.**—Merchant at Turin would import on own account or commission industrial sundries, iron tubing, articles for boilers.

297. **Mining supplies.**—A Johannesburg commission house with a long-established connection in mining territories is prepared to take up the Canadian representation of mining supplies of all kinds.

425. **Machinery and engineering specialties.**—A Durban firm specializing in machinery and engineering specialties requests catalogues and latest information from Canadian exporters of general machinery, mining machinery, pumps, concrete silo pattern, agricultural machinery, shovels, wheelbarrows, and other lines suitable for this trade.

426. **Rubber goods.**—A Durban firm of merchants desires samples when possible, catalogues and price lists on all classes of rubber goods. They are prepared to purchase for Natal or act as agents for the Union of South Africa.

427. **Iron and steel products, tools, chemicals, leather, paper, agricultural implements, etc.**—A Durban firm of merchants and commission agents requests correspondence from Canadian manufacturers of coal mining material, rails, wheelbarrows, steel plates, shovels, coal mining tools, chemicals (caustic soda, bicarbonate of soda, phosphoric acid, arsenite of soda), glucose, lubricating oils, leather belting, agricultural machinery and implements. Will purchase outright in many of these lines or prepared to act as agents.

430. **Catalogues.**—A Port Elizabeth wholesale firm requests catalogues and price lists from Canadian manufacturers of hardware of all kinds, tools of all kinds, lanterns, spades and shovels, picaxes, enamelware, household utensils, paints and varnishes, brushware, fencing and baling wire, wire netting handles.

## BOOK REVIEWS

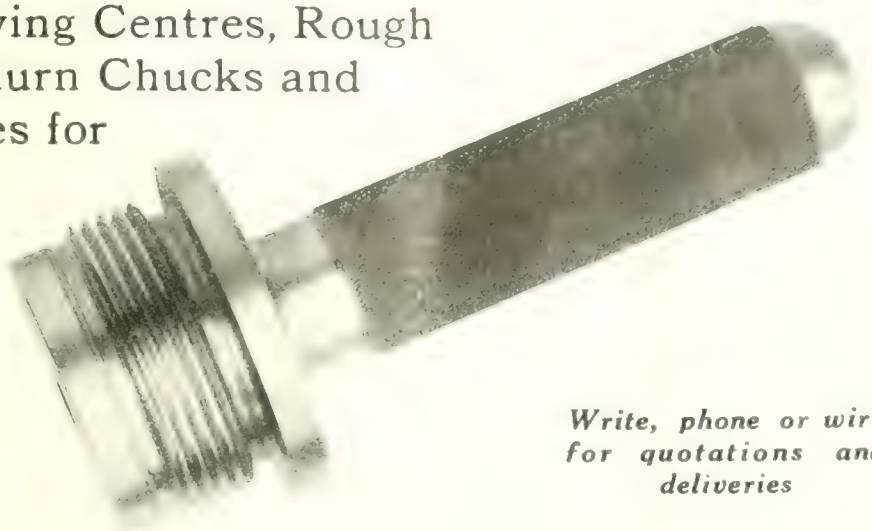
**Craft of the Hammersmith** is the title of an illustrated booklet issued by the Canada Foundries & Forgings, Ltd., of Welland, Ont. The booklet illustrates by means of excellent photographic reproductions the various phases of the operations performed in the production of marine forgings at the Canada Forge plant and also views of a few typical forgings made by the company. The booklet is gotten up in an artistic manner and shows the marked development which the company has made, in this particular line, during recent years.

**Drilling Machines.**—The Henry & Wright Mfg. Co., Hartford, Conn., have issued an attractive catalogue illustrating and describing an interesting line of single and multispindle drilling machines. A list of improvements made in the design of these machines is given, followed by a very useful chart of speeds and feeds for drilling, covering both carbon and high speed drills. The various types of drilling machines are illustrated according to their classification and are accompanied by specifications giving the principal dimensions, weights, etc.

**The Collapse of Short Thin Tubes.**—Professor A. P. Carman of the Department of Physics, University of Illinois, has completed a series of experiments on the Collapse of Short Thin Tubes. The purpose of these tests was to find an equation by the application of which the pressure required to collapse a tube can be calculated when the dimensions of the tube and the elastic properties of the material are known. The results of tests of longer tubes were published by the Engineering Experiment Station in 1905 and the present report contains a brief summary of these earlier tests. Seamless steel, seamless brass, aluminum, glass, and rubber tubes mere used in the new tests. Bulletin 99 of the Engineering Experiment Station contains the results of these tests. Copies may be obtained gratis by addressing the Engineering Experiment Station, Urbana, Ill.

# Screw Gauges for 155 mm. U.S. Shell

Also make Revolving Centres, Rough turn Chucks, Re-turn Chucks and Recessing Fixtures for this size shell.

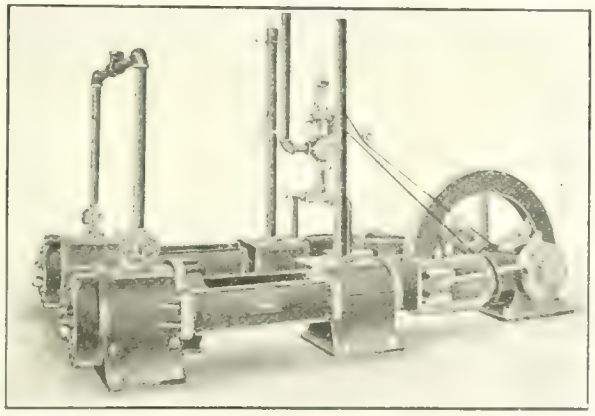


WE have equipped two plants in the United States with these tools.

*Write, phone or wire for quotations and deliveries*

## Reliance Motor & Tool Company, Limited

429 Queen St., W. Phone Adel. 1393 Toronto, Ont



# For Sale at a Bargain

Rand Class "B-1" Air Compressor

Duplex Steam Driven Air Cylinders, Steam Pressure, 80 to 100 lbs. Air Pressure, 90 to 100 lbs. Cylinders 8 Inches x 12 Inches.

Requires 40 to 60 Steam Horse Power for Full Working Load

This Compressor cost us $1,700 New before the war. We are now offering it at considerably less than half this price.

MARSH ENGINEERING WORKS, Limited

Established 1846 BELLEVILLE, Ont.

# You're Busy NOW But How About After the War?

Right now all the time is required to prepare for present demands. But after the war will have facilities for the manufacture of Special Machinery, Gears, Jigs, Patterns, Dies, Small Tools, etc., and time to do it. Get in touch before the factories of these products *now*. Connections made now through this section will help you in keeping things going after the war.

Write for further particulars.

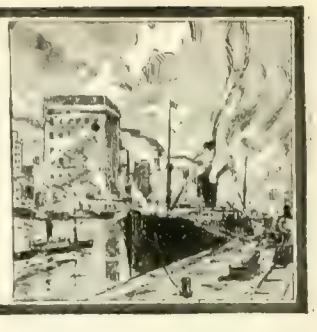
**Canadian Machinery,**

*Contract Work Section,*

143 University Ave., Toronto

# INDUSTRIAL NEWS

## NEW SHOPS, TENDERS AND CONTRACTS' PERSONAL AND TRADE NOTES



## CONTRACTS

**Sudbury.**—Fraser & Chalmers of Canada, Limited, Montreal, Que., have been awarded a contract by the Corporation of the Town of Sudbury, Ontario, for the supply of a 1,200 gallon per minute Lea-Courtenay turbine pump for direct connection to a 175 h.p. Canadian Westinghouse motor.

## ENGINEERING

**Detroit.**—Henry Ford has this to say of the much-discussed Liberty motor; "It is a wonderful creation. It is undeniably the finest mechanism of the kind the world has ever seen. It represents about the maximum of power possibilities in aeroplane motors, inasmuch as it develops about two horsepower for each pound of weight. The men who have worked out this extraordinary motor deserve the thanks and heartfelt appreciation of the nation."

**Chicago.**—A portable track welding outfit weighing less than 200 pounds which takes its power from trolley wires has been invented for small street railways that do not require elaborate equipment.

## MARINE

**Belfast.**—To drive 12,209 seven-eighth inch rivets in nine hours into a standard ship was the feat accomplished at the yards of Workman & Clark here by John Omir, who used about two and one-half tons of metal.

**Sarnia.**—The ferry, James Beard, was raised by the lighter Manistique after Diver John Mara had completed the preliminary work. This afternoon the boat was towed across the St. Clair by the ferry Grace Dormer into the Black River, and will be repaired as quickly as possible.

**Montreal.**—The 7,000-ton cargo ship War Earl was launched from the yard of the Canadian Vickers, Limited, on Saturday morning. The vessel has a length of 380 feet and a breadth of 49 feet. Five minutes after the War Earl was launched another keel was laid down, and this ship will be completed about the first of October.

**Niagara Falls.**—It is interesting to note that in the colossal enterprise in the building of the Chippawa-Queenston Hydro-Electric Power Canal, involving the expenditure of millions of dollars, the employment of a thousand men and the most modern and efficient machinery in the world, during the twelve months the great public work has been in operation, only two men have been killed.

**Quebec.**—The new Canadian Northern car ferry Canora, which has been built here by the Davie Shipbuilding & Repairs Co., was launched at the company's dry-dock at Lauzon. The new steamer, which will ply between Victoria, B.C., Patricia Bay and Port Mann, is 308 feet long, 52 feet beam, has a capacity of 20 loaded cars and a speed of 14 knots an hour. The Canora is a coal burner and cost between $400,000 and $500,000.

**Sarnia.** — The passenger steamer Noronic was moved from her winter quarters in Sarnia Bay to the Northern Navigation dock, where preparations for the opening of the passenger season will be completed. The other two boats, Hamonic and Huronic, have been in service since the opening of the season of navigation, and have done much to move the freight of the country both ways. The steamer Waubic, which operates through Georgian Bay, is now being fitted out for the season.

**St. Catharines.**—A mistake in signals between the captain and engineer of the steamer Linden, owned by the Ontario Paper Company, carried out three gates of lock 4, Welland Canal, on Thursday, and tied up traffic for a couple of days. As she was entering lock 4 the captain attempted to signal for a check down, but instead the steamer crashed into the two head gates and tore them from their fastenings, letting loose the waters of the level above into the empty lock. The steamer was thrown into the level below and one of the lower gates was torn away.

**Collingwood.** — Between seventy-five and one hundred employees of the Collingwood Shipbuilding Company who went down to work on Tuesday morning were informed that as they had taken the King's birthday as a holiday they could take Tuesday without pay. At the plant it was stated that a written agreement had been drawn up between the company and the men in which it was agreed that Victoria Day was to be observed as a holiday, while work was to be done on the Kin's birthday. Instead of this many of the men took both days as holidays, and as a result much inconvenience resulted to the company.

**Halifax.**—A cable received by M. O. Crowell of Crowell Bros., Limited, vice-president of the Larder Bros. Wrecking Company, Halifax, announces that the Larder Bros. Company have been awarded the sum of $86,480 by the arbitration court in England as their remuneration for salvage services performed to the steamer Arachne in 1916. The steamer Arachne went ashore on the Island of Langlade or Little Miquelon in June, 1916. Larder Bros. were employed to salve her and were successful in floating the ship and having temporary repairs made in St. Pierre and afterwards taking her to Quebec, where she was repaired in dry dock.

**Sault Ste. Marie, Ont.**—Freight traffic carried through American and Canadian canals in May amounted to 11,404,045 short tons, the total having been exceeded for the month of May only in 1916, when freight traffic was 12,293,476 short tons, including much heavier shipments of wheat and grain than were handled last month. The movement of iron ore, 8,792,162 tons, was greater than in May, 1916. Soft coal shipments exceeded May, 1917, but fell short of those in 1916, while the movement of anthracite was lighter than in May of either of the two previous years. A feature of the statistical report is the small amount of manufactured iron and steel and of general merchandise included in westbound shipments, this curtailment being traceable to the war.

**Port Stanley.**—A fall of two feet in the level of Lake Erie has been reported by residents of Port Stanley. The fall is sufficient to cause much trouble in the unloading of boats, as it brings the decks a considerable distance below the docks. This makes a steep grade up which the merchandise must be taken. The Bessemer experienced this difficulty at Port Stanley and great care had to be exercised in unloading the coal cars. There is a variation in the height of the water level in Lake Erie every year, but the water line this season is reported to be much lower than it has been for years. No satisfactory explanation of the cause has been advanced. There is a periodic rise and fall in all the Great Lakes, but according to past experiences the water should be still rising and should not commence to recede until next year. If the phenomenon was temporary, a strong wind might have been the cause, but in this event it is not likely that the water would remain at the low level for more than a day. Rainfall in the north coun-

try affects the lakes to a great extent, and if the fall there has been much less than normal it may account for the lower level in Lake Erie.

## MUNICIPAL

**Halifax.**—A meeting of the city council passed a resolution granting tax exemption to the Norcross Syndicate for the construction of steel shipyards at Halifax. The initial expenditure, it was explained, will be between three and four million dollars, and the industry, when running to full capacity, should give employment to between three and four thousand persons.

**Renfrew.**—The town council, through the waterworks' committee, has decided to purchase a twin horizontal enclosed turbine waterwheel, and a 12-inch two-stage pump. It is practically a duplicate of the present outfit. Some idea of the way prices are increasing can be gained from the fact that the present price quoted is $1,244 over the quotation of October 23, 1917, and $1,640 over that of July, 1917.

**London.**—As a result of a secret joint session of the Board of Control and the Locomotive Railway Commission, of which Sir Adam Beck is chairman, a recommendation that London purchase the section of the London and Lake Erie Traction Co., between this city and St. Thomas, at a price of $250,000, providing the other municipalities concerned grant a bonus of $50,000 to make up a total of $300,000, will be considered by the City Council.

**Winnipeg.**—One result of the decision to make the West dependent on Alberta for a coal supply this winter has been a move for an investigation into the price that is to be paid. One of the Winnipeg papers has gone into the matter at some length, pointing out that the price of the coal at the mines is from four to four and a half dollars. The same article delivered to the consumer is paid for at the rate of $12.50 per ton, and it is held that the spread is too great. The Winnipeg Board of Control are also taking action in regard to the same matter.

**Montreal.**—Sir Herbert S. Holt, presiding at the annual meeting of Montreal Light, Heat and Power Company, Consolidated, stated that while the new La Salle gas plant had been considered sufficient for five years' growth, enlargement would be necessary to meet the growing demand. The directors were not inclined to go ahead with extensions just now, because of the high cost of machinery, etc., but an extension in this case was virtually forced on the company by conditions. Sir Herbert referred to the rates for gas and electricity in Montreal being the lowest in America, and reaffirmed the company's intention to make no change unless further increases in cost of operation, taxes, etc., compelled such action.

**Dundas.**—Tenders were opened on May 14 for a mechanical filter plant. The


# Manager Wanted $50,000 Salary

A STRONG man—a tactful man—a man who will create sympathy and respect and support for the greatest factor in the upbuilding of Canada. A man who will curb the few selfish, the grafters, and the offensive combines which exact exorbitant profits, and bring the 95 per cent. decent Canadian manufacturers into disrepute, subjecting them to unfair and confiscatory legislation. A man who will work in unity with the press of the country, with the farmers, trade unions, and various journals, and finally and most important of all—a man who will organize Canadian industry for the greatest possible output of the best quality goods. Such a man can do more than any other to make Canada permanently prosperous. Such a man, says THE FINANCIAL POST of June 1st, should be secured as Manager of the Canadian Manufacturers' Association. You will find the article containing this and other powerfully constructive thoughts on page 1 of THE POST now on sale.

**Know Canadian Affairs**

News of Canadian Securities forms an important feature of THE FINANCIAL POST every week. In addition to the fifteen columns of the June 1st issue devoted to this department the following up-to-the-minute business articles appear:

Policy.
Milling Company Report Not Made on Business Basis.
Banks Prepare for Abnormal Domestic Needs.
Maintenance of Foreign Trade a Necessity.
Canadian Merchants Current Loans Millions Higher.
Effect of Victory Loan on Canadian Banks.
Facts From Experts as to Frost Scare in West.
Outlook for Record Crop Not Impaired.
Bank Clearings Show Big Falling Off.
Drain on Bank Staffs Continues.
Housing Question Acute in East: Remove Restrictions?
A Brighter War Outlook and Why. (By Lt.-Col. J. B. Maclean.)
How the Farmer Looks on High Tariff.

These are only a few of the headlines. THE POST is packed full of valuable business information as you will find if you send for a sample copy, or better still a trial subscription using this form:

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The Monetary Publishing Co.,
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Send me THE FINANCIAL POST for ... weeks, for which I enclose ... ($1.00 for four months' trial subscription) in payment of same.

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"HAWK'D CHROME VANADIUM STEEL

Will Give You Exceptional

# Shell Forging Production

WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat-treated and ready for use.

It does not stick to the work.

There are many cases where each punch has turned out over 2,000 shells.

It means more shells, per machine per day.

STEEL OF EVERY DESCRIPTION.

## Hawkridge Brothers Company

303 Congress St., BOSTON, MASS. U. S. A.



THE IRON WORKS LIMITED

Successors to
Owen Sound Iron Works
Owen Sound, Ont.

Engineers
Boiler-makers
Founders
Machinists

Tank Work
Smoke Stacks,
Grey Iron and Brass Castings,
Special Machinery Made to Order

tenders for the equipment were: Pittsburgh Filter Mfg. Co., $8,850; Interstate Filter Co., $9,100; New York Continental Jewel Filtration Co., $9,350; Roberts Filter Mfg. Co., Inc., $12,000. Tenders for the building were: Canadian Engineering and Construction Co., $13,350; McAllister & Taylor, $13,500; Pigott & Healy, $14,490; Dick Construction Co., $16,350; Secord & Sons, $16,826. The total cost of the plant will be about $27,000. The plans have been approved by the Provincial Board of Health, but the contract has not yet been let, awaiting final action of the council, which will probably be taken this week. E. H. Darling, Hamilton, Ont., is the consulting engineer.

## PERSONAL

**Mr. Bramble**, formerly advertising manager of the Goodyear Tire and Rubber Co., has left to become general sales manager for the Canadian Chicle Co.

**J. W. Coleman**, manager of the Boss Tool Nut Company and also associated with the Consolidated Equipment Company, is making a business trip to Winnipeg and other points in the West.

**J. L. Hynes**, for some time Toronto representative for the Armstrong, Whitworth Co., of Canada, has been transferred to the head office at Montreal, being appointed sales manager for that district.

**E. T. Malone**, who has has been representing Armstrong, Whitworth Co., of Canada, Limited, in the Hamilton district, has been appointed district representative for Ontario and has been transferred to Toronto, his headquarters in the future.

**James A. Stairs**, of New Glasgow, N.S., has gone to Detroit, where he is to take charge of the shell department of the Harmon Motors Co., now devoting their plant to the production of munitions on a wholesale scale. He has had considerable experience in the line of industrial activity developed out of the war, and will, in his new position, have approximately twelve hundred men to direct.

Word was received by Henry J. Waddie, 51 Markland street, Hamilton, manager of the Canadian Drawn Steel Company, that his nephew, Norman Waddie, M.M., had been killed in action. Pte. Waddie enlisted in the Imperial army in Edinboro', Scotland, and was awarded the medal on March 21 for distinguished gallantry. Only a few days after, about the first week of April, he was killed. He is the seventh connection of Mr. Waddie to give his life for his country.

**W. H. Farrell**, terminal superintendent of the Grand Trunk Railway in Toronto, has been offered and accepted the position of general manager of the Algoma Eastern Railway Co., with headquarters in Sudbury. Mr. Farrell will have charge of the line from Sudbury to Little Current, and will assume the duties of his new position on July 1st, Mr. Farrell has been in the Grand Trunk service thirty-four years, for twelve of which he has been superintendent of the Toronto terminals. The new general manager, like almost all successful railwaymen, started at the bottom, and by his untiring devotion to duty worked his way up to his present position.

## TENDERS

The Department of Public Works, Ottawa, will receive tenders endorsed "Tender for Repairs to Pier at Cobourg, Ont.," until 4 p.m. on Monday, June 17, 1918, for the construction of repairs to the Langevin pier at Cobourg, County of Northumberland, Province of Ontario.

**Petrolia.**—Tenders will be received up to Monday, June 17, 1918, for construction of three bridges for county of Lambton. Plans may be seen after June 8, at the residence of John McCallum, County Highway Commissioner, Alvinston, Ont., and at the offices of A. S. Code, Alvinston, Ont., County Clerk's office, Sarnia, and Town Clerk's office, Petrolia, Ont.

## TRADE GOSSIP

**Changing Offices.** — The British-America Nickel Corporation, Ltd., have sent out notices to the trade that they are removing their offices from Toronto to the Citizen Building, Sparks Street, Ottawa.

**Galt.**—Repair work will shortly be undertaken on the bridges over the Grand River. Seven steel spans were damaged by the ice during the spring floods. E. H. Darling of Hamilton will have the work in hand, although the work is already under way in charge of W. C. Greenfield, structural steel erector.

**Winnipeg.**—The Canadian Northern Railway will spend in the neighborhood of $2,000,000 in improvements and the construction of new branch lines this year, according to an announcement made here. Almost all of this work will be done on lines west of Port Arthur and a great deal of it in Saskatchewan and Alberta.

**A Question of Cars.**—Speaking of the coal supply, one authority writes: That coal cannot be satisfactorily stored, as it is so bulky that the investment in space would run into a prohibitive cost. Besides, bituminous coal is liable to spontaneous combustion or deterioration, therefore the mine operators require a steady stream of cars to remove the coal as it is mined. When these cars are not at the mines when the men arrive for work they see it is no use and go home. Thus the day's work is lost. If the men lose several days in a week they demand higher wages. The situation is, therefore, put up to the railways, and their management of it this year will be a severe test of the new government control. If it wins out the cause will have achieved a great triumph.


**Hydro Electric Power For Sale**

THE Pembroke Electric Light Company has a surplus of 1,200 to 1,500 H.P. Rates approximate $18.00 per H.P. per annum for twenty-four hour service.

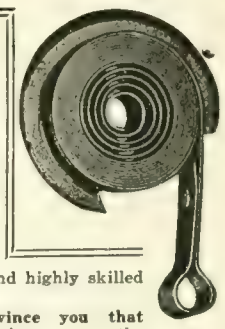
Good labor conditions. Liberal inducements to manufacturers. C.P.R., G.T.R., and C.N.R. connections.

Industries requiring female labor especially desired.

Write

The Secretary, Board of Trade
(23) Pembroke, Ont.

'Barnes-Made' **Springs**



are unusual in service and wear.

They are the result of sixty years' experience, unsurpassed equipment and highly skilled workmanship.

A trial will convince you that "Barnes-Made" Springs are the best buy.

Established 1857
THE WALLACE BARNES COMPANY
218 South St., Bristol, Ct., U. S. A.
Manfrs of "Barnes-made" Products
Springs, Screw Machine Products, Cold Rolled Steel and Wire

**Prompt Deliveries**
on Gauges, Tools, Dies, Jigs and Fixtures
**Special Machinery**
CUT GEARS
Contracting and Repairing Machinists
Quotations cheerfully submitted.
**Normac Machine Co.**
55 Vine Street, St. Catharines, Ont.

STERILIZED WIPERS
NO LINT
E. PULLAN WIPERS & WASTE CO. LIMITED TORONTO

KINDLY MENTION THIS PAPER WHEN WRITING ADVERTISERS

**Conciliation Boards.**—The Minister of Labor has established boards of conciliation to deal with the dispute between the British Columbia Electric Railway Company and its employees and with the dispute between the Canadian Northern Railway Company and its freight clerks, etc., members of the Brotherhood of Railway Employees.

**Order Causes Alarm.**—Dealers in high priced automobiles are face to face with the prospect of closing up shop. This will be the result, if the order-in-council prohibiting the importation of cars valued at over $1,200 goes into effect. Jewelers, fruit dealers and imported rug dealers are also vitally interested in the order that will stop these commodities coming into Canada. All admit that the proposal has come as a "bolt from the blue." The fruit dealers, who declare that the measure will have a tremendous effect on their business will hold a meeting as soon as the terms of the order are made public.

**Increased Output.**—Efforts are already under way to relieve the coal situation in the Canadian West. In Alberta a large increase is noted in the amount of coal mined and exported. A report just issued states that the total amount of domestic coal mined in 1918 during January, February and March amounted to 810,972 tons, as compared with 744,700 tons mined last year during the same period. In the bituminous field the amounts were 712,313, as compared with 650,319 tons mined last year. Anthracite was 39,409 tons in 1918, as compared with 37,817 last year.

**Will Rebuild Enderton Block.**—C. E. Enderton announced that the Enderton block, corner of Portage avenue and Hargrave street, Winnipeg, which was partially destroyed by fire last winter, will be rebuilt this summer. The restored building will be practically a replica of the original. The restoration wil cost about $200,000, it is estimated. Owing to the high cost of material and the difficulty of securing it, the work will be done by day labor, and W. A. Irish, contractor, has been placed in charge of the work. The block will be ready for tenants by the autumn.

**Patents Issued.**—The following is a list of Canadian patents recently issued through the agency of Messrs. Ridout & Maybee, 59 Yonge Street, Toronto, from whom further particulars may be obtained. H. E. Angold and Wm. Duddell, distance operated mechanisms and signals connected to electric supply systems; Wm. T. Bell, Leonard W. Jones and Wm. H. Watson, motor plow; Wm. J. P. Cloakey, dust collector; Wm. Hooker, atmospheric gas burner; H. and A. Saunders, safety catches for brooches and the like; Henry P. Baird, air moistening and filtering attachment for radiators; Shurly-Dietrich Co., Limited, saw blade; G. & J. Weir, Limited, control device for rotary pumps; Gutta Percha & Rubber, Limited, the manufacture of sheet rubber; the Williams, Greene & Rome Co., Limited, reversible cuffs.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The old established firm. Patents everywhere. Head office Royal Bank Bldg., Toronto. Ottawa office, 5 Elgin St. Offices throughout Canada. Booklet Free.

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PORTABLE PLANERS
DRAW CUT SHAPERS
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BERTRAMS LIMITED
Engineers
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PAPER MILL MACHINERY
and
MACHINE TOOLS for IRON WORKERS
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BLACK DIAMOND OVENS
OVENS
Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal.
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Write for Booklet.
Brantford Oven & Rack Co., Ltd.
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Allatt Machine & Tool Co.
107 Adelaide St. West, Toronto, Ont.
Phone Adel. 908
Cutting-off and rough facing machines for 6-inch shell.
Repair parts for Williams type 6-inch R -off machines.

PLEWES Limited
WINNIPEG
For All
Machinists' Supplies

Scandinavia Belting
Is a Good Belt for Dusty Places

In cement plants, saw mills, grain elevators, and lots of dust-trap belts, Scandinavia belts are very satisfactory for the mill operators.

You know how wearing grit is to a belt, and you want a belt that will not come apart when only partly worn through.

"Stand-laval" belts are of such a kind that there are no plies to come apart it is solid woven. We have seen these belts still giving good service when the thickness was half worn through, and on the pulley side of the belt there were no frayed ends the surface of the belt was smooth.

Mr. Plant Manager, you know what this means. If you require a belt for operating in a dusty place, let us ship you one, please. It will be a pleasure to us both.

Federal Engineering Co., Limited
172 John Street, Toronto

Note—Do not use "bar" or "stick" belt dressing on textile belts.

METAL STAMPINGS

We are manufacturers of stamped parts for other manufacturers.
We do any kind of sheet metal stamping that you require. Our improved presses and plating plant enable us to produce the finest quality of work in a surprisingly short time.
We can finish steel stamping in Nickel, Brass or Copper
Send us a sample order.

W. H. BANFIELD & SONS
372 Pape Avenue, Toronto, Can.

# CLASSIFIED ADVERTISING SECTION

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WANTED—MECHANICAL AND ELECTRICAL [illegible] Write [illegible] Canadian (c24m)

WANTED—EXPERIENCED DRAUGHTSMEN [illegible] Canadian Machinery. (c24m)

WANTED—DRAUGHTSMAN JUNIORS, ON [illegible] state age, experience, [illegible] Apply Box 403, Canadian Machinery. (c3m)

FOREMAN WANTED, ENERGETIC, ACTIVE [illegible] particulars as to age, experience, nationality and [illegible] Box [illegible] Canadian Machinery. (c24m)

WANTED PRACTICAL WORKS FOREMAN, [illegible] well experienced in the manufacture of gasoline [illegible] to handle men to get production in machinery manufacture. State age, experience and wages expected. Box 429, Canadian Machinery. (c25m)

PRACTICAL WORKS SUPERINTENDENT with high mechanical and executive ability; competent to handle men to get production in machinery manufacture. State age, give references and wages expected. Steady employment for right man. Apply Box 434, Canadian Machinery. (c27m)

FOUNDRY FOREMAN WANTED FOR IRON foundry, making engine castings and intricate cored work, a first class foreman. Must be thoroughly up-to-date in modern labor-saving methods, and capable of producing high grade [illegible] Shop and appliances unexcelled, best of position furnished. Apply to Box 433, Canadian Machinery. (c27m)

WANTED—CHIEF ENGINEER FOR MANUfacturing plant; a master mechanic, capable of [illegible] charge of boiler room and [illegible] repair department, must be able to handle men. Apply Box 440, Canadian Machinery. (c26m)

MECHANICAL ENGINEER TO TAKE CHARGE of production in small plant manufacturing machine tools, must be technical man, with drafting room and shop experience, excellent opportunity for advancement with progressive firm. State full particulars and salary expected in first letter; quick engagement essential; replies confidential. Box 437, Canadian Machinery. (c26m)

FIRST-CLASS FOREMAN FOR TOOL DEpartment must be capable of making detail drawings and practical experience on punch and dies. Apply Box 438, Canadian Machinery. (c25m)

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# CANADIAN MACHINERY

## AND MANUFACTURING NEWS

A weekly newspaper devoted to the [illegible]

Vol. XIX. TORONTO, JUNE 20, 1918 No. 25


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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Volume XIX No. 25

June 20, 1918

USE OF CUTTING FLUID ON WELLS SELF-OPENING DIE.

# CUTTING FLUIDS AND THEIR APPLICATION

By J. W. Morrison

SINCE the introduction and use of high speed steel great improvements have been made in machining processes and many alterations in machine design have occurred for the purpose of increasing production. Changes and standardization of tool shapes and arrangements have been made, and indeed practically no department of this important subject has failed to make considerable advancement.

In the case of cutting fluids, as used in machining operations, however, though notable progress has been made it has not kept pace with other phases of metal cutting, many shops still clinging to ideas of tool lubrication that were in vogue many years ago and long since abandoned by the more progressive factories. Indeed, many shops still do much metal cutting dry, no lubricant of any kind being used, except perhaps for finishing or threading.

### Advantages Not Recognized

It is well known, of course, that if a first class job of threading or forming is to be done, cutting lubricant, in most cases oil, must be used, but that great gains may be secured by the use of a cutting fluid in all steel turning and cast iron is not so generally understood. As a rule, too, it is recognized that a cutting lubricant should be used on turret lathe and screw machine work, but it is not so extensively appreciated that equally as great, or even greater, advantages may be realized in the same way on all turning and other similar operations.

Interesting proof that such conditions exist is found in the report of a canvass made for the purpose of securing data on the use of cutting fluids. The answers to the questions sent out show that of thirty-eight answering the inquiry as to the best lubricant for cutting steel, brass and cast iron, only, twelve made mention of brass and eleven of cast iron. The answers to the question as to whether a cutting fluid reduced the power required and if the action was simply that of a coolant were, in the main, answered vaguely, or not at all. As a matter of fact some declared that power consumption was reduced and others were equally positive that it was not.

Eleven years ago F. W. Taylor, in a paper entitled "On the Art of Cutting Metals," read before the American Society of Mechanical Engineers, declared that "the copious use of a cutting fluid properly applied makes possible an increase in cutting speed of 40 per cent. when turning steel, and 16 per cent. when turning cast iron," and it is surprising, in view of this very explicit statement, made so long ago, that the use of cutting fluid is not more general and its economies more widely recognized. As Mr. Taylor pointed out, experiments to discover the best tool shapes and other similar matters, such as tool pressure, difficult of determination, have not served to effect a gain of more than 2 to 5 per cent., whereas the determination of the value of cutting lubricant is a simple matter and makes for far larger economies. It is also interesting to note that while the gain of 40 per cent. cutting speed in the case of cutting steel was with high-speed steel tools, yet there was a gain of 33 per cent. when self-hardening steel was used and 25 per cent. gain when carbon steel tools were used.

### Stream Lubrication

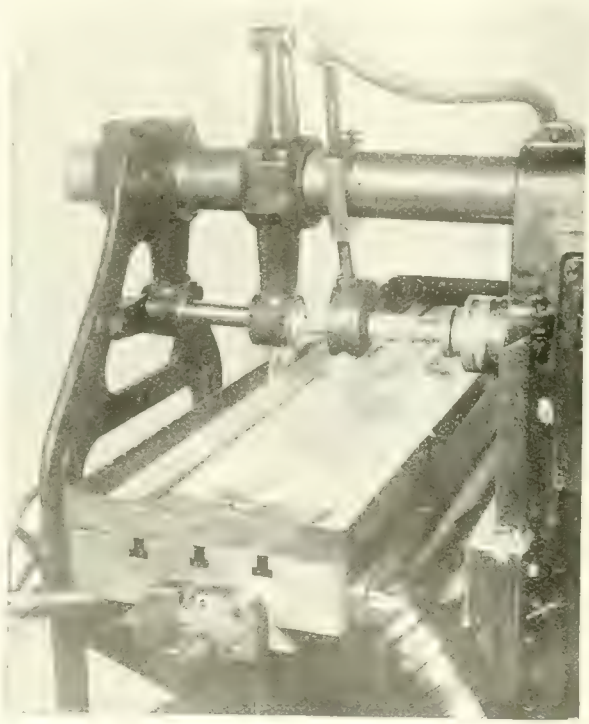
Undoubtedly the most conspicuous demonstration of the efficacy of cutting fluids in increasing cutting speed is that resulting from stream lubrication as practised by the Cincinnati Milling Machine Co. This system of tool lubrication consists of flooding the cutter with a cutting lubricant applied at the rate of about twelve gallons per minute and at a much higher pressure than is customary. This system effectually prevents any appreciable heating of the cutter and thus permits much higher cutting speeds than previously obtained in milling practice, the increase in cutting speed being from eight to twelve times greater. The advantage of lubricant in this case is suf-

as to when and where to use cutting [illegible] to the choice of the kind to be used we find an even greater diversity of opinion and practice. For example, some factories use a high grade cutting oil for all cutting requirements, others mix the oil with kerosene or a mineral oil, and still others use a cutting compound. Factory conditions such as kind or type of machinery, material cut, etc., differ, and of course call for differing treatments, but these will not entirely reconcile the divergent practice. The canvass, already mentioned, brings out this difference of opinion in a very instructive manner. Out of thirty-eight answers to the question of the best lubricant to use on steel, cast iron and brass, there were seven different recommendations for steel and eight for cast iron; some advocating lard oil, others a mixture of oils, and some favored a water mixture. This disagreement still further indicates the lack of unity in practice and is evidence enough that the subject has not as yet received the thorough study and investigation which it merits and is absolutely necessary if it is to be as well understood as other phases of metal cutting. For example, the uses and limitations of high speed steel are very well known, but cutting fluids have never received a general investigation that in any way approaches that accorded high speed steel.

The recommendations of different manufacturers of cutting fluids do little to unify or clear the subject since they very frequently overlap and often are not substantiated by sufficient data. Undoubtedly some of this difference is due to excessive enthusiasm, but the greater part are based on a partial knowledge and statement of the case. For example: the advocate of a water mixture may state that his material works successfully for threading, and while this is undoubtedly true for some kinds of work yet such mixtures are not universally satisfactory for this work when the thread is large and must be made to close limits with a good finish. The claims of the advocates of "mineral lard" oils as well as cutting compounds and soluble oils are often identical, and in many respects serve no other purpose than to confuse the user.

### Investigate Relative Value

An investigation of this subject in a shop should definitely determine the relative value of the different kinds of [illegible] fluids for the work being done and the best manner of applying and using the fluid. Such an investigation should be made of all the cutting operations which are carried on to any considerable extent. For example, if turned and threaded bolts are made in considerable quantities they will merit a special investigation. Similarly forming work will also require special attention, for the most economical cutting fluid in the case of bolts obviously will not be at all satisfactory for difficult forming. Similarly, even on the same kind of work it may not be advisable to use the same cutting fluid on a high speed automatic machine as a hand machine, for the lubricant will enter the bearings of the automatic, and unless it possesses considerable lubricating properties, will cause excessive wear and must be rejected on this account, even though it may be very satisfactory as far as the work to be machined is concerned. Thus the investigation must not only take into account matters pertaining to the actual metal cutting but also various other local conditions. For this reason a general investigation can never serve to cover completely every possible condition even on the same material, but the principal value of such investigations lie in the fact that they furnish an advanced starting point for more detailed studies and save much preliminary work.



STREAM LUBRICATION DEVELOPED BY THE CINCINNATI MILLING MACHINE CO.

### Properties to Consider

In making a comparative study of cutting fluids, there are numerous properties that must receive attention, and these are:—thermal lubrication, cleanliness, acidity, evaporation, tendency to cling to chips and work, and if a water mixture is used, such as a soluble oil or cutting compound, consideration must then be given to the stability and ease of making up the solution.

Considering these items in some detail it is found that the thermal properties are among the most important, for the tool must be kept cool if it is to do maximum work, and in many cases it is also important that the work be kept cool as well. The fluids containing a large proportion of water are naturally the most effective coolants, while oils are much less effective distributers of heat. An oil will absorb only about half as much heat for the same temperature rise as a water mixture.

Good lubricating properties are also essential since this plays an important part in some kinds of cutting, as already pointed out. In many instances the lubricating property is essential to securing a good finish of the work. Additional to this it is important because of its effect upon the machine for the cutting fluid will tend to wash the lubricating oil away, especially if it is strongly alkaline, and thus cause rapid deterioration of the machinery.

Cleanliness of the cutting fluid has much to do with the general appearance of the shop, but possesses particular importance because [illegible] of the workman. Some fluids tend to retain dirt, dust, fine cuttings, etc., in suspension, while others quickly throw it down when they become quiet. Oil is particularly inclined this way, and some plants have found it advisable to instal purifying apparatus. This sterilizes and filters the oil and restores it to nearly the original condition and value. From the standpoint of its value in cutting properties the cleaning process is valuable, for it is scarcely necessary to say that oil is more efficacious when clean than when laden with impurities.

A cutting fluid having a strong acid reaction is injurious to the machinery, and is likely to be so to the operator.

The rate of evaporation has a direct effect upon the consumption of cutting fluid and therefore upon its cost. The thermal properties of the liquid have a bearing here, for unless the fluid has large heat-absorption capacity its temperature will rise and rapid evaporation take place. In the case of water solutions the evaporation loss is easily replaced by adding more water, but when oil is used more material must be added to make up for this loss. When the cutting is quite heavy and oil is used the evaporation loss is often considerable, and in all cases should be thoroughly investigated.

### Loss via Chips

Then tendency of a cutting fluid to cling to the chips is of importance, for in this way much of it may be lost from being carried away on the chips and work. By the use of a centrifugal oil extractor practically all of the fluid

clinging to the chips may be saved provided the chips are in such shape that they can be placed in the extractor. This cannot always be done in the case of the work, on account of its size, etc., and much of the fluid may thus be carried away. This tendency is much more pronounced in the case of oil than a water mixture, and as a matter of fact it will probably not pay to attempt the extraction of the latter. The extractor cannot fully recover the oil in the chips and this loss must be figured into the cost of using any fluid. It will be sufficient to cite but one instance to demonstrate that the loss from this source may not only be appreciable but a very large factor in the cost of using a cutting fluid. When using kerosene as a cutting fluid it has been found that 140 pounds of chips from a lathe will contain as much as a gallon of oil, and since a lathe can make at least 2,000 pounds of chips per day the loss of fluid from this source may easily amount to as much as $1.50 per day per machine, which is certainly well worth considering. A fluid such as lard oil will cling to the work and chips in much greater quantities than kerosene, and this, in addition to the fact that oil is far more expensive, simply serves to emphasize the importance of this item in a cost analysis.

When a water solution such as soluble oil, cutting compound, or soda water is used, the ease with which the solution is prepared is also a matter of importance, for there is often considerable difficulty, particularly in cold weather. Some of these materials readily enter into solution with water, while others require considerable stirring. If the water is cold, as in the winter, this trouble is often accentuated, and in some cases hot water must be provided. Most soluble oils are readily mixed with water and very much more so than the cutting compounds, and both of these are much more readily prepared than soda water mixture. Oils, of course possess a great advantage in this respect since no mixing is required, and this characteristic should always be given consideration in all cases. The writer has seen some soluble oils that in winter would go into solution only after very prolonged stirring.

### Water Solutions

The stability of water solutions is a matter of no small moment for these cutting fluids differ widely in this particular, some being so unstable as to make them almost useless. Undoubtedly every one familiar with shop practice has noticed how difficult it is to keep soda water solutions in proper condition, due to the tendency of the oil to separate; the oil coming to the surface gathers dirt, dust, etc., and takes the form of a scum on the surface of the settling tanks. This of course weakens the solution, may make it unequal to the demands of the work, or, if the solution is still satisfactory, the excess oil is wasted.

Cutting compounds sometimes act in somewhat the same way, while soluble oils occasionally separate and form a jelly-like mass, the solution becoming nothing more than a slightly colored water, useless for cutting purposes. This failure may occur very soon after mixing has been completed or it may not be for several days. Such failures add to the expense of using the fluid in many ways, such as delays and frequent renewals, all of which is unnecessary expense. The writer does not wish to be understood as being opposed to the use of such cutting fluids as a class, for he has often found their use both economical and decidedly advantageous from an operating standpoint.

### Lard Oil Versus Others

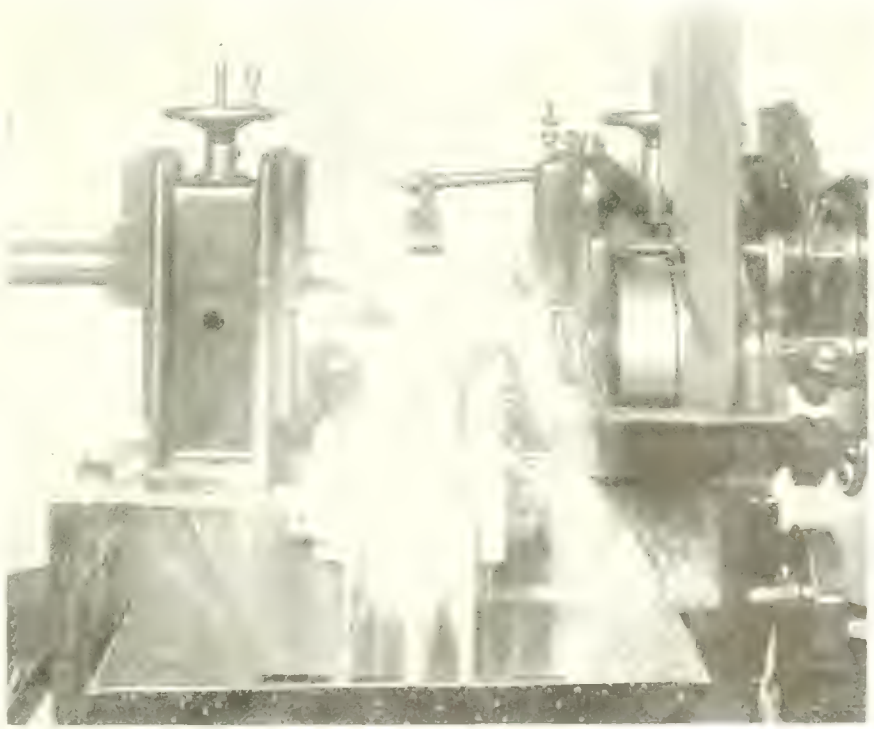
These properties of cutting fluids are those which determine their value and should be thoroughly investigated in each and every case where selection is to be made for a particular purpose and the relative value of various kinds and brands established. In a degree, selection is always made on this basis, but as a rule many of these characteristics are not distinctly recognized and so are seldom given proper weight. However, the need of a more careful selection is daily becoming more apparent and this demands accurate knowledge of the different cutting fluids that their value be placed upon a more definite and comparable basis. There is a well established tendency in many shops to use a first-class lard oil for all cutting purposes on the basis that it is safe and will be certain to prove satisfactory. It is true that this policy now proves satisfactory, but would it if the users had exact knowledge of its relative value? It is perfectly safe to say that in many instances it would not be found altogether acceptable. Already in this paper it has been pointed out that a cutting compound will sometimes replace oil and make a considerable increase in the output of the machine. This is simply an example of the advantages always secured from complete information as compared to partial knowledge. Any investigation of this subject should be as complete as circumstances will permit, and every effort made to reduce the performance to a definite and concrete basis as possible, thus furnishing opportunity for an intelligent choice.

The different kinds of cutting fluids are legion, but the great majority are little used. In general there are four classes of cutting fluids in use yet, while they have some features in common, each forms rather a distinct class. These four classes are—oils, cutting compounds, soluble oils, and so-called soda water. All four are very widely used in machine shops.

### Oils

Beginning with oils, those in more common use are lard oils of various grades, so called mineral lard oils, and mixtures of these with various other oils such as parafine, engine or kerosene oils. These latter being much less expensive than the base oils in the mixture are used on this account and serve to dilute and decrease the cost per gallon of the mixture.

The best lard oils are very expensive and are most frequently used on highly automatic machines, etc., and for difficult threading and forming. In these uses its good lubricating properties play an important part. The manufacturers of the mineral lard oils claim equal merits for their product, but the choice should always hinge upon definite knowledge rather than habit or guess or upon



STREAM LUBRICATION DEVELOPED BY THE CINCINNATI MILLING MACHINE CO.

the recommendation of some one not entirely familiar with the prevailing conditions. In general oils heat up readily and so are not the best of coolants, but in lubricating properties they are usually very fine and are not injurious to the machines. All oils do, however, have a very considerable tendency to keep impurities in suspension, thus deteriorating their quality and endangering the health of the workmen. Oils are sometimes unduly acid which is injurious in every way to the machines and workmen alike, but this defect seldom occurs with good grades. Steel, when finished with oil as a cutting fluid usually has a dull lustre.

### Cutting Compounds

Cutting compounds are usually white, or brownish white, in color, and of a somewhat greasy nature. An analysis shows they consist almost entirely of water, soft soap, mineral and animal oils. The water content of a good quality will run from 30 to 35 per cent., soft soap 20 to 25 per cent., mineral oil 18 to 20 per cent., and animal oil 15 to 20 per cent. The writer has known of some compounds running as high as 60 per cent. water, but this occurs only in the very poorest grades. From this it is obvious that much of the purchase price goes for water, and when using this material care should be taken to see that the percentage of water does not run over that agreed upon in the beginning and at the same time the tests were made. It is also very desirable to check the other constituents as well.

### Purchase to Specification

Such material should always be purchased to definite specifications. This material, mixed with water in varying proportions, to meet differing needs, ic widely used for many different machine shop operations. Containing as it does a large percentage of water it is a good coolant and very inexpensive as compared with oils, but its lubricating properties are much less.

The ease of mixing and stability of the solution varies with the different brands, and in some cases with the temperature of the mixing water, some kinds having a tendency to separate in cold water. The evaporation on heavy work is rather rapid ,but this of course is not serious since more water can be added. In some cases the compounds become rancid, acquire a very disagreeable odor, and, being a menace to the health of the workmen, require frequent renewal. There are, however, many compounds on the market which are not affected in this way even in the hottest weather. The effect of the solution on the machine is of major importance, for it must not be such as to cause an absence of lubricant on the bearing surfaces as this will result in undue and unnecessary wear and other depreciation. While a cutting compound necessarily does not possess the lubricating properties of oil, yet in very many instances and on many kinds of work it does possess sufficient lubrication to keep machine wear at a proper minimum. Generally speaking, the solution is clean, about the only disagreeable features being its tendency to foam. Some manufacturers have what they call a non-foaming compound, but its qualities are usually not quite equal to those of the regular mixture.

To use cutting compound to the best advantage it is desirable to vary the percentage of water, depending upon the kind of work to be done, but while this somewhat complicates the use of the material, at the same time it is usually necessary in order to meet the requirements of the work and likewise to secure maximum economy. The determination of the proper mixture in every case is a matter for trial. The writer has found that compound can frequently replace oil on many kinds of work done on hand screw machines, and when this is possible a great saving is thereby effected. In one instance a saving of 85 per cent. in the cost of the cutting fluid was made in this way on a very few machines, the actual saving per year being over $430.00. The work produced consisted of very carefully made bolts, rings and other similar screw machine products, the work done when using compound being fully equal to that done with oil, the deterioration of the machines not being hastened and tool wear not noticeably increased. The feasibility of such a change is dependent upon the local conditions, and every case must be carefully investigated. As a rule the finish on steel is bright.

SIMPLE CUTTING FLUID SYSTEM FOR SMALL SCREW MACHINES

### Soluble Oils

Soluble oils are a widely used cutting fluid and are very successful in many instances. They consist of an oil, or a combination of oils, so treated as to make them soluble in water, the resulting mixture being white and closely resembling a cutting compound solution. As a rule they dissolve in water very readily and for this reason are very convenient for use. The oil itself is very expensive and therefore the mixture is often considerably more expensive than a cutting compound mixture. The thermal properties are much the same as those for cutting compounds, though there have been some brands on the market of very little cooling capacity. The lubricating properties of the mixture are, of course, dependent upon the proportion of oil present and varies with the differing formulae. The solution is clean, very rarely, if ever sufficiently acid to cause trouble, while the loss due to evaporation is of but little moment since it can easily be made up by adding more water.

The ease of mixing is usually such as to cause but little trouble, though there have been brands marketed which were almost impossible to dissolve, especially in cold water. The stability of the solution is usually all that could be desired, though the writer has known of soluble oils which would not stay in solution more than a very few days. After this they required renewal. This is a very serious matter from every standpoint, for the quality of the solution varies constantly and interferes with the machine operations and the frequent renewal makes the costs excessive. The mixtures must be varied with differing conditions and selection can be intelligently made only after a trial. The finish of the steel where such a solution is used is bright.

### Soda Water

The so-called soda water mixtures are very widely known and have been used for a long time, but on account of the various disadvantages connected with

this mixture are being replaced to a very considerable extent by other cutting fluids. Such a solution consists of water, an alkali such as soda ash, or sal soda, and a saponifiable oil such as a lard oil for example. The alkali reacts with the fatty acids of the oil, causing chemical action, the result being a white cutting solution similar in appearance to the other water solutions already described. The solution is used for screw machine work, drilling, milling, etc. The cooling properties are excellent, but its lubricating properties are practically nothing, and because of the presence of mu- alkali the machine wear is excessive. The free alkali becomes deposited upon the bearing surfaces, and because of its nature drives away the lubricating oil, causing rapid wear. This is a very serious matter and usually results in rejection when this is realized. A decrease in the quantity of alkali can of course be made, but the writer has yet to know of a case where the action described above did not occur in some degree.

The cleanliness of this solution does not compare favorably with that of other water solutions for it soon becomes rancid and has a dirty scum on the surface of the tank at all times. On account of the free alkali this solution is never acid, while the evaporation and consumption are about the same as for other water solutions. It is difficult to prepare on account of the trouble of dissolving the alkali and the necessity of very carefully proportioning the ingredients.

The stability of the solution is sometimes far from what might be desired for some of the oil has a tendency to separate, though when properly mixed this is negligible. The solution is used for the same class of work as the other water mixtures and the bright finish noted with their use also obtains here.

CUTTING FLUID ON THE NUTTER & BARNES AUTOMATIC [illegible] OIL MACHINE

### Greater Use Possible

As already noted the use of cutting fluids is yet in its infancy as far as general practice is concerned, for many make no use whatever of them, and but few to anything like the extent they might advantageously. The great need is a thorough investigation of the subjects that will cover different kinds of cutting fluids and the manner of using them, both as to quantity and kind of material and work to which they are adapted. Some users have undoubtedly made such an investigation to the extent their operations require, but such knowledge is not generally available and has therefore but a limited use as yet. The present critical times demand the utmost possible use be made of existing machinery and all such facilities, and this, together with economies certain to result, should be a sufficient incentive to cause all machine shops to investigate and give this subject their serious and studied attention.

## NEW FOUNDRY FOR DARLING BROS.

THE construction of the new grey iron foundry now being built for the engineering firm of Darling Bros. of Montreal, marks the third extension to their plant during the past two years. While the additional expansion has resulted from considerable activity in connection with government contracts the greater volume of business has come from the increased demands upon their ordinary lines of engineering specialities. Their present activities are treble that of three years back and it is anticipated that with the completion of the new iron foundry the pre-war business will be quadrupled. The foundry, which will be a modern reinforced concrete and brick building with a frontage of 96½ feet on Ottawa street, and a depth of 112 feet, is expected to be in operation in about two months, and will be, when completed, one of the most modern and up-to-date for its size in the country. The plant will be equipped with a 6-ton cupola and every modern facility for economic and rapid production, including a five ton Sprague electric crane and the latest types of molding machines. In addition to supply the castings for their own requirements the firm contemplate catering to the general trade.

## RECOVERING METAL FROM FURNACE FUMES

By M. L.

There has just been erected at Sheffield a plant for the recovery of metallic particles and other by-products from furnace fumes. It was discovered about 1906 that by passing gases containing dust of solid and liquid principle to various forms and types of industrial electrodes, charged with the high voltage of 50,000 to 100,000, dust and liquid particles could be carried over to one or other of the electrodes. Since that time the inventors of the process, which is of American origin, have not only successfully recovered valuable properties from waste fumes, but have also got rid of smoke and the smoke nuisance. Metals, such as zinc, silver, copper, lead and aluminum, have been recovered, besides coal-tar and other by-products of commercial value. The experiments made at Sheffield are yielding satisfactory results, and other firms in Britain are now beginning to instal the plant in an encouraging fashion. The British Government have made one installation. The installation appears to provide a thoroughly efficient remedy for the smoke nuisance, but the treatment of ordinary carbon fumes is unlikely to prove a profitable proposition, and for that reason the installation of the plant purely as a [illegible] within the realms of probability.

**The Trade Balance.** — Sir Thomas White, Minister of Finance, will again visit Washington for the purpose of discussing the exchange situation. He will confer with Lord Reading, British Ambassador in Washington, and with the United States Treasury Board. The Minister will leave almost imediately. Since the last conference was held on the question in Washington the Government here has taken certain steps toward curtailing imports. The amount involved in the embargo, however, is but infinitesimal as compared with the unfavorable balance of trade as between Canada and the United States, which is computed at about $400,000,000.

# Time Study Data: Methods of Analysis and Use

## Accurate Data Well Arranged and Classified Essential to Any Efficient Cost System —All Complex Operations and Processes Are Commendable to Analysis, Resolving Into a Small Number of Machine Operations

By M. H. Potter

There are two methods of making time studies. The old-style method, i.e., each job that goes through the shop has the watch held on it and the over-all time of the job noted. In the course of a year there will accumulate a number of records and the time required for each. This is in advance of the earlier method of guess work. Such a method of fixing the cost is slow and expensive.

The second method, which enables accurate data to be secured, is the method of analyzing all machine and work handling operations into the most elementary details, separating each particular part of an operation into its smallest elements and tabulating these together. The elements are then grouped into classes and filed in such a manner that any element of any particular class can readily be found when desired. It is then a comparatively easy matter to fix a time for a job which has never before been done in the shop, and the time so set will be accurate and fair alike to employer and employee. The method of consistent machine analysis will enable the manufacturer to accumulate in a comparatively short time an amount of time-study data which will be applicable to a large portion of the work in his shop. Every addition to these data will widen the scope of his time-study and rate-setting department.

### Method

This method of elementary analysis is practical, although at first sight it may not appear to be easy. The natural tendency is for a manufacturer to obtain first a study of the time required for the most important job or the job that recurs the oftenest in his shop. He is by this method making the biggest step forward in shop efficiency.

The building of a certain machine is a rather complex proposition, at least we will assume that it is, requiring the machining and assembling of a great variety of different pieces. Nevertheless every one of these many parts can be resolved into a comparatively small number of machine operations. Machine work can be divided into the following divisions: The turning or grinding of cylindrical surfaces, the planing or milling or grinding of flat surfaces, and the boring or drilling of holes. This gives us our first sub-division of our time-study element. We have a means of ascertaining with accuracy just how long it will take to produce the piece in the shop if we know the time required to turn a certain cylinder to a given diameter, to plane or mill its ends and to drill a hole through it. It is necessary to add the time required to put it in the lathe, planer or milling machine, and drill press, and also to remove it. We, therefore, first sub-divide our time studies by the machines on which they are made.

### Machine Study

Each machine should be studied in detail, in order that the various operations which can be performed upon it may be combined with one another to represent the sequence which is to be followed in producing any certain piece. The number of individual operations that a lathe will perform is comparatively limited. We may engage or disengage the back gears; we may shift the belt from one cone to another; we may change the feed gears; we may move the carriage along the ways; we may operate the cross-slide; we may set the compound rest; we may throw in or out the cross-feed; we may move the tailstock from one position on the way to another; we may set the tailstock over one way or the other for the purpose of turning tapers or make use of the taper turning attachment should the lathe have one; we may connect the cross-slide to it or disconnect it; we may put on or remove a steady rest; we may remove the face plate and put on a chuck; we may remove or replace head and tail centres; we may put in the tool post or remove from it one or another type of tool; we may start or stop the machine; we may engage or disengage the nut or screw cutting; we may advance or withdraw the tail centre. These operations represent practically everything that can be done with an engine lathe, yet the combination of these elements in varying sequences and numbers will enable us to perform pretty nearly any job which may come to that machine.

It is obvious, therefore, that the method of analyzing a machine and its handling time will be productive of real results in the shape of accumulated data more quickly than will any other method of time study. It is true that the machine operations must be analyzed and studied completely before the data can be used. A partial study will be of little value in setting a general run of tasks, for in all probability the particular machine item which may be needed in setting the task on a given job will be the one on which no time study has been made. The complete study of a large number of machines does not require such a great amount of time as might be imagined.

### Time Studies in Connection With Inserting and Removing Cutting Tool

We have seen how time-study data should first be sub-divided according to machines, and then according to machine operations. We will go into this detail a little more closely to illustrate how finely the different machine operations should be sub-divided before they are tabulated for recombination into elements forming complete jobs. One of the commonest operations which occurs in lathe work is the placing of the cutting tool in the tool post prior to cutting metal, and the removal of it from the post upon the completion of the machine operation. This is made up as follows:

Get tool from tray at end of lathe.
Measure height of tool.
Put packing in tool post.
Put tool in tool post.
Set tool in position.
Tighten tool-post set screw.

Removing the tool from the post is tabulated as follows:

Loosen tool-post set screw.
Remove tool to tray at end of lathe.

While the operation of tool handling is analyzed in the detail explained above, it is in practice put on the instructions issued to the men in the form shown. The value of the detailed analysis is this, that if the total time is questioned as being too long or too short we have available the elements which enter into its making up, and can easily ascertain in which particular part of the study the workman was at fault.

The principle remains the same, whatever the operation may be. There are many jobs the individual operations of which occupy many minutes, and if these operations are questioned the detailed analysis is always available to show what the workman is expected to do and how long each element should require. If a workman is unable to complete his job in the time fixed a comparison of his work with the detailed analysis—the watch being held while the comparison is made—will frequently show that he is exceeding the analysis time in one particular element only, and a correction of his work as regards this element will often bring his performance well within the time called for by the time study.

### The Combination of Individual Elements

Let us now return to the consideration of the combination of individual elements for the making up of a unit time for a job. In the first table which we cited, those giving the time for putting an ordinary turning tool in the tool-post, we have a list of elements common to any tool. In establishing unit times for handling different types of tools than the ordinary round-nose turning tool we have only to add to the elements for that tool these items which are different from the tool under consideration. We have already seen what change is made in the analysis for a square-nose tool. For a chamfering tool or a facing tool we have only to add to the analysis for the turn-

ing tool the item of setting the tool to a bearing. For a thread tool we have to add the additional item, "Set tool to thread gauge." Thus in determining unit times for handling any type of tool in the lathe we can simplify both the time study and the tabulation by first studying the handling of that tool which contains all the elements which the other tools require, and then studying those particular elements which are different in the remaining tools.

After having determined a series of elements of various characters, such as the putting of the tool in the tool-post, these can be combined with others similarly determined to form complete fundamental operations which enter into the completion of a definite job. Such a fundamental operation is the setting and starting of the cut. In the compilation of the time-study data with which I have been working the setting and starting of cuts on a great many different sizes of lathes and with a variety of cutting tools are tabulated as follows:

Put tool in post and tighten.
Start machine.
Set calipers.
Set cut by calipers.
Put in feed.

This tabulation is for the setting and starting of a cut with a round-nose rough-turning tool. In writing the instruction card, this item should be listed. "Set and start cut."

After the cut has been completed, if the tool is to be removed, the following items are taken together from the analysis to give the time for stopping the cut and removing the tool:

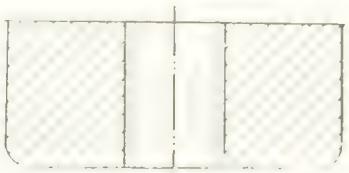
Throw out feed.
Run tool half-way back.
Run back carriage.
Stop machine.
Loosen and remove tool.

On the instruction card this item would appear "Stop machine, remove tool." If, however, the tool was to be run back to the beginning of the cut and an additional cut taken, we would use another set of items appearing in the same tabulation, as follows:

Set cut by calipers.
Put in feed.
Throw out feed.
Run tool half-way back.
Run carriage back.

It will be observed that in the last tabulation the same items appear as in the former ones, except that they are grouped slightly differently. The items of removing the tool and stopping the machine are omitted, as these operations are not performed when repeating a cut without removing the tool from the tool-post. These tables are a good example of how elementary time-study enables one to build up unit times for different operations. Having the data necessary to fix a time for setting and starting a cut, analyzed in the detail exhibited in the first two tables above, it is necessary to make a study of the time required for an additional cut. The man familiar with machine work can list without any trouble just what motions the lathe hand goes through in running his tool back and restarting the cut. These are as given in the table above. Having the time for these various items exhibited in the earlier tables, it is only necessary for him to set them opposite the items in the new table and total them; he then has the proper unit time for [illegible] additional cut with the same tool.

## SPECIMEN INSTRUCTION CARD



| | Prep-aration | Hand-ling work | Hand-ling tools | Ma-chine | Re-ing |
|---|---|---|---|---|---|
| 1. Removing face plate from arbor | X | | | | |
| 2. Put chuck on lathe | X | | | | |
| 3. Move tailstock back | | | | | |
| 4. Grip piece in chuck | | | | | |
| 5. True piece in chuck | | | | | |
| 6. Put rough-turning tool in post | | | | | |
| 7. Change feed and speed | | | | | |
| 8. Set calipers | X | | | | |
| 9. Set and start cut | | | | | |
| 10. Rough-turn dia. close to jaws as convenient | | | | | |
| 11. Stop machine, run tool post back | | | | | |
| 12. Change to rough facing tool | | | | | |
| 13. Move carriage to end of piece | | | | | |
| 14. Set and start cut | | | | | |
| 15. Rough face base | | | | | |
| 16. Stop machine, run tool post back | | | | | |
| 17. Change to finish-turning tool | | | | | |
| 18. Set and start cut | | | | | |
| 19. Finish-turn dia., close to jaws as convenient | | | | | |
| 20. Stop machine, run tool post back | | | | | |
| 21. Change to finish-facing tool | | | | | |
| 22. Set and start cut | | | | | |
| 23. Finish face base | | | | | |
| 24. Stop machine, move carriage back | | | | | |
| 25. Change to rough-boring tool | | | | | |
| 26. Set and start cut | | | | | |
| 27. Rough bore hole | | | | | |
| 28. Run carriage back, change to finish tool | | | | | |
| 29. Set and start cut | | | | | |
| 30. Finish bore | | | | | |
| 31. Run carriage back, stop machine, remove tool. | | | | | |
| 32. Turn piece end-for-end in chuck | | | | | |
| 33. True piece in chuck | | | | | |
| 34. Run carriage up | | | | | |
| 35. Put rough-turning tool in post | | | | | |
| 36. Set and start cut | | | | | |
| 37. Rough turn dia. | | | | | |
| 38. Run carriage back | | | | | |
| 39. Change to finish-turning tool | | | | | |
| 40. Set and start cut | | | | | |
| 41. Finish turn dia. | | | | | |
| 42. Stop machine, change to rough-facing tool | | | | | |
| 43. Set and start cut | | | | | |
| 44. Rough face end | | | | | |
| 45. Stop machine, run tool post back | | | | | |
| 46. Change to finish-facing tool | | | | | |
| 47. Set and start cut | | | | | |
| 48. Finish-face end | | | | | |
| 49. Stop machine, run carriage back, remove tool. | | | | | |
| 50. Remove piece from chuck to floor | | | | | |
| 51. Remove chuck | | | | | |
| 52. Replace face plate | | | | | |
| 53. Clean machine | | | | | |
| Preparation time | | | | | |
| Handling work | | | | | |
| Handling tools | | | | | |
| Handling machine | | | | | |
| Removing metal | | | | | |
| Total time for job | | | | | |

### Preparation of an Instruction Card

The application of the principles of elementary time study to the preparation of an instruction card for a job of lathe work will now be taken up. The instruction card shown in this connection is modified in form [illegible] pare the machine for receiving the work and restoring it to its standard condition after the job is done; handling time of the work itself—that is, the time required to place the work in the machine, remove it, and perform any manipulating which are necessary [illegible]

different classes of elementary times may be separated for purposes of illustration.

In all time study the work is divided [illegible]

truing, leveling, squaring, and similar operations; tool-handling time, or the manipulation of the cutting tools, putting them in the tool-posts, removing them, etc.; machine-handling time, which includes all machine manipulation, such as moving the carriage, changing speeds, setting and starting cuts and similar operations; machine time, which represents the time actually employed by the machine in removing metal. The first four sets of times are determined by elementary time study.

Referring now to the instruction card, we see that it calls for the machining of a cast iron piece, which is to be finished all over and have the hole in the centre bored. It is assumed that a roughing and finishing cut is to be taken for every operation, and that different tools are to be used for turning and facing. An inspection of the card will show that the first operation is the removal of the face plate, which normally remains on the machine and the replacement of it by a four-jawed independent chuck. The sequence of operations followed in machining the work is clearly shown by the instruction card, including the turning of the work end for end.

It will be noted that, although there are 553 different items listed, the actual number of operations performed is considerably less. A study of the card will show that most of the operations recur from time to time.

### Time Totals

Turning now to the totals, it will be observed from the time involved that considerable time is required to prepare the machine for the work and to clean it up after the job is finished. The interesting feature, in most cases, is that the machine is working only a little over 50 per cent. of the time. The importance of studying closely the manipulation both of the machine and of the work; second, the value of time study in increasing the relative producing time of the machine, is obvious.

The mere fact that there is a standard by which the performance of the workman can be measured will in itself tend to increase the effort of the man to do his best. The standard being present, any failures can be investigated, and that particular point wherein the man failed can be pointed out to him and corrected.

## ITALIAN CHEMIST PROPHESIES "DAY OF LIGHT"

WHEN the rays of the sun strike the green leaves of a plant, carbonic acid gas and water vapor or moisture are gathered in from the air and these within the remarkable laboratory of every green leaf are turned into sugar. At the same time oxygen is set free, back into the air. The reaction requires heat, and the sun's rays provide it.

The plant operates other chemical factories and these transform sugar into starch, which is stored in the seeds to feed each sprouting plant until it gets big enough to grow green leaves and make sugar and starch for itself. Starch is also transformed within the plant into gums and cellulose, and the structural basis of wood is cellulose. Please observe also that the sun provides the heat for all of these reactions.

### Fuel Combustion

When we burn wood or coal we reverse the process; we drawn upon the oxygen that has been set free into the air when this or some other tree grew and we combine or burn it with the carbon acid gas and water again. That is the great cycle of vegetable life, beginning with carbonic acid gas and water and ending in carbonic acid gas and water. The reversed reaction gives off heat instead of requiring it, and that is why we burn wood or coal: to get the heat back that the sun provided long ago. White smoke is mostly steam and carbonic acid gas. Black smoke is mostly carbon that got frozen out in the fire or couldn't find oxygen enough to combine to carbonic acid gas again.

Professor Giacomo Ciamician, of Bologna, in an address before the Eighth International Congress of Applied Chemistry, asked why we use only the fossil energy of the sun—which is what we do when we burn coal. Why not get the power direct? If plants do this thing, he insisted there must be a way. There is plenty of water, it is easy to make carbon dioxide, and there is the sun. The point is, of course, to make available the radiant energy of the sun's rays and put it to use, which the plants can do and we cannot—as yet—for lack of adequate research. The professor felt sure, however, that this riddle will be solved some day, and then he made computations as to what we may do after the way has been discovered.

Using the sun for only six hours of every twenty-four on desert lands, and making generous allowances for good measure and waste, he concluded that the sun would deliver in energy taken direct from its rays, instead of by our roundabout method of recovering it by burning coal, the daily power value of 2,500 tons of coal per square mile. We mine in the United States about 600 million tons of coal a year. The desert of Sahara alone receives every day in solar energy the equivalent of six billion tons of coal.

### Looking Forward

Then he showed a long list of photochemical processes which indicate progress in research towards "The Day of Light,"—towards sun power. He prophesied that in time tropical countries will be thickly populated, that on their arid lands there will spring up industrial colonies without smoke or smokestacks but with forests of glass extending over their plains and glass buildings everywhere. Inside of these will take place those processes that are still the guarded secrets of trees and grass. But when these are mastered human industry will make them bear far more than nature does. Nature is not in a hurry and mankind is.

So some day it may not even be necessary to use fuel any more or to worry about the supply or the price. With this enlightenment, when it comes, we shall not need coal, so long as the sun shines. And when the sun ceases to shine we shall not want anything at all. Maybe the man who would shortly have made this discovery has been killed in the war!—*The Little Journal.*

## CARBONIZING COMPOUND IS IMPROVED BY ENGLISH CHEMIST

Charcoal with barium carbonate as "actifier" is well known as a case-hardening compound, but in its ordinary form has many disadvantages. On the other hand it gives a high carbon content to the surface of the work, which is a very desirable feature.

The objections to the old form of the compound were chiefly that the barium carbonate and the charcoal were mixed by various mechanical means. Barium carbonate being much heavier than charcoal, the two always separated in the pot whilst in use, and to a certain extent before use, owing to the handling of the bags. The result of this was that the barium carbonate collected in the bottom of the pot making a large amount of dust, and at the same time ceased to be an actifier to the charcoal on top, thereby causing patching work, i.e., one part of the article was sometimes harder than another.

The importance of this is obvious, and has frequently been the cause of trouble in various types of machinery, and efforts to overcome the difficulties of mechanical mixture, whereby the carbon is impregnated with a soluble salt of barium or calcium and is converted into the carbonate by a later process, have resulted in the preparation of a compound named "Munsite" after its inventor, Leonard C. Munsite, an English chemist and metallurgist.

By this process the barium is held in the charcoal so that it is impossible to separate them, dust is reduced to a minimum, and tarnish is avoided. As barium carbonate is infusible, it does not separate after heating and the much-wanted uniform hardening is obtained.

THE latest claimant to economic fame is the Australian cactus plant. Prominent British investigators are of the opinion that the luxuriant growth and capacity for starch production possessed by this plant may ultimately result in its becoming a world source of alcohol when conditions render the universal use of this fuel inevitable for internal combustion engines of all kinds.

**J. R. Baxter and Co.** have acquired the sole selling rights in Canada and the United States for the "Desy" line of special shell machinery.

# Producing Sound Steel With Special Ingot Molds

## The Inventor of the Gathmann Ingot Mold Advocates the Elimination of Blow-holes by Allowing the Formation of Piping at the Upper End—Many Molds of the Type Described Have Been in Use With Satisfactory Results

By Frank C. Perkins

THE accompanying illustrations, Figs. 1 and 2, show a train of Gathmann 20 x 24 x 80-inch ingot molds and a one-ton ingot made on the big-end-up mold, while in drawings Figs. 3 and 4 may be noted the details of construction of the Gathmann molds. The photograph Fig. 5 shows two ingots cast in a standard mold and in a differential mold, the former having a piping discard of 27.3 per cent. and a blow hole discard of 41.2 per cent., while the ingot cast in the differential mold shows a piping discard of only 5.17 per cent. and no blow hole discard whatever. In the photograph Fig. 6 may be seen split ingots made in Gathmann mold and also in a regular type of mold. In considering the commercial production of sound, homogeneous steel ingots and blooms, Engineer Emil Gathmann has found that there is a decided difference of opinion among the producers of steel as to what constitutes commercially sound steel.

He says: "Some metallurgists insist upon having, for certain grades of steel, a so-called "open steel," i.e., one which contains numerous blowholes of varying sizes, and consequently but little volume of true pipe, although a central intermittent shrinkage cavity often extends well down into the ingot. Such blowholes and pipe are expected to weld up during rolling or forging, because their surfaces are not oxidized. Even if this be admitted, included slag particles and a high degree of segregation are bound to be present in the product of such ingots. Blowholes are the result of an oxidized heat, and all heats, unless made or finished in the electric furnace, are oxidized more or less. Subsequent deoxidation, or rather degasification, either in the ladle or in the mold, or in both, is necessary to reduce or prevent blowholes. As is well known, a greater yield of billets or sheets is secured from the ingot by allowing the formation of blowholes, but this is undoubtedly obtained at the expense of the quality of the product. Decided segregation of carbon, phosphorus, and sulphur, as well as small included slag particles, undoubtedly exists throughout the greater portion of all so-called open steel and cannot be removed by cropping."

FIG. 1- TRAIN OF GATHMANN 20 x [illegible] INGOT MOLDS.

Engineer Gathmann further maintains that "the first requisite for sound, homogeneous steel ingots and blooms is, therefore, in my opinion, so to treat the steel in the furnace, ladle and mold that "piping" steel is produced. The line of demarcation between harmful and so-called "harmless" blowholes is practically impossible to define. Is it not, therefore, the better and safer practice to use means for the elimination of blowholes and correspondingly reduce the segregation and allow the formation of a well-defined shrinkage cavity or pipe at the upper end of the ingot? With the relatively cheap deoxidizers available at the present time, e.g., ferro-silicon, aluminum and titanium, there is no commercial reason why all steel should not be thoroughly degasified."

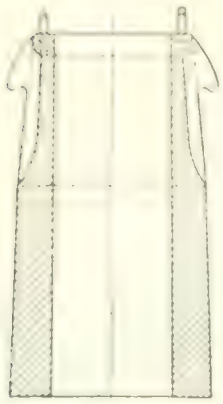
### Theory of Mold

The inventor of these special molds claims that a degasified steel being provided, the method of freezing or solidifying the liquid steel into an ingot, and the subsequent working into blooms and thence into various products, is of great importance in reducing the crop or scrap portion of the steel, due to segregation and pipe. How to accomplish this reduction at a minimum expense and without upsetting the administrative mill practice of present plants is the problem. It has been my experience that the solidifying of an ingot made from steel which has been practically deoxidized or "killed" in the ladle or in the mold depends upon the shape of the horizontal cross-section of the ingot at its various planes from top to bottom, and also upon the thickness and consequent heat-absorptive power of the various parts of the mold walls. An ingot with its larger horizontal cross-sectional area at the top is without question the best shape for obtaining the important "lag" in solidification of the steel, and whenever such large-end-up ingot can be conveniently used, it is the best practice to do so. Nearly all of the large mills are, however, so equipped for handling and stripping the ingots that it is practically impossible to do this without extensive changes in equipment.

FIG. 2. GATHMANN INGOT SHOWING ABSENCE OF PIPE IN MAIN INGOT.

It is declared that it is necessary to employ means in ordinary big-end-down ingots to greatly accelerate the freezing and solidifying of the lower and middle portion of the ingot, and thus provide liquid metal to compensate for the decrease in volume caused by the contraction during solidification of the ingot. This has been accomplished by giving the lower 70 to 80 per cent. of the metallic mold in which the ingot is cast a much greater degree of heat-absorptive capacity than the upper 30 or 20 per cent. thereof.

It was attempted to accomplish this by ribbing the lower exterior surface of the mold in order to provide increased



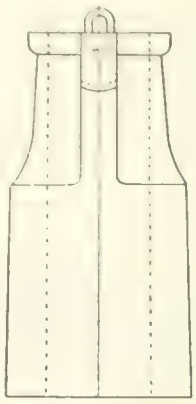


FIG. 3—GATHMANN INGOT MOLDS

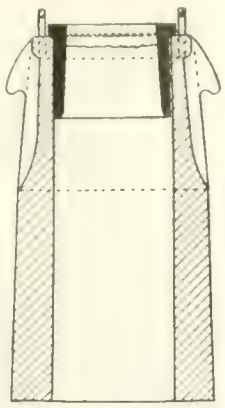


FIG. 4 GATHMANN INGOT MOULD SHOWING SINK HEAD APPLIED.

capacity, and making the upper mold wall thinner and less heat-absorptive.

Many hundreds of molds of the kind shown in Fig. 5 have been in daily use under usual furnace and mill conditions during the past year, and designs of molds have been made and established in actual practice for from 1 to 10-ton ingots. In order to insure an ample supply of liquid steel to compensate for the shrinkage in the upper portion of the ingot in very dense, quick-setting steel it was found advisable to use walls of a material of poor heat conductivity in the uppermost portion of the mold to supplement the differential effect obtained by the combination of the heavy and thin mold walls; in other words, to provide a sink-head.

It is stated that the usual type of sink-head resting on top of the mold, or rigidly secured in the upper part of the mold cavity, was found not to fulfill all the conditions necessary in a commercial sense, primarily because of the high cost of such sink-heads when efficient. Sink-heads of this kind must be of sufficient thickness and strength to hold the liquid steel without cracking or breaking. Even a slight crack or break in the sink-head is sufficient to form a fin of steel and hang the ingot during its vertical shrinkage, thus causing surface cracks and defects in the body thereof.

### Type of Sink-Head

The drawing Figs. 3 and 4 shows a method of freely suspending within the mold cavity a sink-head made of poor-heat-conducting material. This type of sink-head, in conjunction with the heavy-wall mold, has given most excellent results, and is in regular use by several of the largest high-quality steel works in this country, in conjunction with the mold walls with a heavy body and thin top. Such a mold, if properly designed, will produce a sound, homogeneous ingot with about a 20 per cent. top crop, which is about 15 per cent. less than is usually necessary in ingots of like grade of steel made in the old-type mold.

The photograph Fig. 6 indicates split ingots of vanadium-nickel-chrome steel, one cast in a mold of the standard type and the other cast in a Gathmann-type mold. With a sink-head in combination with the type of mold described the crop necessary to eliminate the pipe and segregation is approximately 10 to 12 per cent. of the cold ingot. When the ingots are allowed to solidify in the mold the pipe will be formed to its maximum depth.

A fairly early stripping and rolling of the ingot is advocated, the actual time of stripping being governed by the cross-section of the ingot and no expensive change in administrative practice is required in the production of ingots by this method, which is in use by many steel plants.

It is claimed that it may be readily incorporated in the practice of any of the large steel works without upsetting in any manner the casting or mill practice. The physically homogeneous condition of the ingot of primary importance in producing sound blooms and finished products. The method of blooming such ingots is, however, also of importance. It has been my experience that in some heating and rolling practice there is danger at times of actually forming a false pipe, or rather fissure, in the ingot. This is especially the case where the ingot has been allowed to solidify and become cold in the mold. Many mills have found it good practice to strip the mold from the ingot before its central portions have entirely solidified and place it in the soaking pit or furnace in a vertical position, allowing the temperature to become equalized and the final feeding, due to shrinkage, to occur while in the soaking pit. The ingot is then rolled while the interior is hotter and more plastic than the exterior. Great care must, however, be exercised that the ingots be allowed to remain in the soaking pit until the steel is entirely set, because rolling with any green steel in the ingot will produce spongy centres. It is therefore necessary to determine the proper heating period before pulling specific sizes of ingots for blooming.

Regarding the best method of reducing ingots to blooms, it is best to effect most of the reduction in butt-to-head passes, and a marked improvement in crop reduction is obtained by this method of rolling, especially when the piped section is confined to the upper 20 per cent. of the ingot. Irrespective of any heating and mill practice which it may be desired to use at any specified mill, the physical condition of cold ingots split open for inspection is undoubtedly the true index to the value of any method for producing sound, homogeneous steel.

### Ideal Considerations

It is maintained that the theoretically ideal method of making sound, homogeneous steel is undoubtedly with the big-end-up mold, because the increasingly large area of the ingot towards the top compensates automatically for any irregularities in the temperature of the steel or in the teeming practice.

The photograph Fig. 2 shows a split ingot produced by the Gathmann method under normal conditions with the big-end-up practice, the crop for piped

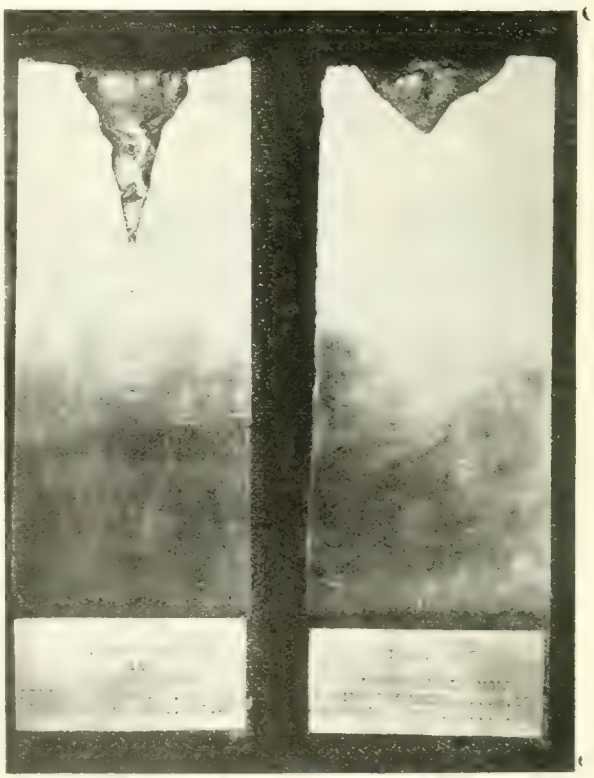


FIG. 5

FIG. 6.

section being approximately 5 per cent. The inventor recommends in the usual mill practice where cars or bogies are used for carrying the molds, the heavy-walled body, light-walled top, big-end-down mold, as shown in Figs. 3 and 4 and also the use of a suspended sink-head of non-conducting material to fully compensate for the contraction in the upper portion of the ingot.

It is pointed out that these molds and methods are applicable for the production of any grade of steel cast in ingots, and will invariably improve the quality and lessen the top crop, and thousands of tons of these molds have been made of both direct and cupola Bessemer iron, giving excellent service as to number of heats per mold, while reports from mills using these methods and molds show that an important saving has been effected thereby in reduction of crop ends, and in making good, sound, homogeneous steel for every purpose.

## U.S. EXPORTS OF MANUFACTURES

The United States has suddenly becomes the world's largest exporter of manufactures. Prior to the war, according to a compilation by the National City Bank of New York, that country held third place among the nations of the world as an exporter of manufactures, being clearly outranked in this line by Great Britain and Germany. With the opening of the war, however, and the suspension of Germany's export trade the United States took rank next to Great Britain as an exporter of manufactures, and with the enormous foreign demand upon its factories it has now passed Great Britain in the race, and stands at the head of the list of nations exporting manufactures.

The world's exportation of manufactures in 1913, the latest normal year in international trade, were, according to the bank's compilation, stated in very round figures—Great Britain $2,000,000,000 of [illegible] tures exported, Germany $1,675,000,000, United [illegible] gium approximately $400,000,000, Austria-Hungary $375,000,000, Italy $275,000,000, [illegible] $250,000,000, Japan $225,000,000, Switzerland $200,000,000, India $125,000,000, Sweden $100,000,000, Canada $77,000,000, Russia $70,000,000, and Spain $50,000,000, all of these figures being in very round terms. Thus the grand total of manufactures entering international trade in the year before the war was about $8,000,000,000, of which the United States supplied about one-eighth, or in round terms $1,000,000,000.

About ninety per cent. of the manufactures entering international trade in 1913 was the product of countries now at war. In certain of the countries, notably Germany, Austria-Hungary, Belgium and Russia, exportation of manufactures was suspended, and in others, notably France, Italy and Netherlands, the exportation was greatly reduced. In still others, however, notably the United States, Canada and Japan, the production and exportation of manufactures greatly increased following the war. In the case of the neutral countries of Europe there was little change, and the official figures of Great Britain show comparatively little change, though presumably they do not include all of the war material sent out of that country by the Government, especially that going to France.

The chief countries which show a marked increase in exportation of manufactures during the war are the United States, Canada and Japan.

## A WORTH WHILE BOOK FOR INDUSTRIAL LEADERS

Facts are facts, and in recognizing their existence and endeavoring to bring them before their fellowmen in a convincing yet withal not discouraging manner, Dr. H. B. Gray and S. Turner state that their main object in this, as in other directions, is to create the consciousness of a need rather than to dogmatize on the methods to be applied. "Eclipse or Empire" is the title of a recent book by these authors, and while the title savors of Teutonic ambition, the work itself is in direct contrast, being more a recognition of facts which a blind prosperity has induced the Anglo-Saxon nations to ignore than a statement of national greed.

The following extracts are a few of the many distinctive passages which characterize the book and give it a lasting charm for every man who lives by or is influenced by organized industry.

### The Message

"There is a soul in industry."

"A perfect machine is not the mere metal out of which it is welded. It is rather the embodiment of human sweat and tears of human sacrifice. Viewed thus broadly it is an embodied tribute to the invincibility of the human spirit."

### Ideals of Business

"The wealth accumulated by the man who makes business his life work, and thereby becomes a creator, is a mere fraction of what that work has saved for the community."

"A business—that is, a scientifically organized system of creation succeeds only when it is cheaper to buy its products than not to buy them."

"The business man of to-day....visualizes that in the process of creating and providing he must be efficient."

"In the future "the rewards of industry will be for those only who render great services to the community at large.'

### The Human Factor in Business

"The rewards for those who do great things, whether masters or men, must be ample and generous."

"The reward for increased speed and increased product should consist in the concession of fewer hours and higher pay."

"It is indeed an economic law....that the greatest possible production is always in the interests of the community at large."

"....the discovery and application to business of the laws of efficiency, thus eliminating waste, which arises from the blind use of antiquated methods. Mathematically put, the equation stands thus: Low profits + low wages = high profits + high wages = waste. What is waste? It is the sprawling of the human factor aimlessly over its environment."

"The first and hardest thing to be done is to kill the microbe of prejudice which eats away the vitals of trade. That microbe must be put in a brain furnace; for it breeds myriads of offspring, but all bear one common surname—waste."

"Man is infinitely the most wonderful and complex instrument, as well as the most essential factor, which the commander-in-chief of a business has to handle....In man there is dynamic force—he must either develop or he must shrink."

"It matters but little what a man is to-day—the great matter is what he desires and intends to be in one, or two, or three years' time. He is not a mere machine with two hands and two feet—but a living, pulsating energy. He has a trinity of powers—spirit, mind, and hand, and the least of these three is hand. For it is only the spirit to do, and the mind to create, that can make the hand move at all."

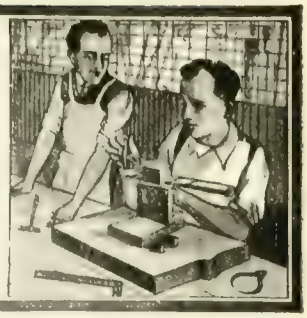
### Science and the State

"We venture to say that nothing in any department of industrial life is being done in 1916 as effectively as it will be done in 1926."

"The progress of our nation will depend on the rate at which we turn the principles and theories of science into terms of ascertained facts."

# FROM THE MEN WHO PRODUCE

Methods, Machining Devices, Systems and Suggestions From Shop And Drafting Room



## TOOLS FOR CUTTING-OUT, BORING, AND FACING A BLIND HOLE

By F. Seriber.

A BORING bar of irregular design that was used for cutting out a blind hole and boring the same is illustrated by the accompanying drawing, Fig. 1 showing the bar for boring, counterboring and facing a large surface is shown.

The object in making a bar for cutting out a blind hole in place of drilling was to eliminate as much as possible the strains which would have been otherwise set up in an aluminum casting of thin section.

First, to be specific, it was necessary to cast the work with the hole in it as otherwise the sections around the hole would be so thin they would draw in the casting and cause a poor structure. Second. on account of the thinness of the casting wall it would not support the strain of cutting out by means of a large drill without distortion, consequently recourse was made to the tool shown in Fig. 1 which is provided with a cutting-out tool in its end.

Having described the object of this tool by referring to the illustration, its construction will be obvious from the reference letters. The boring bar proper A is made with a taper shank which fits into the spindle of the machine. At the opposite end a cutting out tool B is shown; this tool is clamped in place by the wedge C which has two screws D in it and is dovetailed in place. This tool is provided with radial clearances so it will cut free and is tapered back slightly for clearance; this tool is also backed up with an adjusting screw E. At right angles to this cutting out tool a flat boring cutter F of the usual type clamped in place by means of the screw G is placed and in operation; the cutting out tool goes completely through the thin wall of the work and cuts it out, thereby incidentally making a thin disc out of the centre of the hole; following the cutting out tool the flat cutter bores the hole to size for reaming.

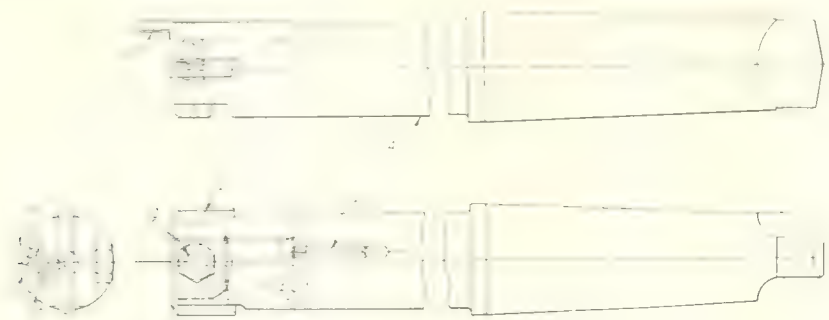


FIG. 1.—BAR FOR CUTTING OUT AND BORING BLIND HOLE.

To accomplish this the bar which is designated as F has a flat cutter G in it of the usual type held in place by a wedge H; this cutter enters the work at the right hand end and as the hole C is the same size as the counterbored hole B, the short hole at C is the first part bored, passing through the hole a pin cutter J which has an adjusting screw in back of it which is not shown and is held in place by the screw K, bores the hole A, while of course at the same time the cutter G counterbores the hole B.

For toughness this boring bar is made of a machine steel forging and at L a cutter M is placed for facing; this is

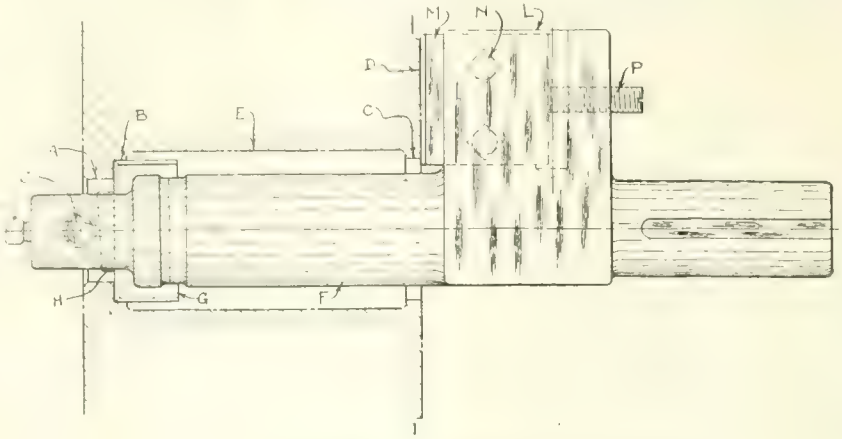



FIG. 2.—BAR FOR BORING, COUNTER-BORING AND FACING.

Referring to Fig. 2 the work operated upon is shown in section and the hole therein is cast out. The finish on this part consists of boring the hole A, counterboring the hole at B, boring the hole C and facing the surface D, while the hole E is a recess which is cast in place and requires no finishing.

securely held by the two screws N and is backed up with an adjusting screw P, while the entire boring bar is held in the turret of a hand-chucking machine upon which the work is done.

On these boring bars both cutting rake and clearances were provided in the usual manner for the material being operated upon, in the first instance, aluminum, and in the last mentioned cast iron.

## SIMPLE CLAMP CHUCK FOR SHELL BORING OPERATION

By M. H. Potter

Considerable trouble as been experienced in securing an efficient and easily operated chuck for holding the larger sized shells (6 inch or over) during the boring operation. In order not to have too much stock to remove in the finish turning operation the shell must be held on centre, not only that but due to the heavy boring cut and the heavy pressure at the end of the shell the chuck must have a positive grip.

The chuck herewith illustrated is simple but positive, inexpensive to make and easily operated; it has been used with marked success by female operators in the boring of many thousands of shells.

Fig. 1 shows the shell in position in

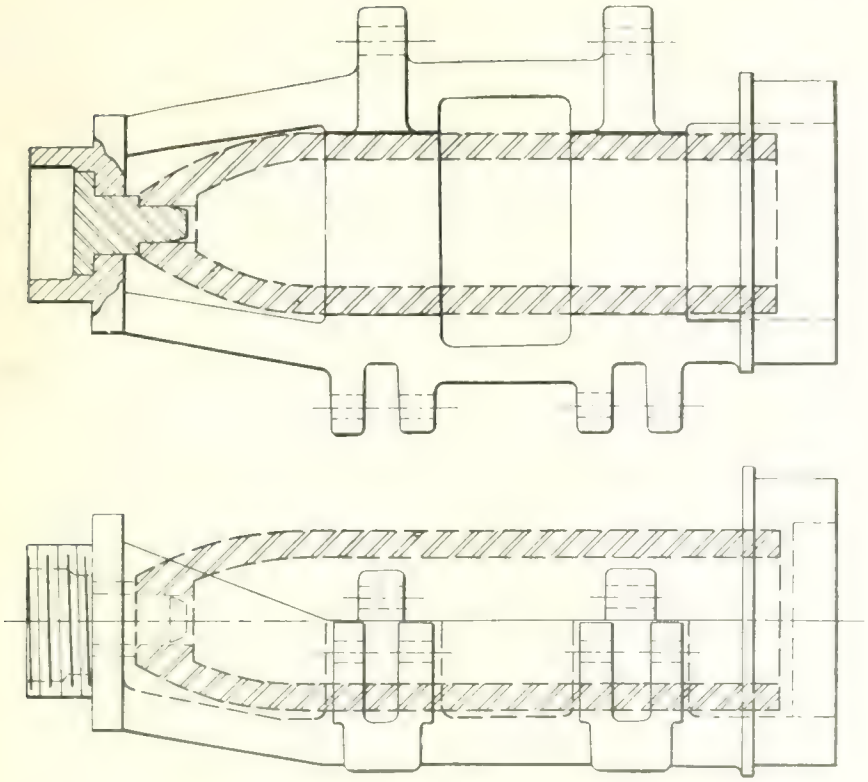


FIG. 1.

the chuck, and Fig. 2 the end view showing the hinged clamp. The babbited steady rest shown in Fig. 3 is of the ordinary type, being split through the centre to take up the wear. The chucks were bored out to size on the machine on which they were used to insure good alignment.

Fig. 4 shows the canvas sling which was used, in connection with an air hoist, to place the shell in and out of the chuck. It will be noticed, Fig. 4, that one ring (at the end) is larger than the other, the smaller one being passed inside the larger one when the sling is placed around the shell. During the operation the sling remains around the shell, the loose end being forced inside the chuck. To place the shell in the chuck or to remove it, the shell is slid slightly forward; it can then be raised upwards.

Fig. 5 illustrates the same type of chuck adapted to a closed-in shell.

## RESEARCH COUNCIL IN U. S. BECOMES PERMANENT

At the request of the President of the United States the National Academy of Sciences is to perpetuate the National Research Council which latter body was organized in 1916 by the Academy at the request of the President.

The work accomplished by the council [illegible] co-operation of military and civilian agencies in the solution of military problems, demonstrates its capacity for larger service and under the aegis of the academy its duties will be as follows:

1. In general, to stimulate research in the mathematical, physical, and bioligical sciences, and in the application of these sciences to engineering, agriculture, medicine, and other useful arts, with the object of increasing knowledge, of strengthening the national defense, and of contributing in other ways to the public welfare.

2. To survey the larger possibilities of science, to formulate comprehensive projects of research, and to develop effective means of utilizing the scientific and [illegible] dealing with these projects.

3. To promote co-operation in research, at home and abroad, in order to secure concentration of effort, minimize duplication, and stimulate progress; but in all co-operative undertakings to give encouragement to individual initiative as fundamentally important to the advancement of science.

4. To serve as a means of bringing American and foreign investigators into active co-operation with the scientific and technical services of the War and Navy Departments and with those of the civil branches of the Government.

5. To direct the attention of scientific

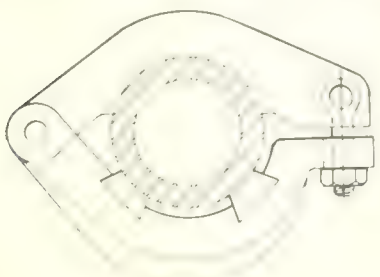


FIG. 2.

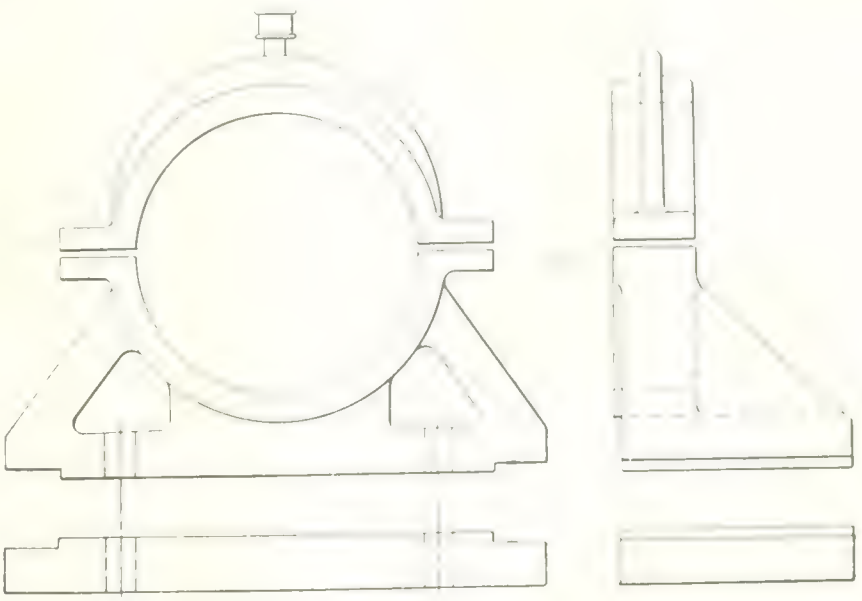


FIG. 3.

to the present ... industrial ... with the war, and to aid in the solution of these problems by ...

... and collate scientific and technical information, at home and abroad, in co-operation with governmental and other agencies, and to render such information available to duly accredited persons.

Effective prosecution of the council's work requires the cordial collaboration of the scientific and technical branches of the Government, both military and civil. To this end representatives of the Government, upon the nomination of the National Academy of Sciences, will be ... as members of the council, as heretofore, and the heads of the departments immediately concerned will continue to co-operate in every way that may be required.

## BRASS FOUNDRY OF THE ST. LAWRENCE WELDING COMPANY

EXPANSION of the brass foundry business has been a natural consequence to the abnormal and rapid development of the shipbuilding industry. The production of brass castings for engine parts and interior fittings is one of the necessary requirements incidental to marine activity, this being due to the imperative need of installations that will give satisfactory service under atmospheric and weather conditions; in addition to this artistic appearance has much to do with brass fittings for ship equipment. The heavy demand for brass and bronze castings has resulted in the development of many foundries for this purpose, some of these having shown remarkable expansion during their brief period of operation.

From a small beginning about the first of November, 1917, when two initial pit furnaces were installed with a capacity of 500 lbs. each per day, the brass foundry of the St. Lawrence Welding Company has shown a capacity increase of approximately 800 per cent. in less than six months, the total daily production at the present time being about 4½ tons. The output is obtained from a battery of eight 500 lbs. pit furnaces and one oil fired tilting furnace, with a daily capacity of 1,000 lbs. A feature of the pit installation is the utilization of hard coal as fuel, with natural draft, the furnaces being arranged in sets of four. The method of firing has shown a great saving over the use of coke, as the hard coal is less destructive on the crucibles.

One portion of the shop is decked over to from a small but serviceable pattern room. The firm at present are principally engaged in the production of brass castings for ships' telegraphs and other general marine work; also considerable business in bronze bearings for heavy duty engine and rolling mill work. A. M. Barry is the managing director of the company.

ANOTHER VIEW OF THE FOUNDRY SHOWING MOULDING FLOOR.

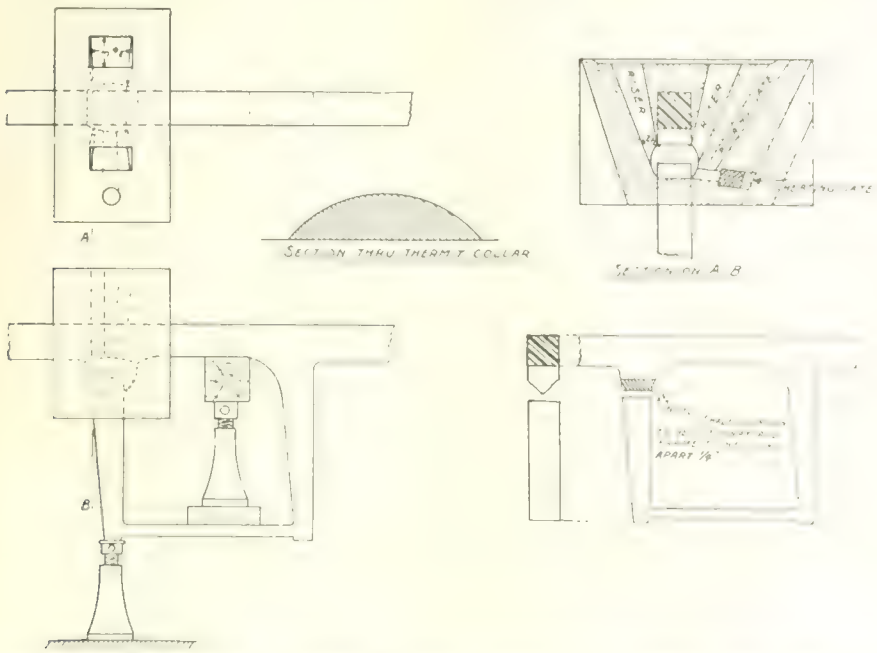
BRASS FOUNDRY OF THE ST. LAWRENCE WELDING COMPANY SHOWING FURNACES

## WELDING LOCOMOTIVE FRAMES

THE welding of a fracture in a vertical frame member of a locomotive sometimes presents difficulties, but this operation is simple if care is taken in preparing the fracture for welding and in placing the risers so that no gases, slag or molding material can be trapped in the weld. It is considered that the best practice is to cut out the fracture as shown in the accompanying drawing, Fig. 1, and to set the pouring gates and risers as indicated. This permits of a good washing action for the Thermit steel so that no molding material or slag that might be loose in the mold will be carried into one riser or the other. Fig. 2 shows a weld on an eight-wheel passenger engine made in this way and illustrates very clearly the arrangement of the pouring gate, heating gate and the two risers. Sometimes a third riser is advisable and as this often has to be placed in a position where it would be difficult to withdraw a wooden pattern, it can be provided for very easily by burying a sheet iron elbow in the mold. The Thermit steel will flow into this elbow, melting the pipe up to the level of the steel.

In the case of guide yoke repairs, it very often happens that the fracture runs in a horizontal direction and a Thermit weld is, therefore, made under very similar circumstances to a weld on

a vertical frame member. A simple way to obtain adequate washing action for the Thermit steel is to cut out the fracture so that the space cut out inclines to the vertical instead of running horizontally. This can almost always be done and the resulting weld will be as shown in Fig. 3.




SHOWING HOW BREAKS IN VERTICAL FRAMES SHOULD BE PREPARED FOR WELDING

In the case of welding light sections, such as an angle iron or light "T" section, care must be taken not to have the Thermit steel collar or reinforcement too heavy and also to see that the collar conforms to the shape of the piece being welded. Too often the collar is made so heavy that it concentrates too much Thermit steel around the part to be welded with the result that the metal on the edge of the weld is apt to slough away. Welds on such sections can easily be made with collars not more than 3 ins. wide by ½ in. thick, tapering to the edges. This, of course, depends on the thickness of the metal, and the above would apply to a metal from ¾ to 1 in. thick.

This question often comes up in the welding of such sections as guide yokes, driving wheel spokes, cross heads, and valve gear parts, because the welder more often than not has gained his experience in the welding of locomotive frames which are comparatively heavy, and is apt to have a tendency to follow that practice when called upon to weld parts that are not so heavy.

While cutting down on the collar is all right in the case of light and thin sections, it must be remembered that in the case of heavy sections such practice will not do, and it has often been noticed that Thermit welders, in an effort to reduce the amount of machining on a weld, will make the collar altogether too thin for safety. Sometimes they only do this on one side, which is worse still.

The Thermit steel collar should always be of uniform width and thickness on all sides in order to obtain uniform heating and therefore uniform results. It should always be borne in mind that the weld is the main object and the weld will not be perfect if the dimensions of the collar are varied on different sides.

## ENGLISH RESTRICTIONS ON ELECTRICAL PURCHASES

Applications to the British Ministry of Munitions for priority certificates to permit the purchase of motors and other electrical apparatus now have to be accompanied by a certificate from the chief engineer or manager of the public service undertaking concerned. This certificate is to state:

1. That adequate generating plant capacity is or is not available.

2. That no additional cost or material is involved in connecting the premises to the mains (including substation equipment, if any), or

3. Where expense is involved the material and apparatus to be provided and the cost thereof, and whether lead-covered cable is necessary or not. Where lead-covered cable is deemed necessary, the voltage of the current transmitted should be stated.

Applicants should, whenever possible, also obtain the written support of the Government department interested in their manufactures, and forward a copy of same.

The purpose is to reduce the demand for energy—other than that used for urgent war purposes—supplied by the public service undertakings and the time occupied in making inquiries.

New restrictions relating to electric converter plant have also been issued by the British Ministry of Munitions. Applications under this order are to be made to the director of electric power supply in the Ministry of Munitions.

## PAPER FROM SAWDUST NOW

At the Donside Paper Mills, Aberdeen, the success of the experiment in making paper from sawdust has now been practically demonstrated. The Aberdeen Evening Express has been in part printed on paper which contained a large percentage of sawdust. The experimental reels were in every respect satisfactory, and the Express is the first newspaper in the United Kingdom to have proved the practical utility of sawdust paper, the output of which promises to have a far-reaching effect on the paper scarcity problem. A hundred years ago experiments in paper-making from sawdust were made at a small mill in Bermondsey.

## CHATHAM GOING AHEAD

Despite the high cost of all kinds of building material, a great deal of construction work is going on in the city, as reflected in the statement governing building permits for May, just out, by Chief Pritchard. The total for May was $39,190, almost double the same period last year.

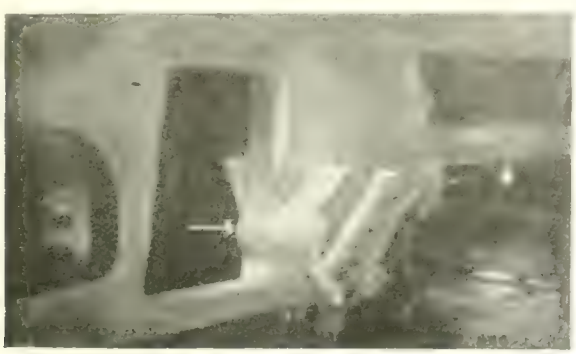
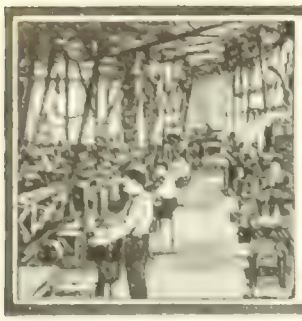


FIG. 2—WELD ON EIGHT-WHEEL PASSENGER ENGINE BROKEN IN VERTICAL FRAME MEMBER.

FIG. 3—THERMIT REPAIR OF A BROKEN GUIDE YOKE



# DEVELOPMENTS IN SHOP EQUIPMENT

*Manufacturers of equipment and devices for use in machine shop and metal working plants should submit descriptions and illustrations to Editorial Department for review in this section.*

## MECHANICS' TOOL CASES

A wide assortment of tool cases for mechanics is manufactured by the Mechanics' Tool Case Mfg. Co., 271 Euclid Avenue, Toronto. The tool cases are of strong construction in [illegible] to which they are often subjected. The cases are made from well-seasoned lumber and have dovetailed joints, except in one style, which has lock corners.

The cases are made in a number of styles, closed or open top, and in mahogany, quarter-cut oak and selected bass wood covered with fabrikoid. Any style can be supplied in oak or covered. The highest grade case is made of mahogany, highly polished, with a removable front, which, when not in use, is slid under the bottom drawer. This case has an open top with seven drawers, and has a cylinder lock with plated trimmings. This case is made in three lengths, 16 in., 18 in., and 20 in. by 12¾ in. high and 9½ in. wide.

Another style is made of selected bass wood and covered with imitation leather. This case has a closed top and eight drawers, which have maple sides and mahogany fronts. The small drawers have sheet metal bottoms, while the larger ones are made of 3-ply veneer. This case is also made in three sizes, 16 in., 18 in., and 20 in. by 11½ in. high and 8½ in. wide. This case has plated trimmings and a removable front.

The quarter-cut oak case is made with open or closed top, and is nicely finished. The open style case has seven drawers and the closed style eight. The drawers are of the same construction as in the mahogany and imitation leather cases, except that they have oak fronts. The open top style has four trunk latches in addition to the lock, while both styles have removable fronts. The oak case is made in three sizes, 16 in., 18 in., and 20 in. long by 11½ in. high and 8½ in. wide. All the cases are nicely finished, and their general appearance considerably improved by the diamond [illegible] plates under each drawer knob.

These cases are intended primarily for tool makers and for anybody using fine tools, such as micrometers, verniers, gauges, etc. The drawers are made in various sizes, so that any particular tool can be kept separate. The open top style cases have a deep box on the top for larger tools. All the cases have a good lock and duplicate keys. The company manufactures these cases for the trade, but also sells direct to private consumers in towns where no dealers are located. These cases were originally made in Hamilton by Ira Embree, who formed the new company and moved the business to Toronto.

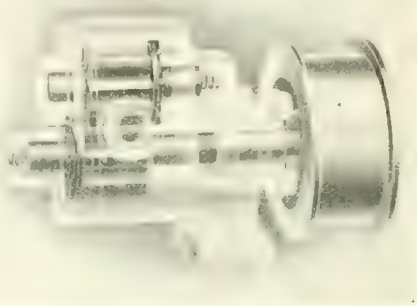
MECHANIC'S TOOL CASE.

## GEAR PUMP FOR CUTTING FLUIDS

According to tests made by the manufacturers, C. F. Roper and Co., Hopedale, Mass., the efficiency of a gear pump is far more dependent upon the endwise fit of the gears than upon the fit of the outside diameter. It was found that a looseness of .004 inch in the endwise fit of the gear would make the pump unable to start up under a suction head of three feet without priming, while .01 inch could be taken off the outside diameter of the gears without making this impossible. Furthermore, it is evident that as the outside diameter of the gear must be smaller than the pump housing in order that the gears may run at all, there can be but very little wear on the outside diameter in any event.

On the ends of the gears, however, which are made to fit as nearly as possible the housing, wear is certain to occur, because the space is so small that grit or chip entering the pump and getting into this space is ground around and cuts down the length of the gear until finally it is loose.

The Roco pump overcomes these difficulties by means of offset gears and spring compressed pistons on the gear ends. This construction makes any end



SKELTON VIEW OF CIRCULATING PUMP SHOWING END PISTONS ON GEAR MEMBERS.

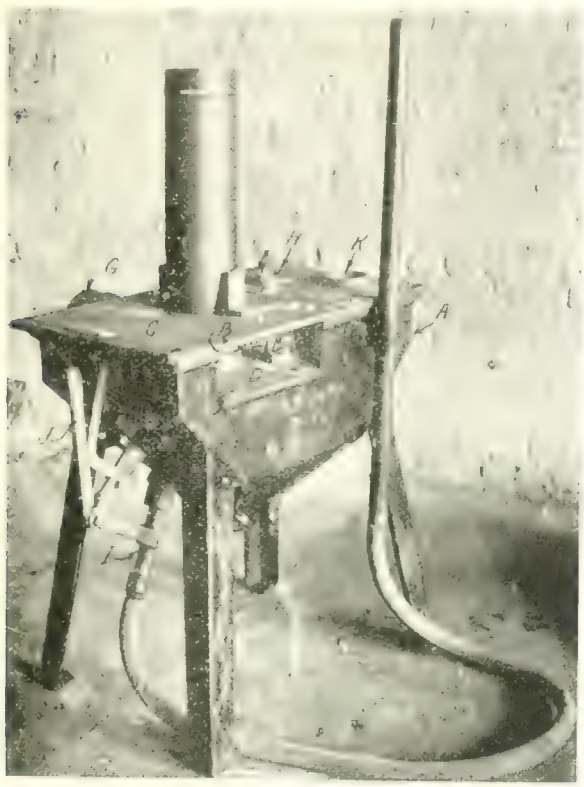
looseness impossible as any wear is immediately taken up.

This pump requires no by-pass or relief valve, either in the pump or in the piping, as the pistons operate to by-pass any fluid when the pressure in the delivery line is greater than that exerted by the spring controlling the piston.

## NEW SANDBLASTING MACHINE

FACILITIES for cleaning the interior of high explosive shells are essential in meeting the requirements of government specifications, and to insure a surface free from grease and other foreign matter that would prevent the adhesion of the protective coat of varnish. The accompanying illustration shows a machine designated by D. W. Richards for sandblasting the bore of the various sizes of shells. The box frame A is supported by means of the four legs so that the top of the machine is about 30 inches from the floor. The center of the top plate is bored out to receive the hub of the large bevel gear B, located directly below the plate C. The plate D, that is secured to the gap in the box frame, carries three brackets E, which in turn support three small bevel rollers F; these rollers are located 120 degrees apart and bear upon a turned surface just inside of the teeth on the large

bevel gear. The small roller shaft at the rear of the machine also carries a small bevel pinion for driving the large gear. This gear and likewise the shell, is revolved by the small pulley G secured to the small pinion shaft. The sand is placed in the box through the opening H and the air is delivered through the pipe and hose shown. The nozzle I can be moved in and out by the action of the bell-crank lever J. The exhaust air is allowed free egress through a pipe attached to the opening K. These machines are being made by the Montreal General Tool Company.




SAND BLASTING MACHINE

## HEAT TREATING PROCESS FOR SPADE CUTTERS

The loss in money, material and output due to breakage of shell-boring cutters of the double-edged or spade type has been a constant and hitherto unavoidable handicap to many munition makers. The use of high speed steel has been a necessity in order to get the output, but the very virtue of this steel which gave it its superiority as a cutting material reacted against it in the shape of cracks through the clamping holes induced and facilitated by the methods of hardening hitherto in use.

By a special process controlled by the Canadian B. K. Morton, Ltd., Montreal, it is now possible to provide a cutting edge of ample hardness to meet severest demands while retaining the central portion of the cutter in a tough condition so that breakages are completely overcome. The process is applicable to the full spade or double-edged cutter, and also to the single or half spade type.

## A SUBSTITUTE FOR BRASS

By Mark Meredith.

The very high price of copper, brass, zinc and tin resulting from the war has taxed the ingenuity of both men and nations to find substitutes. Many combinations of these have been made with steel, iron and other metals to bring down the cost, and there has been a considerable increase in the use of cast iron for bearings. This metal makes an excellent bearing if it is well fitted and has sufficient area, but once it begins to grip at any ill-fitted part, much mischief may be caused in a very short time.

Metal is far from being the only material for bearings. Various hard woods have been successfully used for the purpose, notably in the case of screw propeller shafts that have for many years been made of lignum vitae, which grows principally in the West Indian Islands, but increasing demands have rendered it so scarce that substitutes had to be sought for.

The Philippine Islands Islands are famous for the quality and variety of their hard woods, and of these the mancono is reported to be the best and most durable. The following is a comparison between lignum vitae and mancono:

Lignum vitae (guajacum officianale) is greenish brown and the sapwood is a bright yellowish color. Its specific gravity varies from 1.17 to 1.39. The grain is fine and the wood fibres small and exceedingly twisted, thus making it a very difficult wood to split.

Mancono (xanthostemon verdugonianus) has a brownish heartwood that turns purple when exposed to the air; the sapwood is narrow and of a pale reddish color. The wood weighs from 77 to 90 pounds per cubic foot or 44 per cent. heavier than water. Compared with teak it is just double the weight. Tests have been made of this timber that show it impervious to decay, being proof equally against the white ant and the teredo, or sea worm. An official test was made with it in the stern tube of a steam launch in constant use, and after seven months it was withdrawn and the commander of the naval station reported it to be quite equal to lignum vitae when used for the same purpose.

There seems to be an opening for mancono amongst ginning factories both as bearings for the shafting and for the connecting rods of gins. They might be [illegible] of a small circular saw and a revolving cutter. A comparison may be made of the friction of hardwood bearings with those of brass from the table published by Trautwine representing the co-efficients of moving friction of a smooth surface when kept perfectly lubricated: Wrought iron on brass lubricated with olive oil 0.078; wrought iron on elm 0.078. It is probable that mancono would have about the same friction co-efficient but would be more durable on account of its resemblance to lignum vitae.

The durability of wooden bearings depends to a great extent upon the smoothness of the metal in contact with them, and thus the metal should be carefully smoothed. In shafting an extra allowance of length might be made in view of the inferior hardness of the wood as compared with brass. With brass castings at such high prices it would be well worth the trouble to factory owners to experiment with wooden bearings, and begin with the hardwoods of the country that is nearest to them. India supplies a number of hardwoods, including babul and the various iron woods found in the jungles. It must not be forgotten that until the development of wheel-cutting in steel and iron, which is of comparatively recent date, power was transmitted through wheels with wooden teeth that rendered very good service, and even to-day there are millions of carts in the world with wooden axles carrying merchandise a long distance. Even the Japanese, who are already making and exporting electrical plant and instruments of precision, are still using machinery of wood to manufacture goods for export.

## YOUTH

YOUTH is not a time of life; it is a state of mine. It is not a matter of ripe cheeks, red lips and supple knees; it is a temper of the will, a quality of the imagination, a vigor of the emotions. It is the freshness of the deep springs of life. Youth means a temperamental predominence of courage over timidity, of the appetite for adventure over the love of ease. This often exists in a man of fifty more than a boy of twenty. Nobody grows old by merely living a number of years. People grow old by deserting their ideals. Years wrinkle the skin, but to give up enthusiasm wrinkles the soul. Worry, doubt, self-distrust, fear and despair—these are the long, long years that bow the heart and turn the greening spirit back to dust.

Whether sixty or sixteen, there is in every human being's heart the lure of wonder, the sweet amazement of the stars and at star-like things and thoughts, the undaunted challenge of events, the unfailing childlike appetite for what next, and the joy of the game of living.—"American Iron and Steel Institute Bulletin."

**Arthur Balfour and Co.** are now issuing a monthly stock list covering their various lines of carbon and high speed steels.

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## BARRING OF NON-ESSENTIALS BEGINS

THE first step has been taken by the Federal Government in its effort to correct the trade balance by means of import prohibitions. Luxury imports, as war-time non-essentials are termed, have reached an annual total of $70,000,000.

The classes of good which are affected are either perishable, pertain to personal pleasure and sport, or are non-conducive to production, the latter category including such items as paintings, jewelery and marble.

The entire situation is based on the necessity of keeping out that which we can do without, and producing as much as possible of that which we need, with a view to reducing the amount of trade at present in favor of the United States.

At least 75 per cent of the goods banned are obtained from across the line, and the measure is accepted by the United States Government in the spirit in which it has been enacted.

The stimulation of several home made lines should result forthwith, provided raw material is available, and while it may devolve on the War Trade Board at Ottawa to exert influence in this respect, the difference between raw materials and finished product should be great enough to insure some considerable initial influence on the adverse trade balance.

## HUMAN NATURE AND PRODUCTION

MAKING a study of the individual characteristics of different workmen has often been a valuable factor in developing and maintaining greater plant efficiency. Among the many duties of the factory superintendent or foreman—and one that might be considered as of small consequence by the unobservant—is that of cultivating the personal touch with those of his workmen or associates whose co-operation is essential for effective production. One of the very important features in connection with shell making is that of inspection, particularly that involving the Government examinations. In many instances these men perform their duties under certain fixed rules and instructions from higher officials, so that tactful judgment on the part of the under-inspectors is frequently an absent quality. However, experience has been a remarkable teacher in the education of those now engaged in this work, and differences between plant officials and Government inspectors—that in the early days were often greatly magnified—have almost been eliminated, so that in the place of antagonism and spasmodic disorganization, the best co-ordination now manifest

The superintendent of one plant was successful in overcoming the prejudices of different inspectors by the adoption of the following plan: His experience in various shops and with different inspectors led him to believe that nearly every one paid more than ordinary attention to the inspection of some particular portion of the shell; one man would be very strict on the wave and groove, another on the bore and inside profile, and still another on the outside profile, base plate, etc. After finding the inspector's special "bug," as he termed it, the superintendent set to work to humor the former's vanity, giving instructions to the foreman in charge of the particular operation that extra precaution be exercised by the men on these machines in producing work that would meet the personal requirements of the inspector.

In commenting on this particular feature the superintendent said: "While it is highly desirable that every detail in connection with shell making should receive the closest supervision, it is no doubt true that the study of the traits of those responsible for the acceptance of the work is a factor not to be overlooked by the different plant executives."

## LEGITIMATE MANUFACTURE SHOULD BE MAINTAINED IF POSSIBLE

THOMAS A. Edison is of the opinion that the way to meet the present situation is not by curtailing the manufacture of what are termed non-essential commodities but by increasing production. In a recent signed statement to a convention of phonograph dealers in New York he said:

"No legitimate industry is non-essential except as it interferes with the conduct of the war, and then only to the extent to which it interferes. No statistician can prepare figures that can be accepted safely as a guide to the curtailment that should occur in the manufacture of the so-called non-essentials

"What we need to do is to speed up. It is not a question of what we must not do, but a question of what we must do. We must win the war. We must provide all the arms, ammunitions, ordnance, airplanes, and equipment that can be transferred to Europe, and we must build ships as rapidly as possible.

"We must make all the other goods that we can possibly make. We must keep on creating new wealth. We must keep our manufacturing organization in good running order. We must continue to go after foreign trade, and we must prepare ourselves for the intense competition for foreign markets that will come after the war."

Mr. Edison's idea seems to be that in this time of stress it is not fitting that industries should be torn up root and branch. He recognizes the need for production of war materials. But he does not think that the manufacturing organization should be crippled in certain lines.

The great inventor would make two blades of grass grow where formerly one grew. Production of certain commodities can be kept up even when the working staffs are reduced to provide for the necessary war work. Production of war materials on the other hand should be speeded up. This is sound business sense.

In connection with the work being carried on by the Council it is proposed to establish a Central Research Institute and that in connection with this project the government will be asked for a grant of about $500,000. Of this amount about $100,000 will be in the shape of salaries or an annual obligation while the remainder will represent capital expenditure for the installation of the required apparatus and equipment.

Another phase of the problem has to do with educational facilities and plans are being considered for the establishment of new branches of activity in connection with the big universities.

# THE MAN WHO STARTED FUSE MAKING IN CANADA

**Arthur Kirby Had a Wide Experience in England Before Coming to Canada**

THERE is no particular novelty or secrecy connected with the making of fuses in Canada now. There was a time, though, when an intimate knowledge of the delicate operation was in possession of practically one man in this section. That man was Arthur Kirby. He had learned the business thoroughly in the big munitions plants of England. At that time though there was not the element of urgency in the situation that developed when Canadian factories first turned to the making of fuses.

There were many deliberations, long and serious, before the work was undertaken in Canada. It was a new venture, more complicated and less known than the forging or machining of shells, and on this account, and the lack of expert help to swing the business, delay was long.

Arthur Kirby, now of the Russell Motor Car Co., knew the fuse business—knew it thoroughly. He had served for many years in the greatest plants in England, and had been in Vickers, Son & Maxim when the first orders were undertaken on the No. 80 fuse for the British Government. The No. 80 is essentially and originally a German time fuse, changed and improved to suit the purpose and style of the British guns.

Mr. Kirby started to serve his apprenticeship at the age of 15 with Kynoch, Ltd., at Birmingham, working in all departments, and finishing as an expert tool maker. In all he remained in that immense plant for eleven years. At that time between eight and ten thousand people were employed there. His father was an employee of the same shop as manager of the sporting cartridges department.

Leaving this firm, Mr. Kirby went to the great Vickers, Son & Maxim plant in 1905. At that time the first government order was given for the No. 80 fuse, and he was placed in charge of the fuse department. Making the No. 80 fuse at the Vickers, Son & Maxim plant was new work, the design being largely an adaptation of the German usage. New machinery, and all the tooling had to be designed, and it was here that Mr. Kirby mastered the fuse business for the great British munitions shop, little thinking of the use to which he would be called to put his training later on.

### Comes to Canada

Leaving the Old Country some six years later he came to Canada, direct to Toronto, going with the Canadian Fairbanks-Morse as a tool maker. Later he joined the staff of the Architectural Bronze & Iron Co.

With the declaration of war, and the commencement of munitions making here, the question was asked "and what can be done for fuses?" Mr. Kirby knew how to make fuses, knew the machinery and equipment necessary for their production, and it was not long before representatives of the old Shell Committee got in touch with him. Even before the arrival of any prints or drawings from the Old Country, Mr. Kirby had sketched out the requirements, and took charge of the work when the Russell Motor Car Co. decided to start the manufacture of their first order [illegible]

### Got Splendid Results

The venture was a success in every way. "The matter of sufficient help was something that bothered us at first," remarked Mr. Kirby, but the introduction of female labor was the solution for that. It was something new in this country, but in the large munition plants of England female labor is largely relied upon. There were in Toronto a number of English women who had worked at fuse making, and at the very outset we got splendid assistance from these people. Of course the Canadian girls came in later, and they gave good service too, although they do not appreciate shop discipline and the need of it as the women from the Old Land do.

"As a matter of fact," concluded Mr. Kirby, "there is a very serious shortage of good mechanics in Canada right now. Even in the past this country has never been noted for its number of first-class mechanical men. Too many of them never get past the handy-man stage."

Mr. Kirby is still with the Russell Motor Car Co., Ltd., in charge of the vocational school for returned soldiers, which is being operated by the company on Adelaide St. west.

## A Word for the Candle

The Hydro lights were off last night, and there was the usual scramble for candles, etc.—News item.

It does beat all how some folks make a fuss and grit their teeth, and make themselves look just as though they had a quart of grief—why, good land sakes it ain't no cause to worry nor to fret, nor yet to get your system in a state that's overhet.

What if the 'lectric lamps go out and leave things on the blink, it gives a chance to contemplate, to meditate and think.

It makes your sister raise her nose from off some fancy work, and it makes paw pause a bit when he's readin' 'bout the Turk. And then they light a candlestick, it sputters out a gleam, and somehow it's a restful light, though not a head of steam.

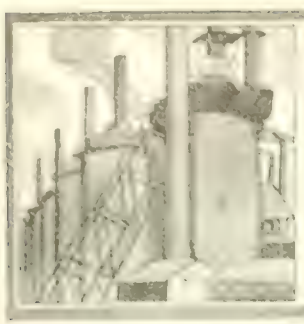
Why, our grand-dads and mothers too, they used a light like that, and though perhaps they didn't get things fresh right off the bat—they used to sit when day was done to rest their weary bones, and they didn't have no 'lectric lamps to 'luminate their homes.

But by the candle's little glow they'd talk of the hereafter, while fragrant pipes would build a haze to circle near the rafter. And in those hours of sweet content, oh let their praise be sung, their every corner got a rest, their liver and their lung. But folks don't want no candles now, nor evenings that be dim—they want the 'lectric searchlights on to keep them in the swim.

They aint content to have the sun a-blazin' far away, but they want to spoil the twilight by makin' it like day.

Let's have a candle now and then, of the 'lectric lamps be rid, and sit and meditate at night like our grandfathers did.—Ark.

and steel industry of United States was that the market had been engaged in a wild runaway. Prices at which Canadian jobbers months ago stocked up at United States mills testify to that fact. While the producers were promised very large profits temporarily, it would not have been good business for them to have the run of the market for any length of time. Natural laws of trade, that usually make for equalized conditions, were altogether suspended. No class of manufacturers can indefinitely prosper in conditions that are altogether unsound economically.



# MARKET DEVELOPMENTS

## A Launching in Every Yard on the Fourth

### Unique Way in Which U.S. Plans to Celebrate National Birthday—Firms Having Made Success of Canadian and British Business Get Preference on New American Orders

THERE are few weeks passing now but are marked by a spectacular price jump. Sometimes it is in the realm of iron or steel, again in the values of chemicals. But without fail the price jump takes place. This week staybolt iron has furnished the feature. It has advanced $40 per ton. In fact it is almost double the price at which sales could be made two months ago. It is used in good boiler work and is much needed now.

Canadian firms continue to take on new orders for munitions. Those that had the greatest degree of success with the Canadian and British orders are receiving a preference on the business which the American government may have to place in this country. There is also a revival of the rumor about the making of airplane bombs in Canada. Possibly the idea is that reject shells will be used for this class of work. They will not stand gun operation, so would be fitted with a tail piece to keep the nose pointed to the ground and would explode upon striking any object. Nothing has been done in this matter yet, and rejects are not being held for such a purpose, but are passing as formerly back to the furnaces.

There is bound to be a unique Fourth of July celebration in many parts of United States this year, especially along the coasts. It is planned to launch a ship from every yard now working on government orders on that day. And in more than one way United States is showing the serious way in which it is approaching war business. There are many mills in the Western States that cannot turn over to the work of producing steel or pig iron of a quality that can be used in war work. These places are simply being closed down and the basic materials formerly used by them are passing over to the shops turning out government requirements.

Jobbers in United States are hoping for better times ahead, and the trade in Canada is wondering how they will make out. Restrictions on buying for warehousing purposes were put on with the idea of preventing the hoarding of material, but the jobbers point out now that a certified inventory and sale sheet would serve this purpose. Especially where ship building is going on it is desirable that warehouses should be fairly well supplied with standard sizes to make good the rejects that the builders may get in their deliveries from the mills, and which must be quickly replaced to avoid delay.

Supply prices for machine tools are the same, no changes having been noticed this week. Business remains brisk, and orders placed for shops handling new munitions orders would indicate that it will remain so for some time

## FREIGHT CHANGES MAY AFFECT THE PRICE OF MACHINE TOOLS

Special to CANADIAN MACHINERY.

MONTREAL, June 19.—The characteristic feature of present conditions is the ever-increasing emphasis placed upon essential activities. The prosecution of the war has now become of such importance that the reduction of unnecessary enterprise has almost reached the point of practical isolation. That this condition will become additionally pronounced is recognized by many, and the entire elimination of non-essentials may only be a question of time. The present national registration may be a vital factor to this end. Steel for ship construction is coming forward in good volume, but some makers of shells are complaining of inadequate supply. Machine tool interests are all active but the supply is insufficient to meet demands

**Steel**

Present industrial activity is almost entirely operated on a war basis and everything of any magnitude is virtually controlled by the government and the War Trade Board. Dealers here are looking forward with considerable interest to developments in the States, as the coming advance in freight rates on American roads has created much excitement across the line. It is anticipated throughout the trade in this district that some similar action may be carried out in Canada in the near future, and as negotiations for government control of certain railroads show further progress a higher rate is not only likely, but within the bounds of probability. Speaking on the possibilities of a stronger steel market as a result of freight advances, dealers here do not anticipate anything along these lines in the immediate future, as present regulations would offset such a move, but should it develop that considerable volume of steel could be diverted to ordinary commercial enterprise, the situation would become one where steel prices may be affected.

Recent action on the part of the American War Board has given renewed hope to those consumers coming under the classification of non-essential industries. When the government requirements and preferred demands are amply supplied the surplus production may be available for other purposes, but may only be distributed to the trade on the written approval of the board. This new ruling to some extent will release the producer from previous responsibilities. However, until the new regulations are effective for some little time uncertainty will still prevail, as present needs of first and second choice are not sufficiently known to predict what volume of present production may be diverted to ordinary commercial enterprise. With war requirements of such an abnormal character, domestic activity can expect but little encouragement.

Price quotations are very firm and

the [illegible] relatively quiet

### Metals

Interest is being displayed over the increased activity in several of the metals. The coming change in transportation charges may serve as an argument for better prices and there is a possibility that some revision may be made respecting fixed prices and advances may result where the market is an open one. Copper is firm but producers are bidding for a higher price. Tin is easing on better supply. Spelter, lead and [illegible] strength of improved demands. Aluminum is steady and firm.

**Copper.**—Renewed agitation for a higher price on copper has arisen as a result of the announcement of the new advance in freight rates. It is more than likely that negotiations will be carried out with the object of coming to an agreement in this connection, as the arguments of the producers are more convincing than those of a few weeks back. The market here is not disturbed by these developments but dealers are watching the American situation for interesting developments. Local prices are unchanged on a quiet but steady market; quotations are firm at 29c and 30c per pound.

**Tin.**—The situation here has taken on a less nervous tone, following the report of an easier market in London, and the fact that shipping permits are more readily obtainable. The situation in New York is still acute but relief is in sight with the possibility of better supply. Prices there are still nominal in character on a basis of 90c per pound. Dealers here are inclined to think that the most acute stage is over, but the return to anything like normal will be quite gradual. The market here is still strong but with an easier tendency. Quotations of $1.25 shows a decline of 5c per pound. During the past week as high as $1.40 was asked in 100 pound lots.

### Machine Tools and Supplies

Heavy requirements still exist for machine tool equipment and facilities of the builders are invariably inadequate to the demands; in consequence manufacturers are unable to promise machinery for definite delivery. In order to expedite operations certain shell makers here are having their tools made in several local shops. Machines coming in from the States are very difficult to acquire as the demand on the home market is abnormally heavy. Dealers here would not be surprised to announce advances on machine tools in a few weeks owing to the coming change in American freight rates. Shipbuilders are consistent buyers of pneumatic tools. Shipments of the smaller class of tools are more regular.

### Scrap Quiet

The old material situation is practically a reflection of other activities where operations are conducted on a basis of government regulations. Dealers here report a quiet week with the bulk of the business being done on a basis of immediate requirements. Machinery scrap is still in good demand but the price tendency is weaker. Tin scraps are active but the undertone is for easier prices. Lead scrap has advanced following the stronger position of the ingot metal. Local dealers are asking 5½c for tea lead, a ½c rise over last week.

## POINTS IN WEEK'S MARKETING NOTES

The price of staybolt iron has jumped $40 per ton this week. In fact it has almost doubled in value during the last two months.

Canadian steel jobbers are trying to get some relief at American jobbers secure recognition from the war board.

Talk is heard of making aerial bombs from reject shells, fitting them with tail pieces to keep the nose toward the ground. So far nothing has been done toward this as all rejects simply pass on to the furnaces again.

Even with every mill ton turning directly to the order of the war board there is not enough steel for war work, and none at all for commercial business.

Shortage of labor is going to interfere with building of the plate mill under government orders at Sydney, N.S.

It is planned to celebrate the Fourth of July this year by launching a vessel from every shipbuilding yard in the United States.

Mills are wondering what to do with any "off-heat" ingots as they will find it too expensive to hold them or reheat. They are bound to turn everything to government direction.

A large number of mills in the Western States are closing because they cannot supply the sort of steel needed for war work.

U.S. fuel administrator warns that there will probably be a fuel shortage this winter in Canada as well as United States.

New shell orders in Canada are going to the shops that made the most satisfactory showing on Canadian and British business.

Transportation conditions are so serious in the United States that they are interfering with the production of munitions.

## PRICE JUMPING IS OF THE $40 NATURE

### At Least That's the Figure That Is Being Put on Staybolt Iron

TORONTO.—Equipment for new shell shops is being asked for by Canadian firms who have taken on new war business. In some cases the number of hangers, etc., that are included in the lists would indicate beyond doubt that extensive business is planned. It is likely that the large calibre business from Washington will come to Canada. CANADIAN MACHINERY has it on very good authority that the American officials are well pleased with the way in which Canadian contractors are going about it to live up to their delivery promises. In this regard it is stated that the performance by factories on this side of the line is much more satisfactory than records made in United States. Canadian shops that made the best showing in handling the Canadian and British work are being given the preference in American orders.

Steel jobbers are wondering if it is possible that they shall secure some measure of relief from the anti-warehousing rules that were laid down by the department some six weeks ago, and which have been enforced strictly ever since. Action is being taken across the line in this direction, and it is possible that the same may happen here.

Prices came up again to-day for one line, viz., Staybolt iron. In these two days of price-jumping there has to be quite a gap opened up from the old price before the amount is noticeable. Staybolt iron went up a clean $40 per ton—in fact the price of this line has just about doubled in the last two months, it being much sought for boiler work.

The large order for 3½-inch tubes, which was referred to in these columns a week or so ago, has passed the War Board. Delivery will be made very shortly. There was some speculation as to whether the order would receive consideration as it could not be classed as war work.

There has been a revival of the talk about using reject shells for the making of air bombs, the idea being to rig them up with a tail piece that would keep the nose pointed toward the ground, but nothing definite could be learned concerning this.

### Prices Are Increasing

Dealers in steel goods are wondering if there is going to be any relief for them from the order that forbids the warehousing of plate, and other lines mentioned under the orders from Ottawa about six weeks ago. They are watching the steps that are being taken to secure some form of recognition for jobbers in United States, and if success is met there they see no reason why it should not have some influence on the situation here, as they are practically distributors for the same mills as their colleagues in the States. The idea behind the rules

in the market this week. That is stay- per hundred, or an increase equal to $40 increases have been so rapid that it is doubtful if dealers will clear themselves are.

mentioned that an order had been sent forward from a Toronto house for a large number of 18-ft. boiler tubes of the 3½-inch sort. To-day word was received that the order had received recognition at Ottawa. There is no improvement in the tube situation regarding the two-inch size, which are in such urgent de promises of any better supplies in regard to steel for commercial purposes, in fact they are discouraging the placing of orders, knowing that they have mighty small chances now of being passed.

### Scarce But What of It?

Tin is scarce. There is nothing new in that. In fact it has been stated so often in market reports that people are beginning to wonder if it's true. The element of price comes in to emphasize the certainty of the scarcity as it is over five times the old price. But dealers stated to-day that they did not know of any concern that was shut off for the want of tin, although there was very little of it in the country.

Trade in all lines of non-ferrous metals is good. Prices can hardly be stated to be a fair indication of the trading value in certain items. For instance bids were raised in New York for spot tin from 91 to 93 cents, but there was not a pound traded. Canadian dealers point out that there has been no confirmation yet about the fixed United States price for copper. This is supposed to be 23½c per pound. As a matter of fact there has been no official announcement concerning the matter. It is urged that part of the output should be allowed to pass into open trading as in the time before prices were fixed, but such a state would be undesirable, as in an abnormal market regulation is necessary to give stability to the trading.

Locally metal prices are unchanged except for lead, which advances 50c per hundred pounds.

### More War Business

American orders are still coming to Canada. More have been placed for the 155 mm. shells. We are informed that on the placing of this business the Canadian shops which made the best showing on British and Canadian business are likely to receive the preference in the placing of the new business. As a matter of fact this rule has been largely followed, and will still be adhered to. Canadian munition firms have lived up to their delivery promises and have made a good name for the shops on this side of the line.

There may be orders for shells larger than the 155 type, although the amount of this business placed so far is not very great. The rumor is also around concerning the making of airplane bombs. It has been suggested several times that reject shells from Canadian plants should be used for this purpose. At present all such are passed back to the furnaces, nor are they being held for any such object as airplane bombs.

### Near Stagnation

There is nothing moving in scrap metals. "A year ago," stated one Toronto dealer to-day, "we wouldn't go out of our way to secure a hundred tons of scrap iron, but to-day we will go far afield if we hear of half that amount offering." Prices do not change at all, and there is only a very nominal amount of business moving.

### In Supplies

Supplies for machine shops are in good demand, and prices and discounts and additions to lists remain much the same. There is a certain amount of sympathy between values, and some of the articles that do not enter into the war furnishings are feeling the trend of prices. For instance certain lines of valves are off the old lists now, pending an upward revision of prices. It may cost more to produce the goods now, but as a matter of fact nearly all the supply houses have a good number of the valves on hand, secured at old prices.

## RECORDS GIVEN ABOUT DRIVING RIVETS ARE VERY MISLEADING

Some of the riveting records that are being made and published at present are very confusing. Figures have now got to the stage where they reach to the thousands per day, some as high as 12,000. When one reads of that number of rivets being flattened out in a single day the record of 1,200 in a day looks small, and there must be something to explain the discrepancy, otherwise it would appear that there were a great deal more efficiency in one class of yards than in others.

Take for instance the case of John Moir, a workman in the yard of Workman and Clark, Belfast, who is credited with a score of 11,209 in nine hours. It is stated that this work was done by a hydraulic hammer, and "driven in floors." This explains much, and shows for a certainty that there is no fairness in comparing that performance with the work done by the ordinary air-gun used by the riveters on the work in Canadian yards. The hydraulic-driven rivets are not really driven at all, but pressed into by the hydraulic ram principle, which can be made to give hundreds of tons' pressure. It is only on a few certain parts that this method can be used, for the piece to be riveted has to be of such a size and shape as will fit between the horns of the "bull riveter," as it called in the shops.

Further, the rivets in the floors would not have to be watertight, and probably a full head was not required, but just the end of the rivet 'burred' over to hold the pieces together.

Rivets in the sides of boats and ninety per cent. of the field or 'erection' rivets must be driven down by the air hammer and forced to completely fill the holes and head formed by hundreds of quick blows. The riveting gun must be held on the rivet for sufficient length of time to allow the same to cool somewhat, or it would shrink away from the metal and be like a loose bolt. That is why no such a speed as mentioned above is possible on ordinary work with the standard equipment for driving same.

The record mentioned is no record of riveting at all. It is a record of a machine which is practically automatic. It is not riveting in the full sense of the word as the boilermaker understands it, any more than the number of nails a special machine could drive in a box factory could be said to be a carpenter's record.

## PLAIN TALK ON COAL SITUATION

**Special to CANADIAN MACHINERY.**

### Says Western Canadian Mines Must Increase the Movement at Once

MONTREAL.—Women freezing in the hearts of Canadian western cities and towns, families deserting their houses to go and huddle in cramped quarters with those who happen to have a little coal, closed schools, office buildings, and even hospitals, and possible epidemics of pneumonia and influenza, are foreshadowed in a statement issued this morning by the Canadian Railway War Board.

"This board cannot possibly exaggerate the gravity of the Western fuel situation," said Secretary W. M. Neal. "Only the seriousness of the situation prompts the board to issue what may be termed an alarming statement.

"The movement of coal from the Western Canadian mines to the consumers in the West must increase, and increase at once, if the people of the prairie are to have means of keeping warm next winter. There is the very highest authority for stating that they cannot and should not rely for one moment on the hope of obtaining the usual supply of anthracite coal from the East."

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Baling Iron.—A New South Wales company requiring quantities of baling iron invites correspondence from interested firms in Canada who will supply samples and quotations as per particulars appearing in report from Canadian commercial agent at Sydney in this issue.

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

### PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago | 37 50 |
| Standard low phos., Philadelphia | ..... |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 32 00 |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | ..... | ..... |
| Victoria | ..... | 50 00 |

### FINISHED IRON AND STEEL

| Per lb. to Large Buyers. | Cents |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in base | 6 00 |
| Steel bars, 4 in. and larger base | 7 00 |
| Iron bars, base, Montreal | 5 25 |
| Steel bars, base, Montreal | 5 50 |
| Reinforcing bars, base | 5 25 |
| Steel hoops | 7 50 |
| Refined iron | 5 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Band steel, No. 10 gauge | 5 75 |
| Chequered floor plate, 3-16 in. | 12 20 |
| Chequered floor plate, ¼ in. | 12 00 |
| Staybolt iron | 11 00 |
| Bessemer rails, heavy, at mill | ..... |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | *3 50 |

F.O.B., Toronto Warehouse

| | |
|---|---|
| Steel bars | 5 50 |
| Small shapes | 5 75 |

F.O.B. Chicago Warehouse

| | |
|---|---|
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

### FREIGHT RATES

Pittsburgh to Following Points

| | Per 100 lbs. C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 38.1 | 50.5 |
| Halifax | 39.1 | 51.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

### METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $30 00 | $28 50 |
| Electro copper | 30 00 | 28 50 |
| Castings, copper | 29 00 | 28 00 |
| Tin | 125 00 | 125 00 |
| Spelter | 10 50 | 9 50 |
| Lead | 9 50 | 9 50 |
| Antimony | 15 50 | 16 00 |
| Aluminum | 50 00 | 50 00 |

Prices per 100 lbs.

### PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¼ to ½ | $10 00 | $10 00 |
| Heads | 10 00 | 10 25 |
| Tank plates, 3-16 in. | 10 50 | 10 10 |

### WROUGHT PIPE

Effective Feb. 5, 1918.

| Standard Buttweld | Discount | Discount |
|---|---|---|
| ⅛ in. | $ 6 00 | $ 8 00 |
| ¼ in. | 5 16 | 7 29 |
| ⅜ in. | 5 16 | 7 29 |
| ½ in. | 6 55 | 8 12 |
| ¾ in. | 8 28 | 10 41 |
| 1 in. | 12 24 | 15 39 |
| 1¼ in. | 16 56 | 20 82 |
| 1½ in. | 19 80 | 24 89 |
| 2 in. | 26 64 | 33 49 |
| 2½ in. | 42 72 | 53 53 |
| 3 in. | 55 85 | 70 00 |
| 3½ in. | 70 84 | 87 86 |
| 4 in. | 83 93 | 104 10 |
| **Standard Lapweld** | | |
| 2 in. | $ 29 60 | $ 36 08 |
| 2½ in. | 44 46 | 54 70 |
| 3 in. | 58 14 | 71 53 |
| 3½ in. | 72 68 | 90 62 |
| 4 in. | 86 11 | 107 37 |
| 4½ in. | 97 79 | 122 56 |
| 5 in. | 114 00 | 142 82 |
| 6 in. | 147 80 | 185 28 |
| 7 in. | 192 80 | 241 57 |
| 8 L in. | 202 50 | 253 75 |
| 8 in. | 233 30 | 292 32 |
| 9 in. | 279 50 | 350 18 |
| 10 L in. | 259 20 | 324 80 |
| 10 in. | 333 70 | 418 18 |

Prices—Ontario, Quebec and Maritime Provinces.

### WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

### OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 22 50 |
| Copper, heavy | 22 50 | 22 50 |
| Copper wire | 22 50 | 22 50 |
| No. 1 machine composition | 22 00 | 21 50 |
| New brass cuttings | 16 00 | 14 00 |
| Red brass turnings | 18 00 | 17 00 |
| Yellow brass turnings | 12 50 | 12 50 |
| Light brass | 10 00 | 9 50 |
| Medium brass | 12 00 | 12 00 |
| Heavy brass | 15 00 | 14 00 |
| Heavy melting steel | 24 00 | 21 00 |
| Steel turnings | 12 00 | 12 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 27 00 | 20 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 23 00 |
| No. 1 machine cast iron | 34 00 | 30 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 22 00 | 17 00 |
| Car wheels, iron | 26 00 | 30 00 |
| Steel axles | 38 00 | 35 00 |
| Mach. shop turn'gs | 9 00 | 8 50 |
| Cast borings | 12 00 | 12 00 |
| Stove plate | 19 00 | 19 00 |
| Scrap zinc | 6 00 | 6 50 |
| Heavy lead | 7 00 | 7 00 |
| Tea lead | 5 00 | 5 00 |
| Aluminum | 21 00 | 20 00 |

### BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, ⅜" and less | 10 |
| Carriage bolts, 7-16 and up | net |
| Coach and lag screws | 25 |
| Stove bolts | 55 |
| Plate washers | List plus 20 |
| Elevator bolts | - |
| Machine bolts, 7-16 and over | net |
| Machine bolts, ⅜ and less | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | 10 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | add 25 |
| Nuts, square blank | add $1 50 |
| Nuts, square, tapped | add 1 75 |
| Nuts, hex., blank | add 1 75 |
| Nuts, hex., tapped | add 2 00 |
| Copper rivets and burrs, list plus | 30 |
| Burrs only, list plus | 50 |
| Iron rivets and burrs | 25 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 37½ |
| Wood screws, O. & R., brass | 32½ |
| Wood screws, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

### MILLED PRODUCTS

| | Per cent. |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws | 20 |
| Rd. & Fil. Head Cap Screws | net |
| Flat But. Hd. Cap Screws | plus net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. & Semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2 in. | plus 10 |
| Studs | net |
| Taper pins | 40 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | list plus 20 |
| Collar screws | list plus 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | 65 |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add 7 00 |

### BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $47 50 |
| Open-hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.

F.O.B. Pittsburgh.

### NAILS AND SPIKES

| | |
|---|---|
| Wire nails | $5 25 $5 20 |
| Cut nails | 5 70 5 65 |
| Miscellaneous wire nails | 60% |
| Spikes, ⅜ in. and larger | $7 50 |
| Spikes, ¼ and 5-16 in. | 8 00 |

### ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 41 |
| Pitch | - |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila rope | 0 33 |
| New Zealand hemp | 0 33 |
| Transmission rope, Manila | 0 45 |
| Cotton rope, ¼-in. and up | 62¼ |

### POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | net |

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | 0 50 |
| Solder, guaranteed | 0 53 |
| Babbitt metals | 18 to 70 |
| Soldering coppers, lb. | 0 53 |
| Lead wool, per lb. | 0 16 |
| Putty, 100-lb drums | 4 75 |
| White lead, pure, cwt. | 16 05 |
| Red dry lead, 100-lb. kegs, per cwt. | 15 50 |
| Glue, English | 0 35 |
| Tarred slater's paper, roll | 0 95 |
| Gasoline, per gal., bulk | 0 33 |
| Benzine, per gal., bulk | 0 32 |
| Pure turpentine, single bbls., gal. | 0 71 |
| Linseed oil, raw, single bbls. | 1 95 |
| Linseed oil, boiled, single bbls. | 1 98 |
| Plaster of Paris, per bbl. | 2 50 |
| Sandpaper, B. & A. | list plus 20 |
| Emery cloth | list plus 20 |
| Sal Soda | 0 03½ |
| Sulphur, rolls | 0 05 |
| Sulphur, commercial | 0 04½ |
| Rosin "D," per lb. | 0 03 |
| Rosin "G," per lb. | 0 03½ |
| Borax crystal and granular | 0 12 |
| Wood alcohol, per gallon | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

### CARBON DRILLS AND REAMERS

| | Per Cent. |
|---|---|
| S.S. drills, wire sizes up to 52 | 35 |
| S.S. drills, wire sizes, No. 53 to 80 | 40 |
| Standard drills to 1½ in. | 40 |
| Standard drills, over 1½ in. | 40 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 |
| Bit stock | 40 |
| Ratchet drills | 15 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 40 |
| Sleeves | 40 |
| Taper pin reamers | net |
| Drills and countersinks | list plus |
| Bridge reamers | 40 |
| Centre reamers | 50 |
| Chucking reamers | 10 |
| Hand reamers | net |
| High speed drills, list plus | 10 |
| High speed cutters, list plus | 75 |
| | 40 |

### COLD ROLLED SHAFTING

| | |
|---|---|
| At mill | list plus 40% |
| At warehouse | list plus 50% |

**Discounts off new list. Warehouse price at Montreal and Toronto**

### IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 8 00 | $ 8 00 |
| Sheets, black, No. 10 | 10 00 | 10 00 |
| Canada plates, dull, 52 sheets | 9 00 | 8 65 |
| Can. plates, all bright | 9 50 | 9 50 |
| Apollo brand, 10¾ oz. galvanized | ..... | ..... |
| Queen's Head, 28 B.W.G. | ..... | ..... |
| Fleur-de-Lis, 28 B.W.G. | ..... | ..... |
| Gorbal's Best, No. 28 | ..... | ..... |
| Colborne Crown, No. 28 | ..... | ..... |
| Premier, No. 28 U.S. | ..... | 9 20 |
| Premier, 10½ oz. | ..... | 9 50 |
| Zinc sheets | 20 00 | 20 00 |

### PROOF COIL CHAIN

B

¼ in., $12.35; 5-16 in., $11.85; ⅜ in., $11.50; 7-16 in., $10.90; ½ in., $11.20; $11.00; ⅝ in., $10.90; 1 inch, $10.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $13.00; 3-16 in., $12.50; ¼ in., $11.75; 5-16 in., $11.40; ⅜ in., $11.00; 7-16 in., $10.60; ½ in., $10.40; ⅝ in., $10.00; ¾ in., $9.90.

**Prices per 100 lbs.**

### FILES AND RASPS.

| | Per cent |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 40 |
| Black Diamond | 40 |
| J. Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 37½ |
| Disston | 50 |
| Whitman & Barnes | 50 |

### BOILER TUBES.

| Size | Seamless | Lapwelded |
|---|---|---|
| 1 in. | $36 00 | $..... |
| 1¼ in. | 40 00 | ..... |
| 1½ in. | 43 00 | 36 00 |
| 1¾ in. | 43 00 | 36 00 |
| 2 in. | 50 00 | 36 00 |
| 2¼ in. | 53 00 | 38 00 |
| 2½ in. | 55 00 | 42 00 |
| 3 in. | 64 00 | 50 00 |
| 3¼ in. | ..... | 58 00 |
| 3½ in. | 77 00 | 60 00 |
| 4 in. | 90 00 | 75 00 |

Prices per 100 ft., Montreal and Toronto.

### OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | |
| Royalite, per gal., bulk | 18 |
| Palacine | 21 |
| Machine oil, per gal. | 26½ |
| Black oil, per gal. | 15 |
| Cylinder oil, Capital | 49½ |
| Cylinder oil, Acme | 39½ |
| Standard cutting compound, per lb. | 0 06 |
| Lard oil, per gal. | $2 60 |
| Union thread cutting oil antiseptic | 88 |
| Acme cutting oil, antiseptic | 37½ |
| Imperial quenching oil | 39½ |
| Petroleum fuel oil | 13½ |

### BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30-5% |
| Standard | 40% |
| Cut leather lacing, No. 1 | 1 95 |
| Leather in sides | 1 75 |

### TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 3½ to 05 |
| Emery glue | 28 to 30 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 45 |

**Prices Per Lb.**

### ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | .08½ |
| Grits, 80 and finer | .06 |

### BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 38 |
| Brass sheets, 24 gauge and heavier, base | 0 43 |
| Brass tubing, seamless | 0 46 |
| Copper tubing, seamless | 0 48 |

### WASTE.

| White. | | Cts. per lb. | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 18½ |
| Peerless | 21 | X Empire | 17¼ |
| Grand | 19¾ | Ideal | 17¼ |
| Superior | 19¾ | X press | 16 |
| X L C R | 18½ | | |

**Colored.**

| | | | |
|---|---|---|---|
| Lion | 15 | Popular | 12 |
| Standard | 13½ | Keen | 10½ |
| No. 1 | 13½ | | |

**Wool Packing.**

| | | | |
|---|---|---|---|
| Arrow | 25 | Anvil | 15 |
| Axle | 20 | Anchor | 11 |

**Washed Wipers.**

| | | | |
|---|---|---|---|
| Select White | 11 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING.

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

### ANODES.

| | |
|---|---|
| Nickel | .58 to .65 |
| Copper | .36 to .40 |
| Tin | .70 to .70 |
| Zinc | .23 to .25 |

**Prices Per Lb.**

### COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | 42 50 | 43 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 46 00 | 44 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 48 00 | 48 00 |
| Copper sheet, planished, 16 oz. base | 57 00 | 45 00 |
| Braziers,' in sheets, 6x4 base | 45 00 | 44 00 |

### LEAD SHEETS.

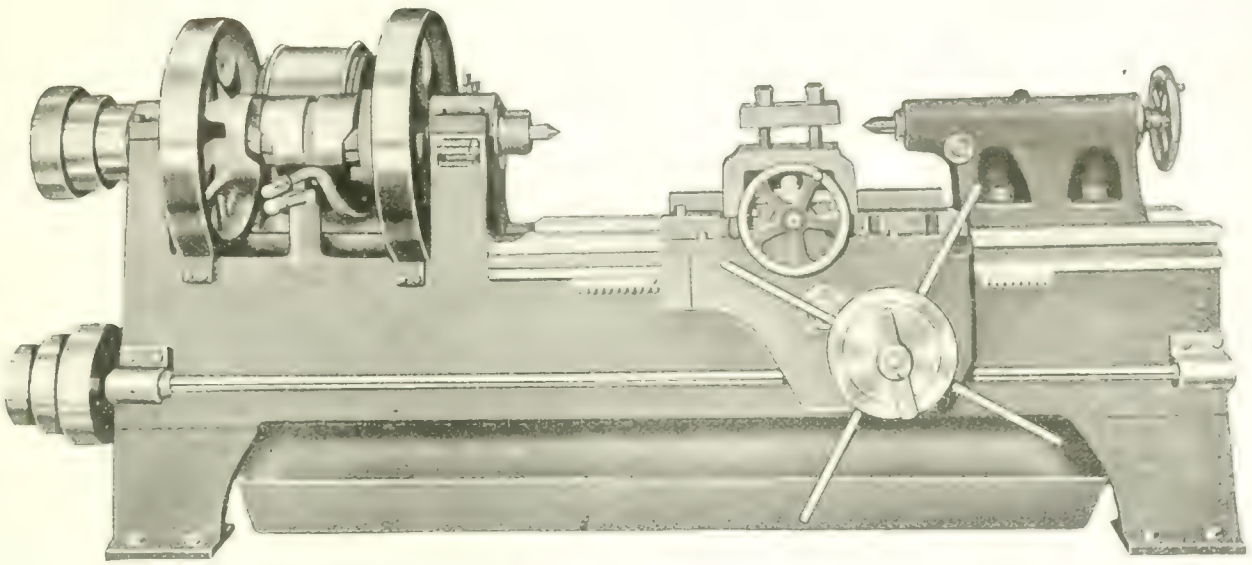
| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $13 25 | $13 25 |
| Sheets, 3½ lbs. sq. ft. | 13 25 | 13 25 |
| Sheets, 4 to 6 lbs. sq. ft. | 12 50 | 12 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS.

| | |
|---|---|
| Acid, boracic | $ .22 |
| Acid, hydrochloric | off |
| Acid, hydrofluoric | .09½ |
| Acid, nitric | .10 |
| Acid, sulphuric | .03½ |
| Ammonia, aqua | .14¾ |
| Ammonium carbonate | .20 |
| Ammonium, chloride | .40 |
| Ammonium hydrosulphuret | .50 |
| Ammonium sulphate | .30 |
| Arsenic, white | .25 |
| Copper, carbonate, anhy | .45 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .90 |
| Iron perchloride | .20 |
| Lead acetate | .35 |
| Nickel ammonium sulphate | .25 |
| Nickel carbonate | .65 |
| Nickel sulphate | .35 |
| Potassium carbonate | 1.50 |
| Potassium sulphide (substitute) | .20 |
| Silver chloride (per oz.) | .85 |
| Silver nitrate (per oz.) | .75 |
| Sodium bisulphite | .25 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .50 |
| Sodium hydrate | .18 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | .18 |
| Tin chloride | .85 |
| Zinc chloride | .90 |
| Zinc sulphate | .18 |

**Prices per lb. unless otherwise stated.**



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for the economical production of 4.5, 6 and 155 MM. shells. If you are interested in obtaining maximum production at minimum labor expense, investigate the records of the MONTREAL lathe in plants of the largest producers of shells in Canada.

The MONTREAL lathe is wonderfully simple in operation and construction, yet every worth while improvement has been embodied in the design.

A powerful machine—designed to transmit all the power that the cutting tools will stand—with large broad ways, liberal wearing surfaces and unbreakable apron. The MONTREAL lathe comes to you equipped as you need it—with carriage for rough turning —with rigid single bar for boring, or with swivelling bar for inside profiling.

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# EVERY YARD IN U. S. TO LAUNCH A SHIP IN CELEBRATION OF FOURTH

Special to CANADIAN MACHINERY.

manufacturers desire. The War Trade Board has given the most positive proof of this in an order issued this week which prohibits the placing of further war orders in the eastern section of the country. [illegible] War Trade Board the action is taken solely for the purpose of relieving conditions in transportation. Up to this time the greatest part of the war work has been done in the Eastern States, particularly in the Atlantic coast States. This has resulted in a general freight congestion of raw material and finished products. The War Trade Board is now making efforts to divert this business to the Western States and to make it possible to clear up some of the freight congestion in the East.

The order recently issued by the Railroad Administration which calls for cash payment on all freight shipments has been postponed until August 1, in order to give manufacturers an opportunity to adjust their business so that they may meet the new demands.

### Are in Agreement

Manufacturers in the United States have been informed through the War Trade Board of the action of the Canadian War Trade Board in restricting the exportation of platinum, caustic soda, soda ash, Douglas fir ,and other war products. In very few instances have any manufacturers in the United States been dependent upon Canadian sources for these materials, but the War Trade Board and the Canadian War Mission are in an agreement whereby they will secure licenses for exportation from Canada for any of the needed materials if it is shown that war work would be vitally injured by the inability to secure the product from Canadian sources. It is possible that there may be an agreement which would in effect pool the resources of raw materials held in Canada and in the United States, but this is so indefinite at the present writing that it is hardly more than a conjecture.

### The Blow Falls Hard

Reports have begun to reach the War Trade Board of the effect of the recent order issued forbidding steel plants to manufacture steel for other than war purposes until all of the steel wants of the United States and the Allies have been filled. According to one report coming from the middle West more than two hundred steel plants have been forced to close down because of their inability to furnish the sort of steel needed for war work, their plants being adapted to special manufacture for non-war purposes. Members of the War Trade Board are very firm in their belief, however, that the order will work out to a fair advantage to all steel manufacturers and will result in such a concentration of steel supplies that within a short time it will be possible for some of the factories using steel for non-war purposes to resume their work.

### A Poor Outlook

The Fuel Administration has come out with a frank statement this week to the effect that there will be a coal shortage this winter in the United States and in Canada, in so far as Canada depends upon the United States for her supplies of coal. The estimates which have been made up to this time show that there is a possibility of some fifty millions of tons of bituminous coal needed which will not be available. Production in the United States during the past year has been increased materially, but consumption has increased far faster than production. The only possible remedy which the Fuel Administration offers is economy, and all users of bituminous and anthracite coal have been ordered to use the strictest economy in their coal consumption lest they suffer from serious shortage when the winter months come.

### Cutting Supplies

An important step taken by the Fuel Administration has been to order the cutting of the coal supplies furnished factories for the manufacture of pleasure cars 75 per cent. This step, coupled with the proposed heavy tax upon pleasure cars, is already being felt to a considerable degree by the manufacturers of automobiles in the United States.

### A Great Fourth

The United States Shipping Board has authorized the construction of five additional shipyards for the construction of concrete vessels. Already contracts have been let for forty-one of these vessels. The tests which have been made show that concrete vessels can compete with wooden and steel vessels and the estimated cost per ton is far below that of the steel and wooden ships.

July Fourth will be made a day of special effort in shipbuilding in the United States. It is planned to have a ship launched on that day in every shipyard in the United States.

The Ordnance Department of the War Department has announced that since the United States declared war there have been 1,568,661 rifles manufactured in this country.

# SHORTAGE OF LABOR MAKES THE BUILDING OF PLATE MILL HARDER

Special to CANADIAN MACHINERY.

SYDNEY, N.S., June 19.—The decision of the Royal Commission on the questions connected with wages which have for some time been an issue between the various steel companies and their employees has been announced. The commission has recommended an increase in the wages of the lower paid men, at New Glasgow, Sydney Mines and at the Sydney Steelworks. The minimum rate for day labor is raised from 24 cents per hour to 27½ cents, and a graded system of increases is recommended on a lessening scale ceasing at the men who receive from 30 to 32 cents per hour. Above this figure no increases are recommended. The decision of the commission is not acceptable to the higher paid men, and there are some indications of trouble. At New Glasgow the men ceased work on the 14th June, but it is not thought the trouble will be of long duration. Great stress was laid by the workmen's representatives in placing their case before the commission on the necessity for increasing the wages of the lower paid men, and the commission's decision was doubtless guided by a desire to adjust wages where the necessity was the greatest.

The reconstructed No. 1 blast furnace of the Dominion Iron & Steel Company is in process of heating up preparatory to being put into blast. The date when this will be done is largely dependent upon the date at which coke from the new ovens will be available. The housing is now being stripped from the new ovens, and it is expected they may be in operation by the beginning of August.

### New Plate Mill

Work on clearing the site of the new plate mill is now proceeding at Sydney, and the officials of the company are actively engaged on the plans of the mill layout. As the new mill is the first of its kind in Canada a good many problems have to be worked out, and the present time is more than ordinarily unfavorable towards quick construction because of the difficulty of obtaining delivery of materials, and the shortage of labor. The already inadequate number of workmen available for construction labor has been latterly decreased by the calling of young men for military service, and it is difficult to see how the work of constructing the mill can proceed as rapidly as might be desired, unless the Government itself can furnish a labor supply.

The location of a shipbuilding plant at Halifax appears to be definitely decided upon by the Government, and in a recent visit to Sydney Mr. Carvell has announced that while Sydney is destined to become more and more the centre of iron and steel manufacture it is not considered to be the best location for a dry-dock and shipbuilding plant. As between Sydney and Halifax at the present juncture Mr. Carvell's pronouncement is probably a correct one, but doubtless some day we shall see shipbilding plants both at Halifax and at Sydney—or it may be Louisburg. Nothing can ever

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64 FRONT ST., W. TORONTO, ONT.

SALES SUPPLY DEPARTMENT SERVICE

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We are in a splendid position to supply you with every requirement in the tool line

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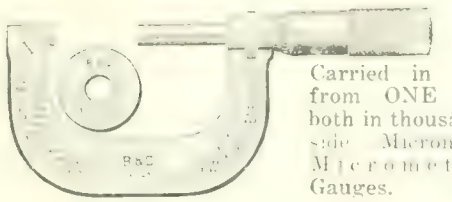
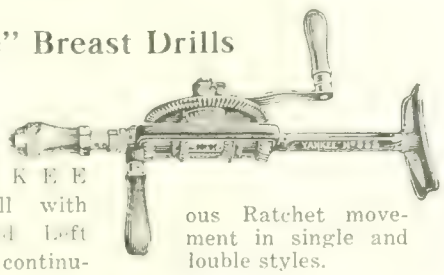


Carried in stock sizes from ONE INCH up, both in thousands and Inside Micrometers and Micrometer Depth Gauges.

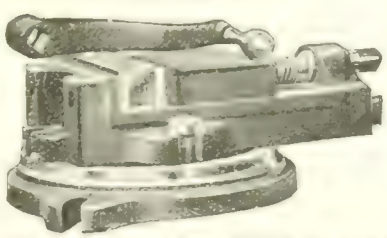
### "Yankee" Breast Drills

in stock at all times. We have the YANKEE Breast Drill with Right and Left Hand and continuous Ratchet movement in single and double styles.



### "Universal" Combination Pliers

Forged of High Grade Tool Steel perfectly tempered and carefully machined. Consists of Screw Driver, Reamer, Flat Nose Plier, Pipe Wrench, Wire Cutter, etc.



### "Williams" Combined Stationary and Swivel Milling Machine Vise, with removable jaws

Depth of Jaw 1⅝". Width of jaw 5". Vise opens 3". Weight 45 lbs. List price, $25.00

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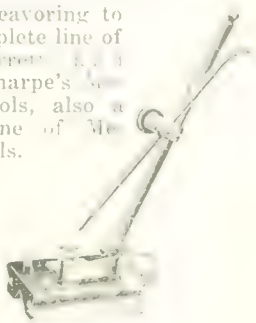

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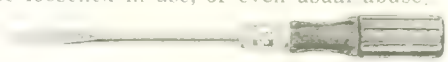
they are strong, durable, well-balanced tools. The fastening of blade and handle is such that they cannot be loosened in use, or even usual abuse.



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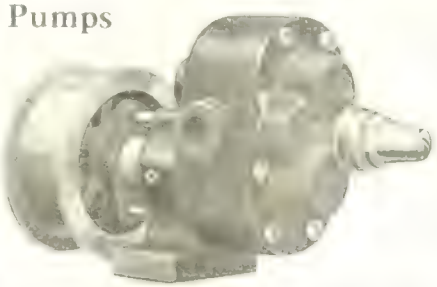

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shadow even the proximity of the coal-fields and the great steel plants on Sydday.

The production of coal in Nova Scotia, considering the drain on the labor supply to the Military Service Act, is keeping up fairly well, at the reduced level of the past few months. There is, however, not the slightest possibility that any Nova Scotian coal will go up the St. Lawrence this summer, except the most negligible quantity. The shortage of coal production is to-day overshadowed by the lack of ships to transport the

# HENRY FORD TO BUILD NEW TRACTOR PLANT

Special to CANADIAN MACHINERY.

**Steady Flow of Orders Going Out For All Branches of Machinery**

NEW YORK, June 19.—Great activity continues throughout all branches of the machinery industry. There is a steady flow of orders for cranes and fabricating machinery from shipbuilders and many additional purchases of shop equipment have been made by shell manufacturers and other manufacturers of war munitions in the last week. Railroads have also put out more enquiries for repair shop equipment and other lists are being prepared.

The Symington interests, which are already manufacturing guns and shells for the Government at Rochester, N.Y., are preparing to build a new plant at Chicago in connection with some local interests, to cost $6,500,000 and to have a capacity of 10,000 shells a day. Inquiries for machinery for the new plant have already gone out to dealers and to manufacturers. Other inquiries for shop equipment have come from the Motor Products Co., of Detroit, which is manufacturing 155 mm. shells, and from the Templar Motor Corporation of Cleveland, which is expecting a large shell contract from the Government. The Liberty Ordnance plant of the American Can Co., Bridgeport, Conn., has bought a number of new tools. The Mead Morrison Co., East Boston, has taken a contract for gun sights for which its shops are already well equipped and several of the electric companies are placing shop equipment to execute Government orders.

Shipbuilders have received bids this week on 200 cranes and 100 machine tools for two new yards to be constructed at once, one at Alameda, Cal., and the other in the vicinity of New York. It is understood that some of the orders for cranes have already been placed and contracts for punches, shears and rolls are expected to be closed in the next ten days. The American International Shipbuilding Corporation, Philadelphia, the Staten Island Shipbuilding Co., New York, the American Shipbuilding Co., Cleveland, and the Toledo Shipbuilding Co., of Toledo, Ohio., have purchased fabricating equipment, while the Foundation Co., which is to build a new plant at New Orleans, is also in the market for cranes and other machinery for plate and angle shops. It is estimated that orders from ship yards alone will call for the expenditure of $10,000,000 this month.

Manufacturers of tractors are constantly expanding their facilities and heavy purchases of machinery will be necessary. Henry Ford & Son, who will build a tractor plant at Dearborn, Mich., are preparing a list of machine tools needed. The Wolverine Tractor Co., at Detroit, require equipment for a new tractor plant at Saginaw, Mich. The Peoria Tractor Co., East Peoria, also requires machinery for plant extension.

Railroads are placing larger contracts for bridges and structural work and also for locomotive and car repair shops. The New York Central is asking for bids on 175 machines which will cost approximately $500,000. The New York, New Haven & Hartford is buying tools for its Readville, Mass., and New Haven, Conn., shops. The Northern Pacific R. R. has also put out a list of tools required in the Chicago and Eastern markets.

The Railroad Administration in the last two days has completed the distribution of orders for material for the building of equipment for the nationalized railroads. The orders included 200,000 forged steel wheels, which will cost approximately $8,000,000, about one-third of the order went to the Carnegie Forged Steel Wheel Co. The remainder of the order was distributed among three other manufacturers. It will be recalled that orders for 800,000 cast iron wheels were placed about ten days ago. Yesterday orders for specialties required in construction of 100,000 cars were distributed among seven different manufacturers. Contracts for 390 additional locomotives which will call for about 78,000 tons of steel were also distributed. In the last week, the Government has allocated orders for 500,000 tons of steel products to be used in construction of railroad equipment, ships and manufacture of shells.

# CAN'T OVERTAKE THE DEMAND FOR STEEL

Special to CANADIAN MACHINERY.

**And Chances of Commercial Business Getting a Look-in Are Not Bright**

PITTSBURGH, June 19.—While the steel producers are not altogether clear as to some points in the new regulations as to the distribution of pig iron and steel products, adopted by the War Industries Board under date of June 6, they feel fairly familiar with the general bearing of the regulations.

One very interesting point seems clear in the minds of most steel producers, to the effect that the distribution of any surplus material that may develop after the preference list (the recognized "more essential" classes of commercial consumption) has been taken care of, cannot occur at present, or until the War Industries Board issues its promised revised list of the preference purposes. The list embodied in the resolutions of June 6 is an old list, compiled without particular reference to iron and steel. When that list is promulgated the distribution of surplus steel can occur, but only upon written consent of the Director of Steel Supply.

**A Queer Point**

The tying up of surplus steel goes farther than the actual shipment; it appears to relate to the finishing of steel that may have been produced. The regulations refer not merely to material existing, but also to the use of "manufacturing facilities." Therefore leading steel producers make this interpretation, that if in the filling of a Government order they chance to produce an "off" heat of steel, which cannot be used for the order, they must hold the heat in ingot form until instructed by Washington what finished forms to roll it into. Obviously such a thing cannot be carried far, in point of time, as ingots cannot be stored to any great extent, and also it is expensive to let them cool and heat them later for rolling.

**Not Enough Yet**

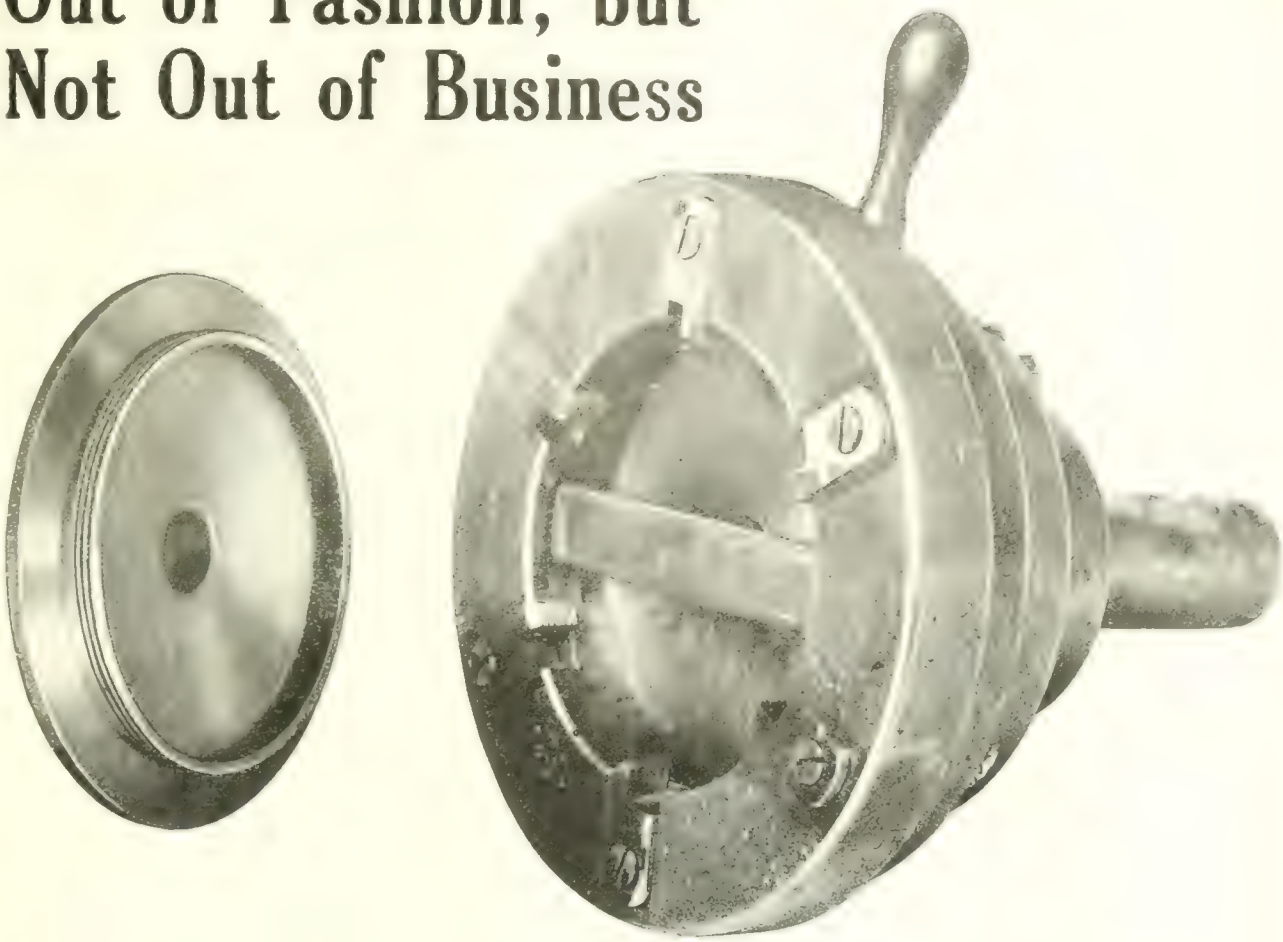
The authorities at Washington continue to insist that there will not be nearly enough steel, at least for months to come. Many steel producers adhere to their view formed long ago that the war industries cannot possibly consume all the steel, and that there must be a surplus eventually. Of course they merely hold the opinion and cannot allow it to modify their conduct, and thus they are merely carrying out the regulations. Some of them have the thought, however, that the intensive shipping of steel against the war activities will in its own due time bring the surplus to light, in the form of some of the war industries finding them well stocked with steel and expressing a willingness to have shipments to them curtailed. Meanwhile the producers have nothing to do but "play the game."

**Pig Iron Supplies**

From the current trends it would appear that even if some steel products should eventually become more plentiful, and no one can say that the balance of probability is really in that direction, it would not follow that pig iron would become more plentiful, for the iron foundry, for instance, not engaged in war work. The best estimates that can be made of capacity are that there is 43,000,000 tons of pig iron capacity and 47,000,000 tons of steel ingot capacity. While steel is made from pig iron, in general, there is normally much scrap used, and that scrap is scarcer than usual, hence it takes a larger proportion than usual of the pig iron to keep the steel works running, and the steel works are going at a less proportion of their capacity than are the blast furnaces. There is practically no new construction except in connection with the war, and that means that old bridges and buildings are not being torn down. The railroads are doing but little in rail

Continued on page 62.

# Out of Fashion; but Not Out of Business



This old "war horse" of a Geometric Die Head has been cutting Screw Threads for a Chicago concern for seventeen years. It was recently sent back to the Geometric Factory for overhauling, and has gone again to Chicago, for possibly seventeen years more of duty.

A Geometric Collapsing Tap, purchased by the same people seventeen years ago, is still cutting the inside threads to match. Can you match that?

Geometric Thread Cutting Tools of to-day can surpass it. What thread cutting method are you using? Learn the Geometric way. It is a path others have trod for the past twenty-five years. Geometric experience has smoothed the path of thread cutting for many. What will you let it do for you?

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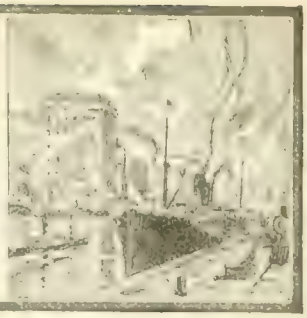
# INDUSTRIAL NEWS

## NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES



## CONTRACTS

**Hull, Que.**—The Hull Electric Com- [illegible] extensions [illegible]

**Lloydminster, Sask.**—The installation [illegible] power plant, to cost about $60,000, is under consideration by [illegible] Lloydminster.

**Shawinigan Falls, Que.**—Work, it is reported, will soon begin on the construction of a new plant for the Canadian Ferro-Alloys Company, to cost about $100,000.

**Montreal, Que.**—The contract for rebuilding the hydro-electric plant for the College de Montfort, including a concrete dam, a wooden-stave pipe line and a brick and concrete power house, has been awarded to Arsenault & Plamondon, Ltd., of Montreal.

**Vancouver, B.C.**—Mundy, Rowland & Company, of Vancouver, have been awarded the contract for the electrical work on the Manitoba Parliament Buildings at Winnipeg, amounting to more than $100,000. The company has also secured the contract for the electrical installation in the Saskatchewan Co-operative Hospital at Port Arthur, Ont., at $25,000.

**Drummondville, Que.**—The Southern Canada Power Company has awarded contract for the construction of a dam and concrete power house on the St. Francis River, near Drummondville, to Morrow & Beatty of Peterboro, Ont. The company is planning for a development of 10,000 h.p. at present, but will make provision in the power house for an ultimate development of 18,000 h.p.

**Nova Scotia Steel Record Output.**—Nova Scotia Steel and Coal Co.'s plants broke all previous records in May for steel and iron production, despite a labor shortage, according to a despatch from New York. The open-hearth plant produced 14,558 tons of steel ingots and the blast furnace 8,835 tons of pig iron, as against the previous record of 14,243 tons of steel and 8,016 tons of iron in March, 1917.

**OTTAWA.**—A contract for the construction of a 3,750-ton merchant vessel has been awarded to the Collingwood Shipbuilding Co., by the Department of Marine, Ottawa. It is the second contract let to that company since the Government announced its shipbuilding policy. The Marine Department has placed in all contracts for ten vessels. It is now engaged in the preparation of plans for the 10,000-ton ships to be built at the new Halifax ship yard.

## ENGINEERING

**London.**—The Ministry of Munitions is considering the adoption of the Madsen machine gun, the War Office announced recently. The gun weighs only 15 pounds, fires at the rate of 18,000 rounds

### MARKET REPORTS

continued from page 60.

replacements, and they are wrecking very few cars and locomotives, and thus the railroad scrap lists are small. The Pennsylvania Railroad (east of Pittsburgh) is running only about 10,000 tons of scrap a month. Then, too, a great deal of steel is going abroad, to be fabricated there, and the scrap resulting does not come out here.

#### Steel Production

The statistics of steel ingot production in May are somewhat disappointing. Pig iron production, as noted in last report, was at the rate of 40,400,000 tons a year in April and at the rate of 40,900,000 tons a year in May. There was an increase, even though it was not as great an increase as had been expected. Now the steel ingot figures appear, showing that while the rate in April was about 42,650,000 tons a year, the rate in May actually dropped to about 42,300,000 tons a year. The production of finished rolled steel runs about 75 per cent. of the ingot production, the difference being scrap, mill scale, etc., so that finished rolled steel was produced in May at the rate of about 31,600,000 gross tons a year, or about 3,000,000 net tons a month.

#### War Requirements

At the Institute meeting May 31, J. Leonard Replogle, Director of Steel Supply, stated that the unfilled war orders on the books of steel producers, plus orders he had practically ready for placing, amounted to 16,800,000 net tons. Since then news has come out of additional requirements, for early placing, involving some 3,000,000 tons more, and making 20,000,000 tons in all.

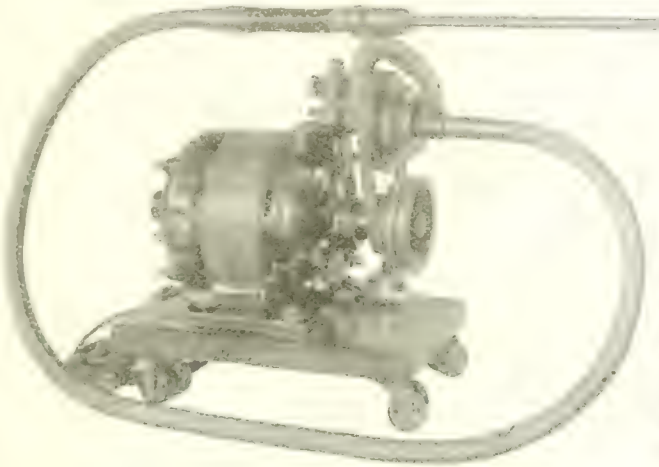
The vital question, of course, is the rate per month at which this steel will be required. If the Government were simply buying farther ahead, as its plans are developed, the mere increase in total tonnage would mean nothing. That the trade at large has no definite idea is quite certain, and one can go farther than that, and observe that there is a hint that the highest authorities as yet know very little. This hint is contained in a paragraph in the War Industries Board's resolutions of June 6, in which distribution of pig iron and steel products to the preference list was decreed. It will be recalled that on May 17 a committee was formed, of a few members of the War Industries Board and a larger number of men, leading representatives of the iron and steel industry, to determine, among other things, this very question, the prospective rate at which steel could be furnished and the prospective rate at which it would be required. In the resolution of June 6, however, the committee is given instructions as if it had not reported any very definite findings as yet, and it is asked to recommend, if possible, ways by which steel supply can be increased.

#### Prospective Prices

There is no definite hint as to what the War Industries Board will do in the matter of iron and steel prices, a subject it must decide by the end of next week, as the present set prices run only through June 30. There is a strong presumption that reductions, and perhaps considerable reductions, will be desired, particularly as the Government is taking such a large proportion of the output that taxing excess profits is not enough to equalize. On the other hand there are arguments as to increased costs, and indeed a great increase since the original price basis was decided upon, September 21, 1917, and there is also the argument that the last ton of steel possible is desired, and even if the best positioned producers do make large profits the poorly positioned producers are also needed, when six months ago it did not appear that the war needed them. The familiar argument in some quarters then was that if 75 per cent. of the iron and steel industry was given a profit, its output would be amply sufficient to conduct the war work in all its phases. That is no longer the case, for the consumption that does not help directly or indirectly to win the war has become relatively small.

# Rectifying the Inside of High Explosive Shells of Every Size

is work that takes a great deal of time when done by hand. It is work that runs into unreasonable cost without



Aikenhead's

## Flexible Shaft Grinder

It will thoroughly clean out and smooth any rough spots in the shell. This Aikenhead grinder makes the work easier and more accomplished.

Hand service will not put it out of order. An automatic stop arrangement guards against accidents. Short bends and flat curves in connection and belts prevent overheating of the motor.

**Aikenhead Hardware Limited**

**17, 19, 21 Temperance Street, Toronto**

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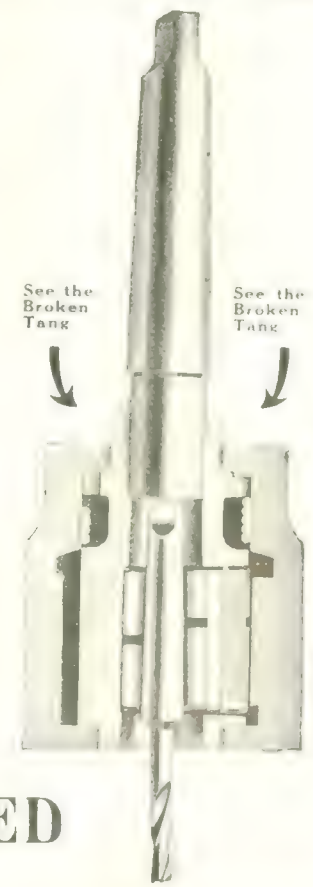
# Slippage is Impossible

Here is an automatic chuck whose jaws grip firmer as resistance on the tool increases. The tool may have no tang; that makes no difference. This chuck grips by the entire shank.




Aikenhead's

## Wahlstrom Chuck

puts an end to the waste of time and motion. It enables the operator to make tool changes, in just two seconds, without stopping the spindle of machine. For a tool that earns, saves, produces all the time, its cost is very reasonable.

Give your men this keyless and colletless chuck. Results will prove it pays.

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**AIKENHEAD HARDWARE LIMITED**

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at least. At only 12 hours are required to learn to operate it. Speaking in the House of Commons, Lord Beresford urged its adoption, declaring: "Two battalions armed with the Madsen gun could hold three divisions on a limited front."

**Ottawa.**—Establishment of a lignite briquetting plant to be financed and operated by the Dominion, Manitoba and Saskatchewan Governments, is recommended by the lignite committee of the advisory council for scientific and industrial research. The committee's report favors establishment of the plant in southern Saskatchewan "at a locality where the lignites are of poor grade, with the idea that if it were succesful at this point, it would undoubtedly be successful elsewhere in Saskatchewan and Alberta."

**Vancouver.**—Representing a total investment of between three and four million dollars, preliminary work has commenced on the establishment of a large pulp and lumber mill at Beaver Cove, B.C., 165 miles north of Vancouver. Among the heads of the company are W. H. White, Boyne City, Mich., president and managing director, and W. O. King, of Chicago, vice-president and treasurer. The company will be known as the Beaver Cove Lumber & Pulp Co., and the total daily capacity of its plant will be forty tons of pulp and 100,000 feet of lumber.

**Ottawa.**—With a view to investigation of the fuel and power resources of Canada, the "Dominion Power Board" has been created under the chairmanship of Hon. Arthur Meighen, minister of the interior. The members of the board are: A. St. Laurent (vice-chairman), assistant deputy minister, Department of Public Works; C. N. Monserrat, consulting engineer, Department of Railways and Canals; W. J. Stewart, consulting engineer, Department of External Affairs, regarding international waters; John Murphy, electrical engineer, Dominion Railway Commission; H. G. Acres, chief hydraulic engineer, Hydro-Electric Commission of Ontario; O. Higman, chief electrical engineer, Department of Inland Revenue; D. B. Bowling, geologist to Department of Mines; F. F. Haanel, chief engineer, fuel testing division, Department of Mines; J. B. Challies, secretary, chief engineer and superintendent, Dominion water power branch, Department of the Interior.

## INCORPORATIONS

**Montreal, Que.**—A new company has been organized here, to be known as Crane, Limited, with a view to manufacturing a complete line of valves and fittings, as well as certain lines of plumbing supplies. It is the intention of the company to erect a factory at once, to be planned on the unit system, so that additions may be made later as conditions warrant. The initial outlay calls for an expenditure of some $40,000. The officers selected for the new concern were: President, R. T. Crane, jr.; First Vice-President, J. B. Berryman; Second Vice-President and Secretary, E. C. Townsend.

**Ottawa.**—Halifax Shipyards, Limited, the Montreal company which, with a capital of $6,000,000 was granted incorporation, is authorized by the Government to engage in a variety of pursuits. The notice of incorporation appearing in the Canada Gazette states that the company may design, construct, purchase, lease or charter steamships, ships, dredges, tugs, scows, steamship lines, transportation lines, wharves, dockyards, shipbuilding yards, marine railways, telegraph and telegraph lines, etc., on lands owned or controlled by it. The company may also build and operate steamboat and railway terminals, transportation warehouses, storage and cold storage facilities, yards and stockyards, etc., on its own land. The company may construct steamship works for the manufacture of machines, railway or railway equipment and all supplies for steam boats and vessels generally. Power houses and structures for the development and utilization of water, steam, electric and other power may be built and operated. It can also carry on the business of transporting mail and freight upon land and water of the dominion and engage in all branches of towing, wrecking and salvage in Canadian waters.

## MARINE

**Detroit.**—Changes in the barometer pressure caused a variation of as much as two feet in seven minutes in the level of Thunder Bay and Lake Huron over its northern end. The water rose so abruptly and to such a height that wood piles along the shore were threatened. Similar fluctuations are predicted for the southerly part of Lake Huron.

**Port Huron.**—The towing tug Salvor, owned by the Reid Wrecking Company here, went down in Lake Huron, not far from Manitoulin Island. The crew reached shore in safety and are now in Georgian Bay district. The Salvor was 135 feet in length and was valued at $40,000. She was an old-time river tug and ran originally under the name of the George H. Parker.

**Detroit.**—Complaints have been received by the office of William Livingstone, president of the Lake Carriers' Association, that masters of some lake steamers are subjecting their own and other vessels to danger by anchoring in foggy weather in mid-channel just below the entrance from Lake Huron into the St. Clair River. Several vessels are reported to have narrowly escaped collision in that locality this season.

**Washington.**—Deliveries of steel ships to the Shipping Board in the first two weeks of June numbered 16, with a total weight tonnage of 89,162. Because of German submarine activity off the American coast, the Shipping Board ordered bonus of 25 per cent. of their monthly wages paid to all seamen employed on American merchant vessels in the coastwise, West Indian and South and Central American trade.

**A Pacific Port.**—Messages received here said the Pacific Steamship Company's freight and passenger steamer Ravalli was destroyed by fire en route to Alaskan points recently. When the fire was discovered the boat was beached and the passengers and crew put ashore. The fire did not stop burning until it reached the water's edge. All the baggage was saved. Most of the cargo was destroyed. The Ravalli was a vessel of 777 tons.

**St. Catharines.**—James R. Lawrence, for over 30 years paymaster on the Welland Canal, faces a charge of stealing $16,000 from the department of railways and canals. The defalcation with which Lawrence is charged dates back to the year 1892 and is altered to have taken place between that date and 1912. Last fall, at the time of enumeration for the Dominion elections was taking place, a discovery is understood to have been made which resulted in an auditor being sent from Ottawa. Further discoveries apparently followed, for the paymaster was suspended.

**Montreal.** — Another blow at the German submarine was delivered on Saturday when the 7,000 ton cargo steamer "War Earl" was launched from the yard of the Canadian Vickers Limited. The big vessel, which has a length of 380 feet and a breadth of 49 feet, took the water without a hitch amid the blowing of sirens and cheers of thousands of workmen and spectators who lined the quays. Within three minutes after the champagne had splashed over the "War Earl's" bows the keel of a sister ship was in place on the ways she had vacated, and will in turn be launched in October.

QUEBEC.—The steel rudder and tail shaft for the new wooden ship in course of construction by the Quebec Shipbuilding and Repair Co. on the Louise docks, arrived yesterday and work of installation will be commenced as soon as those large parts, weighing over seven tons of solid steel, are transferred from the Canada Steamship Co.'s landing to the docks. The propeller needed for this ship, weighing about five tons, with its 14-foot blades, is expected to arrive to-morrow or Wednesday. Just as soon as these three essentials are put in position the new 3 000-ton ship, to be christened the War Quebec, will be ready for launching.

**Detroit.**—There are several suspicious circumstances, it is alleged, in connection with a collision which occurred between two lake freighters in St. Clair River, in which one boat, the Australia, was rammed and sunk in such a way as to indicate that a deliberate attempt was made to block the Canadian channel at this point. The vessel which collided with the Australia is the B. F. Jones, one of the largest boats on the Great Lakes. The wheelsman on duty on the Jones at the time was at once placed under arrest and locked up under guard on orders from the vessel's captain, when the Federal authorities were notified of the affair. His name is withheld.

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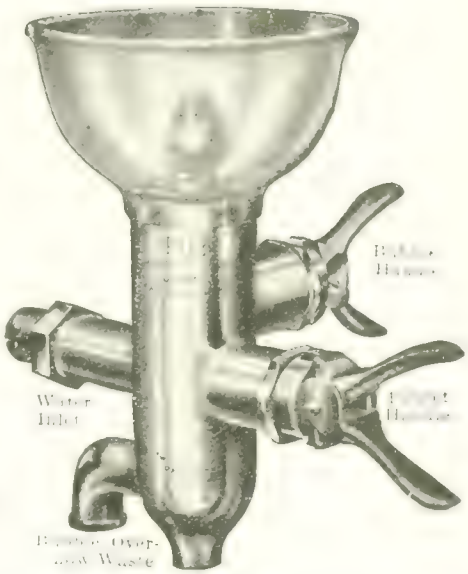

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London. Twelve new British companies have been registered with the object of constructing ferro-concrete vessels. They are as follows: Marine and General Concrete Construction Syndicate, Ltd., capital £600,000; Scottish Concrete Ship Co., £10,000; Blacketts Concrete Ships, Ltd., £5,000; Gloucester Ferro Concrete Shipbuilding Co., Ltd., £20,000; Stuarts Concrete Ship Co., Ltd., £15,000; Amble Ferro Concrete Co., Ltd., £25,000; Wear Concrete Building Co., Ltd., £70,000; Concrete Seacraft, Ltd., £12,500; Aberdeen Concrete Shipbuilding Co., Ltd., £40,000; Blair-Frost Ferro Concrete Co., Ltd., £60,000; Cambelltown Ferro Concrete Shipbuilding Co., capitalization not given.

London. The "Manchester Guardian" understands that a final conclusion has been reached in the negotiations that have been pending for the purchase by a British syndicate, including Lord Pirrie and Sir Owen Phillipps, of all the vessels of British register now owned by the International Mercantile Marine Company. The transaction has yet to be ratified by the stockholders. The reported transfer price is $125,000,000, much below the present market value of the ships, which aggregate about 960,000 tons. By an understanding among the Admiralty, the Board of Trade, and J. Pierpont Morgan in August, 1903, when the combination was formed, none of the vessels could be transferred to foreign registry for 20 years from that date.

## MUNICIPAL

**Woodstock.**—The ratepayers voted on two loan by-laws and both were carried by large majorities. The Worsted Spinning Company by-law granting the concern $20,000 of a loan for purchase of site and erection of buildings, was carried by a vote of 874 to 116. The second by-law voted on was to give a grant of $18,000 to the Hosiers, Limited, the same to be applied to the purchase of a site and erection of suitable buildings. This by-law also carried by 882 to 107.

## PERSONAL

**Wilford Phillips**, for 17 years general manager of the Winnipeg Electric Railway Co., died on June 12th at Rochester, Minn., after a prolonged illness.

**Mark Workman**, president of the Dominion Steel Corporation, has rented the J. K. L. Ross property, "Cromarty," Sydney, N.S., and will leave with his family shortly to spend the summer in Cape Breton.

**Captain D. A. Waggoner**, a well-known marine man, died at the hospital at Brockville, Ont., on June 11th, where he was receiving treatment. He sailed several boats out of Alexandria Bay, which was his home. He was 83 years old.

**E. D. Cassidy**, manager of the Barnett and McQueen Company, **E. H. Smith**, of the Canadian Westinghouse Company, Fort William, and **E. B. Hagarty**, of the Canadian Government railways, Winnipeg, have returned after a week's very successful fishing trip near Ameson, on the C.G.R. They have been fishing in virgin country about 500 miles north-east of Fort William. They found speckled trout very plentiful, and the fish they caught were beauties, averaging two pounds in weight. The Nagogami, White and Skung rivers are easily accessible from Ameson. There is excellent canoeing on these rivers, and the district is a veritable paradise for fly fishermen.

**Capt. Eugene Cowles**, well known to Montreal residents, is on sick leave at his home, 14 Tower avenue. He has not only won promotion in two years from second lieutenant to his present rank, but is as well the recipient of the Military Cross. He won his decoration in leading a party of sappers in the capture of Hill 70, near Lens, on August 15, 1917. Captain Cowles is a graduate of McGill University, class of 1910. Upon taking his degree, he spent five years in Johannesburg, South Africa, as a mining engineer. The call for volunteers brought him to London in 1916, where he enlisted with the Royal Engineers, going overseas with a tunneling company on March 28, 1917. He was wounded, and spent two months in hospital in England. He is now on sick leave until October.

## TRADE GOSSIP

**The Spartan Machine Co.** of Montreal are making preparations to change over from the 4.5 to the 4.7-inch shells. A small extension will be made to the present plant to accommodate the additional equipment that will be required to maintain the desired output. The machinery has recently been rearranged to increase the efficiency and the operations are proceeding with more regularity.

**The Fuel Situation.**—CANADIAN MACHINERY has the following as a reliable summary of the coal situation:—"So far as trade conditions are concerned, dealers are making deliveries as fast as they can and generally are bare of stocks. Demand for all grades of coal is greater than the supply. Lake shipments so far have been below expectations, though carrying capacity is plentiful."

**The Standard Machinery and Supply Co.** of Montreal have acquired the selling rights for the special purpose shell lathes manufactured by the Tolland Manufacturing Co. This firm is successors to the Foundry and Machine Co., the original designers and makers of these machines. Several improvements have been added to the previous design which greatly increases their productive efficiency.

**To House Employees.**—The Brantford City Council granted a special concession to the Dominion Steel Products Company, which will erect 100 homes to cost from $3,000 to $5,000 for its employees. The land assessment will remain the same for five years, and only half of the building assessment will be taxed for general purposes, though in full for school and local

# Success and Your Associates

ALWAYS associate with men who are earning more money than you are. Such is the advice given by a man whose name is known the world over for his own success and the business which he created. It is good advice of a certainty, but we are not urging that it is the best advice. At the same time it is wise to associate with better or bigger men than you are yourself, because you are likely to be lifted up to their levels.

Most of us would probably like to be the intimates of J. P. Morgan, or of John D., or of Charlie Schwab, or Canny Andrew. If we had a speaking acquaintance with John Wanamaker, or Lord Beaverbrook, or Lord Shaughnessy, and with other distinguished and successful men, we would take comfort from the fact.

And most of us would feel rather small and uncomfortable if we were placed beside President Woodrow Wilson at a dinner table, or beside Sir Robert Borden, Sir Herbert Holt or Sir Wm. Mackenzie. And the reason would probably be that we know so little of the knowledge that really counts. If these successful business men engaged us in conversation we would probably find ourselves knowing very little about the things that matter.

This will illustrate the point:

Here's a true story. A Toronto manufacturer found himself on a train going to Albany in company with a number of distinguished Americans about to attend the inaugural ceremonies of a State Governor. A washout led to a delay, and the Canadian was thrown into close association with senators and congressmen and prominent lawyers. They bantered the little Canadian about Canada. He had the pluck of a bigger man. He had been a constant reader of THE FINANCIAL POST, and had absorbed many facts about Canada. He surprised his American travelling companions with his positive, well-informed and wide knowledge of Canada. When the company reached Albany, the Canadian was persuaded to attend the ceremonies and was introduced as the man who knew all about Canada. The Governor was interested in Canada, and said so, and the little Canadian found himself telling the story of Canada very ardently to a very attentive listener, much to the amusement of his friends who introduced him.

This man made a hit on that journey, and many friends. One of the company gave him a stock market tip worth a fortune.

The point of this story is: You, as a Canadian, can make yourself very fully and intelligently if you become a regular reader of THE FINANCIAL POST. You can make yourself a worthy companion and intimate of presidents and magnates. The world likes to listen to men who know something well, and who can talk interestingly and informingly on the subject of their study.

You can become worth listening to if you know your Canada well. And you can get the kind and amount of knowledge concerning Canada which will make you interesting to others if you will read THE FINANCIAL POST regularly each week.

IF you read THE FINANCIAL POST REGULARLY you will find yourself keeping company with the highest paid staff of editors engaged on any publication in Canada—trained men who know how to make others know what they know and learn.

You will find yourself living in a most interesting world—the great, throbbing world of business. You will have your thoughts tremendously stimulated and helpfully directed. You will find yourself becoming a fit table companion for big men—this because you will have knowledge of a quality that will keep you from shame.

What is it that keeps you and THE POST separated? It cannot be its subscription price of $3. Probably it is because you are not very well acquainted with this paper.

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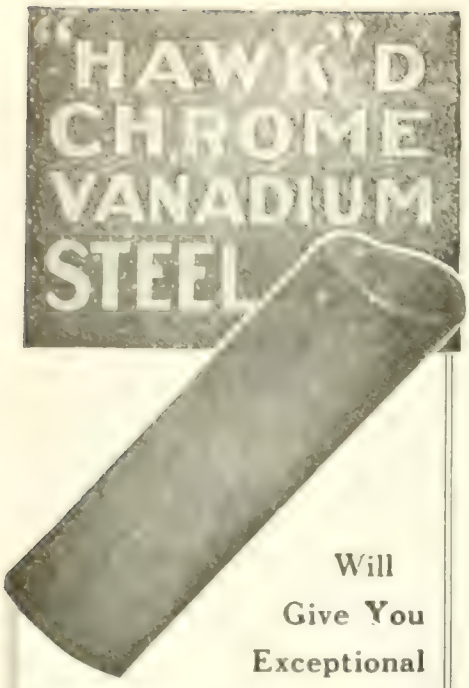


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Improvement taxes. The city will pay the cost, $25,000, of grading the streets in the new subdivision.

**Canadian Canners Get in Tin Plate.**—The War Trade Board of Canada has made arrangements with the War Trade Board of the United States whereby canners of Canada will be enabled to obtain supplies of tin plate from the United States at an approximate price of $7.75 per base box of 300 pounds. An order-in-Council has been prepared by which the Canadian Government will take power to purchase on behalf of the canners the total supply of tin plate necessary.

**Haldimand.**—The town is considering the purchase of a fire engine from the Waterous Engine Works, of Brantford. The engine is to be a four cylinder, 48 horsepower water-cooled, and a gasoline tank with a capacity of 11½ gallons. A rotary pump with a capacity of 300 to 350 gallons per minute, with heating device to prevent freezing, and the drive is a direct connection to engine by means of flexible coupling and friction clutch. The purchase price is to be $3,500.

**New Greaves-Etchells Electric Furnaces.**—The Electric Furnace Construction Co., Philadelphia, is installing a 6-ton Greaves-Etchells electric furnace at the Mare Island Navy Yard, San Francisco, Cal., for making special steel castings for naval vessels. This brings the total of this type operating or contracted for in the United States to 13. New 3-ton Greaves-Etchells electric furnaces have been started up at the Leyland Motor Works, Leyland, England, and at Stewarts & Lloyds, Ltd., Glasgow, Scotland. They will both make high-grade steel castings.

**Makes a Record.**—A wonderful record in an important branch of war work has been made by Annie Irving, who is employed as a grenade filler in a munition filling station in the south-western district of London. In nine hours she filled 6 036 hand grenades with high explosives. Her score during the first hour was 50 boxes of 12 grenades each, and gradually increasing her speed during the afternoon, she turned out a box full each minute, and for the last two hours more than a box a minute, or one grenade in less than five seconds. She was assisted by a squad of cementers, screwers up, painters, packers and examiners.

**The Wheeler Condenser & Engineering Co.**, of Carteret, N.J., has, under agreement with the Sugar Apparatus Manufacturing Co., acquired the exclusive right to manufacture and sell evaporating apparatus under the patents of S. Morris Lillie, president of that company. The advice of Mr. Lillie is to be at all times at the command of the Wheeler Condenser & Engineering Co., and at the same time Mr. Lillie will have the co-operation of the entire engineering, sales, shop and erecting organization of the Wheeler Company. This combination will doubtless result in service of the highest character.

**Carbonate of Ammonia.**—The Canada Food Board has made arrangements with the United States War Trade Board, by which a limited quantity of carbonate of ammonia has been allotted to the Canadian trade. The allocation will be made by the Canada Food Board, and the latter will issue import permits. These permits must be attached to the applications of United States shippers to the War Trade Board at Washington. Canadian manufacturers desiring to import carbonate of ammonia should make application to the import and export section of the Canada Food Board, Ottawa, stating their monthly requirements.

**Southern Canada Power Co. Extensions.**—Southern Canada Power Co. has completed its high tension transmission lines, with the necessary substations, etc., connecting the cities of Sherbrooke and Granby. This line, which is of 48,000 volt capacity, passes through Magog, Knowlton, Foster, etc., and is now in operation supplying Granby and the intervening territory with electric power. Work on one of the company's large hydro-electric developments at Drummondville is progressing very satisfactorily, over 250 men being employed. This plant will have an ultimate capacity of 17 000 h.p. and it is expected two units, with a capacity of over 7,000 h.p., will be in operation by April 1st next. The company are also building additional high tension transmission lines connecting Drummondville with the city of Sherbrooke.

**Platinum Scarcer.**—Attention is called to the shortage of platinum in a circular letter sent out by the War Trade Board to jewelry manufacturers and dealers in Canada, appealing for their co-operation in the administration of the order-in-council passed on May 29, governing the prices and sale of the metal. The platinum requirements of the allied governments are much in excess of any production that is expected to be forthcoming, and in view of this the board requests that the regulations be strictly observed. Manufacturers or persons trading in platinum are asked to furnish J. W. McConnell, Director of Licenses, with an inventory of all platinum, platinum scrap and articles containing more than 25 per cent. in value of platinum held by them. According to the regulations no platinum can be purchased or sold unless the deal is first authorized by a license of the War Trade Board. Further, no platinum scrap can be used for the manufacture of any ornament or article of jewelry, except under license by the board.

## TENDERS

**Montreal.**—Tenders are being received up to the 24th by Rev. P. G. Vaugeliste, parish priest, No. 2808 Drolet Street, for the construction of a church. Plans can be seen at the office of the architects, 230a St. Andre Street, Montreal.

**Ottawa.**—Tenders will be received until 12 o'clock noon, on Friday, June 21, 1918, for dredging required at the Eastern Channel of the River St. Maurice, at Three Rivers, Quebec. Contractors must be ready to begin work within thirty days after the date they have been notified of the acceptance of their tender.

R. C. Desrochers, secretary, Department of Public Works.

**Toronto.**—Bulk tenders for all trades required in connection with the removal and reconstruction of upper part of tower to combined police station and fire hall in Exhibition Grounds will be received by registered post only, up to noon on Tuesday, June 25th, 1918. Plans and specifications may be seen and forms of tender and all information obtained at the office of the City Architect, City Hall, Toronto. Address T. L. Church, Mayor.

**Ottawa.**—Tenders will be received up to July 2, 1918, for the lighting fixtures required in the reconstruction of the Parliament Buildings, Ottawa. The work of this contract shall be proceeded with as indicated in the schedule or as may be directed and in such a manner as to ensure the completion thereof by November 1, 1919. Plans, specifications, schedules and any other information required can be obtained at the office of the general contractors, P. Lyall & Sons Construction Company, Limited, Ottawa, Ontario

**Ottawa.**—Sealed tenders will be received up to and including twelve o'clock noon, Friday, June 21, 1918, for the construction of about 2.7 miles of railway from a point on the main line of the Intercolonial Railway at Moffat Station to a junction with the International Railway, about seven miles from Campbellton, N.B. Plans, specifications and blank form of contract may be seen at the office of the chief engineer of the Department of Railways and Canals, Ottawa, Ont.; at the office of the chief engineer, Canadian Government Railways, Moncton, N.B., and at the office of the resident engineer, Campbellton, N.B.

**Ottawa.**—Tenders will be received until noon, July 2, 1918, for the hardware required in the reconstruction of the Parliament Building, Ottawa. All tenders are to be based on the supplying and delivery to the site of all hardware included in the schedule of quantities as required and described by the plans, specifications and schedule for hardware. The work of this contract shall be proceeded with as indicated in the schedule or as may be directed and in such a manner as to ensure the completion thereof by June 1, 1919. Plans, specifications, schedule and any other information required can be obtained at the office of the general contractors, P. Lyall & Sons Construction Company, Limited, Ottawa, Ontario.

## CATALOGUES

**Air Compressors.**—The Canadian Ingersoll-Rand Co., Sherbrooke, Que., has issued a bulletin describing the class "P L B—2" power driven, two stage, cross compound air compressors. The principal features of design and construction are given in detail accompanied by a description covering the general design. Particular attention is given to the air valve feature of this type of compressor. The illustrations include views of details showing their design.


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227 Davenport Road, Toronto, Ont.

# CLASSIFIED ADVERTISING SECTION

Rates (payable in advance): Two cents per word first insertion; one cent per word subsequent insertions. Count five words when box number is required. Each figure counts as one word. Minimum order $1.00. Display rates on application.

## FOR SALE

[illegible] DAVIS CHUCK [illegible]

[illegible] LEVIN ENGINE [illegible]

[illegible] NO. 1 TO NO. 7 [illegible] Peel Rolling Mills, Limited, Montreal, Que.

FOR SALE RETURN TUBULAR BOILER 16 [illegible] six 2½ inch tubes. Passed for 85 pounds steam. Full [illegible] For price apply Canadian Hart Wheels, Limited Hamilton. (c25m)

FOR SALE CHEAP—ONE 30 K.W. GENERA[illegible] D.C. 125 Exciter. Westinghouse Generators on sub-base - switchboard. One 20 K.W. generator set on sub-base, same as above. These two sets are in perfect condition and we offer decided bargain for quick sale. Winnipeg Machinery Exchange, Sutherland & Gladstone Sts., [illegible] (c2-26)

## WANTED

WANTED SECOND HAND ALLIGATOR OR Guillotine Shears in good working condition, [illegible] Address Dulon Crucible Alloys, Limited, Welland, Ont. (c26m)

WANTED QUICK ONE SCLEROSCOPE, ALSO [illegible] Give full particulars and price. Albion Machine Co., Ltd., New [illegible] (c1m)


# MACHINE TOOLS

In stock and offered for sale:

[illegible]

1 "New Haven" 32"x14'-0"

1 "Norwood" 22"x7'-0"

1 "Niles" offset press No. 26 (new)

1 "Ballard" 20"x12'-0"

1 Hydraulic press 14" x 24"

1 Hydraulic press for copper bands 4.5 to 6"

Write for details and prices.

**I. MATHESON & CO., LTD.**

*Manufacturing Engineers*

**New Glasgow, Nova Scotia**

tf


## HELP WANTED

FOUNDRY FOREMAN WANTED FOR IRON [illegible] engine castings; also [illegible] first class foreman. Must be thoroughly conversant in modern shop system, methods and economies of handling help, and capable of securing good advance production. Apply at [illegible] Address to Box 143 Canadian Machinery. (c26m)

WANTED CHIEF ENGINEER FOR MANU[illegible] plant; a master mechanic capable of taking charge of boiler room and supervising repair department; must be able to handle men. Apply Box 440, Canadian Machinery. (c26m)

MECHANICAL ENGINEER TO TAKE CHARGE of production in small plant manufacturing machine tools, must be technical man, with draftsman room and shop experience, excellent opportunity for advancement, with progressive firm; state full particulars and salary expected in first letter; quick engagement essential; replies confidential. Box 437, Canadian Machinery. (c26m)

FIRST-CLASS FOREMAN FOR TOOL DEpartment must be capable of making detail drawings and practical experience on punch and dies. Apply Box 148 Canadian Machinery. (c26m)

WANTED A FOREMAN FOR TIN AND sheet metal shop; one who also understands roofing and accustomed to the handling of men. Apply Box 439 Canadian Machinery. (c26m)

WANTED—PRACTICAL WORKS FOREMAN, with high mechanical and executive ability, well experienced in the manufacture of gasoline engines, competent to handle men to get production at a minimum cost; give references, state age, experience and wages expected. Box 429, Canadian Machinery. (c25m)

PRACTICAL WORKS SUPERINTENDENT with high mechanical and executive ability; competent to handle men to get production in machinery manufacture. State age, give references and wages expected. Steady employment for right man. Apply Box 434, Canadian Machinery. (c27m)

WANTED — DRAFTSMAN, JUNIORS, ON electrical machinery. State age, experience, and salary expected. Apply Box 403, Canadian Machinery. (c3m)

MASTER MECHANIC WANTED FOR PLANT [illegible] Must be superior man, good executive, plant maintenance and tools. Apply with full particulars of experience and salary to Box 441 Canadian Machinery. (c1m)

FOREMEN WANTED FOR MUNITIONS plant on six inch and seventy five millimetre [illegible] Excellent openings for a limited number of men. Apply Box 442, Canadian Machinery. (c1m)

## POSITIONS WANTED

FORGE SUPERINTENDENT HAVING WIDE experience on shells, all sizes; also miscellaneous heavy forging, desires change. Box 435, Canadian Machinery. (c27m)

POSITION AS TOOLROOM OR MACHINE shop foreman; 20 years' tool and general machine shop; 14 years foreman; British, American and Canadian experience in manufacturing small and medium interchangeable parts; familiar with latest up-to-date methods; good organizer, energetic, tactful. Open for position after June 15th. Box 436, Canadian Machinery. (c26m)

## SPECIAL MACHINERY

H. C. THOMAS, GENERAL MACHINE SHOP, tools, jigs and machine repairs. 301 King St. W., Toronto. Telephone Adelaide 3836. tf

MANUFACTURERS - WE CAN UNDERTAKE work to any specification—munition production equipment or otherwise. Write W. H. Sumbling Machinery Co., 7 St. Mary St., Toronto

## PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (cfm)

## Long-distance messages---telegrams

are frequently received in answer to ads in this section. Readers realize the importance of getting in touch with advertisers at once. And again, this illustrates how closely the section is followed.

Have you any proposition that will interest our readers? Do you want equipment or help? If you do, here is the place to make your wants known. Your ad will get the attention of the men in the office and the men in the shop.

Mail your copy now for next week's issue.

**Canadian Machinery**

*Classified Advertising Section*

**143 University Ave., Toronto, Ont**

# CANADIAN MACHINERY

## AND MANUFACTURING NEWS

*A weekly newspaper devoted to the machinery and manufacturing interests.*

Vol. XIX. TORONTO, JUNE 27, 1918 No. 26


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## THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, Pres. H. T. HUNTER, Vice-pres. H. V. TYRRELL, Gen. Man.

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmers' Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, Power House, Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY AND MANUFACTURING NEWS

J. M. WILSON, Editor. P. G. NEWTON, Manager

Associate Editors: A. G. WEBSTER, J. H. RODGERS, W. F. SUTHERLAND, A. R. KENNEDY

Eastern Representative: E. M. Pattison; Ontario Representative: S. S. Moore; Toronto and Hamilton Representative: J. N. Robinson.

CHIEF OFFICES:

CANADA—Montreal, Southam Building, 28 Bleury Street, Telephone 1004; Toronto, 143-153 University Ave., Telephone Main 7324, Winnipeg, 1207 Union Trust Building, Telephone Main 3178.

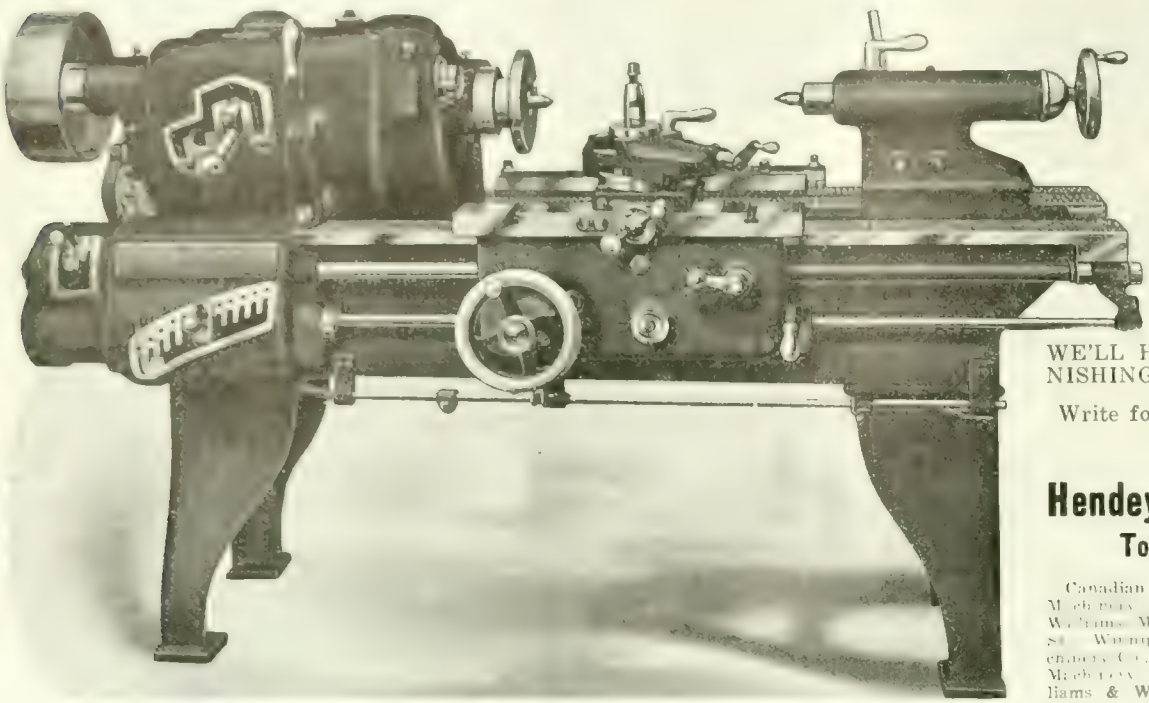
GREAT BRITAIN—LONDON, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 12960. Cable address: Atabek, London, England.

UNITED STATES—New York, R. R. Huestis, Room 620, 111 [illegible], N.Y. Telephone [illegible]; C. L. Morton, Room 733, Old South Building, Telephone Main [illegible]; A. H. Bates, Room [illegible], 14 E. Jackson Street, Chicago, Phone Harrison 1147.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $3.00 a year; United States, $3.50 a year; other countries, $4.00 a year. Single Copies, [illegible]

# HENDEY 18-inch GEARED HEAD LATHE

8 mechanical changes of speed for spindle with driving shaft running at constant speed, 4 direct and 4 through back gears.



36 DIFFERENT THREADS AND FEEDS are had through Mounted Change Gearing, each change being quickly made through controlling handles in Gear Boxes.

BEFORE PURCHASING A NEW LATHE INVESTIGATE THE HENDEY SERVICE.

WE'LL HELP YOU BY FURNISHING LIST OF USERS.

Write for descriptive circular.

**The**

**Hendey Machine Co.**

**Torrington, Conn.**

Canadian Agents: A. R. Williams Machinery Co., Toronto, Ont.; A. R. Williams Machinery Co., 260 Princess St., Winnipeg; A. R. Williams Machinery Co., Vancouver; A. R. Williams Machinery Co., St. John, N.B.; Williams & Wilson, Montreal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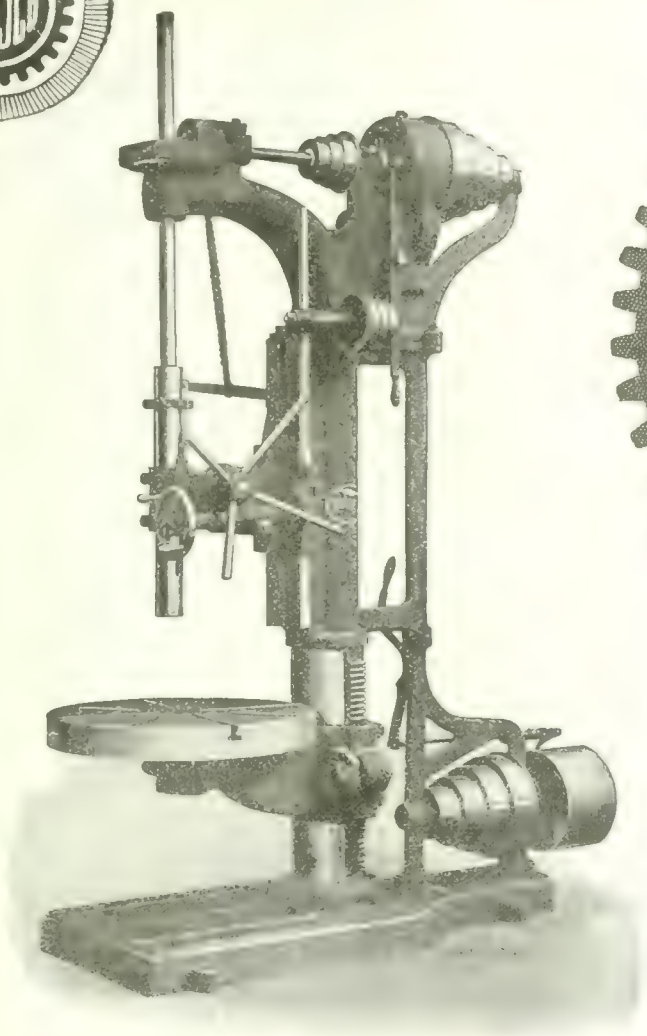


# Bertram MACHINE TOOLS

Locomotive and Car Shop Equipment

Structural and Bridge Shop Machinery

Repair Shop Machinery

General Machine Shop Equipment

**30-inch Vertical Drilling Machine**

**Photographs and full particulars gladly mailed upon request.**

***WRITE US NOW***

We'll be pleased to submit photographs and full details on any line or lines in which you are interested

## The John Bertram & Sons Company Limited

DUNDAS, ONTARIO, CANADA

MONTREAL 723 Drummond Bldg. | TORONTO 1002 C.P.R. Bldg. | VANCOUVER 609 Bank of Ottawa Bldg. | WINNIPEG 1205 McArthur Bldg.

# The Publisher's Page

TORONTO JUNE 27, 1918

*From* PRINTERS' INK, *June* 6th, 1918

## Germany G oatsOver Decrease in American Advertising

Significant Paragraphs from Famous German Papers

*From the Berlin "Tageblatt," Apr.* 26, 1918.

"If the despised Yankee nation think they are going to win the war and force Germans out of foreign markets there is nothing to indicate this sentiment in their local and foreign advertising. Many of their advertising agencies have closed their doors through lack of patronage. Their much-talked-of captains of industry have cancelled advertising contracts everywhere. Germany and German merchants have increased their advertising space in neutral markets and at home. It pays to advertise in war as well as in peace. The farseeing merchant never stops advertising."

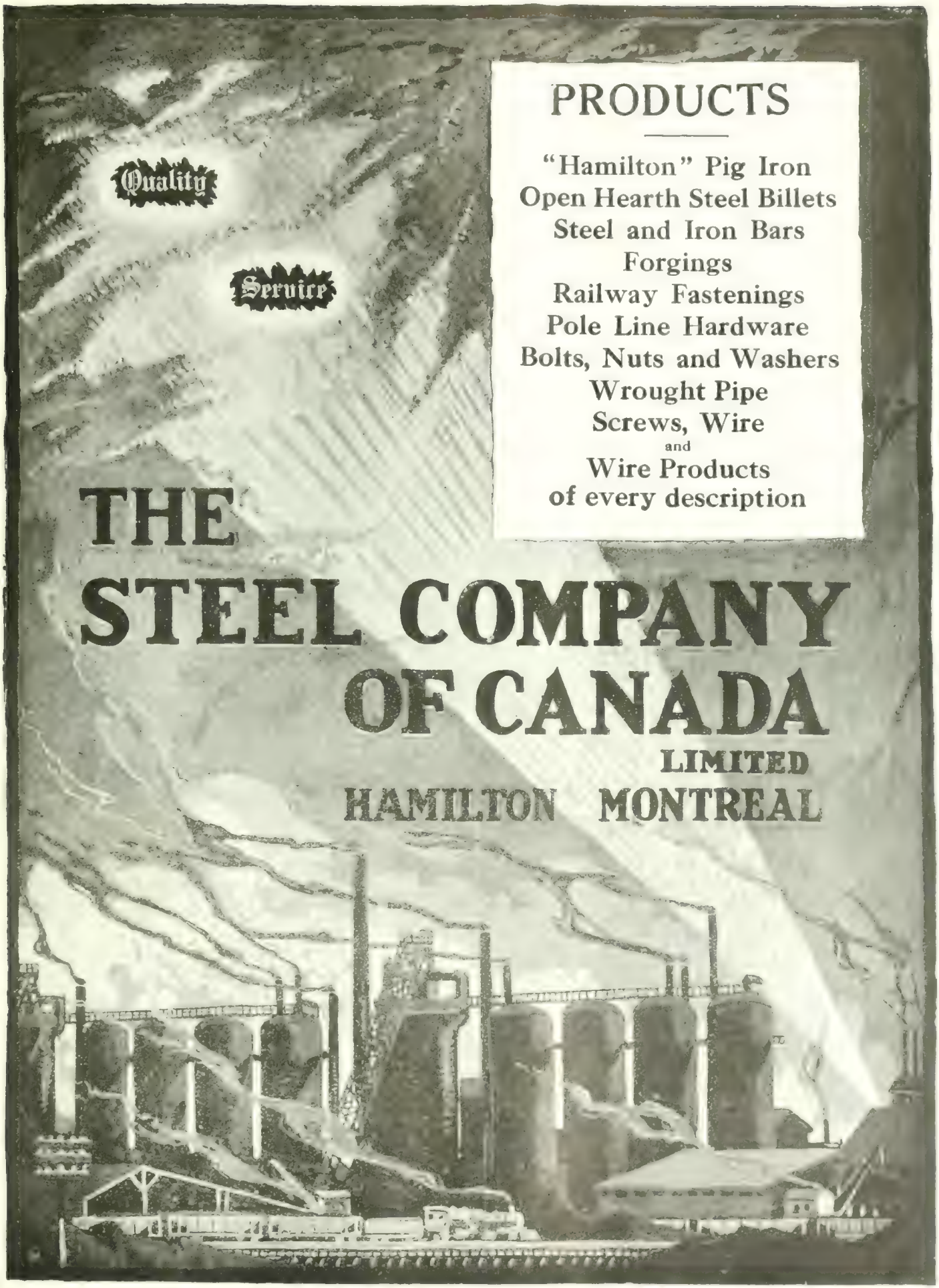
---

*From the Berlin "Lokal Anzeiger," Apr.* 20, 1918.

"Nothing is more acceptable to the German nation than to note the fact that the North Americans have abandoned advertising their goods in practically all of the foreign markets. In the Latin-American publications, the market which they have always tried hardest to acquire, there has been a heavy loss of advertising. A prominent Buenos Aires agency announces the fact that 83% of their United States advertisers have cancelled their contracts. This is also true in the Orient, and a careful compilation of the decrease in advertising there shows a greater depreciation than in South and Central America. In the United States itself there is not a paper which has not suffered a loss in its advertising lines, and that despite the fact that the last year showed an increase in the millionaire class of 973 individuals. In other words, the war has terrorized the American nation, but not the Germans, for a perusal of their periodicals will show that manufacturers still advertise even if they have not the goods to deliver, but with the idea of keeping their name before the public."

---

Let the Germans tageblatt all they like. It makes them feel better and it doesn't hurt us; they are playing ostrich. The great majority of Canadian and American technical publications show heavy increases in advertising carried. CANADIAN MACHINERY carries three times as much advertising as it did before the Kaiser let the war dogs loose.


Quality
Service
PRODUCTS
"Hamilton" Pig Iron
Open Hearth Steel Billets
Steel and Iron Bars
Forgings
Railway Fastenings
Pole Line Hardware
Bolts, Nuts and Washers
Wrought Pipe
Screws, Wire
and
Wire Products
of every description
THE
STEEL COMPANY
OF CANADA
LIMITED
HAMILTON MONTREAL

# OUR GOVERNMENT

will spend a minimum of $350,000,000 for Destroyers—when these are built the American Navy will lead the world in boats of this type and the submarine is doomed.

Nothing but the best materials will enter into the construction of these vessels. *This is also true of*

# "Red Cut Superior"

The Nationally Known First Quality

## HIGH SPEED STEEL

The greatest vigilance is observed in every detail of its manufacture—we spare no expense to insure the highest quality in every bar. No better all purpose High Speed Steel has as yet been produced

*It's best for all machine work.*

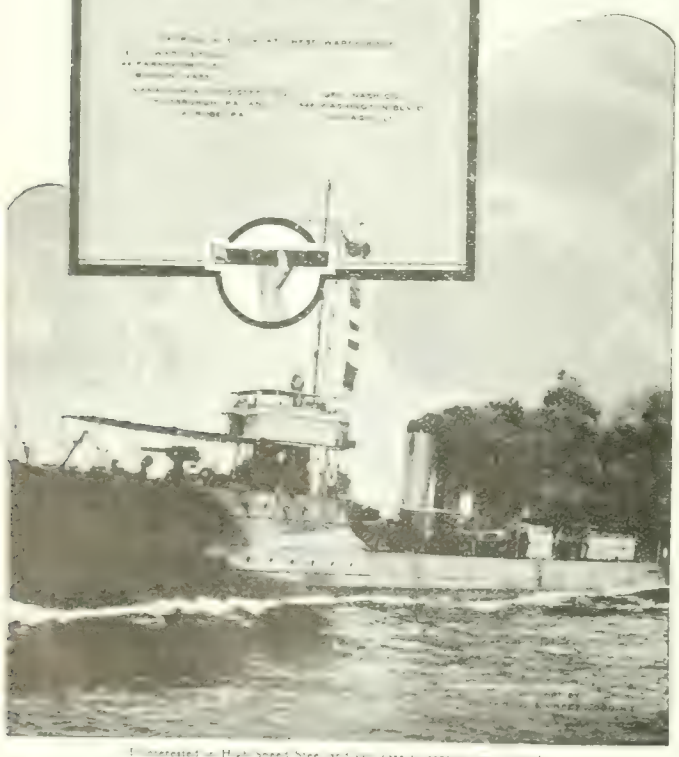
## VANADIUM-ALLOYS STEEL CO.

PITTSBURGH, PA.
Works at LATROBE, PA.

*U. S. S. Warrington torpedo boat destroyer, the type of vessel that safely escorted Major General Pershing and his staff to England*

*This is the type that is now aiding the British and French navies in wiping out the submarine menace. They are doing great work in lessening the effectiveness of the submarine warfare*

Passed by the Censor



If interested in High Speed Steel and you care to receive our printed matter at intervals, send your name and address for our mailing list

# ELECTRITE-URANIUM High-Speed Steel

**Will amaze you in its ability to remove metal**

The introduction of this rare element—"URANIUM"—into the mixture of our already superb cutting product, has supplied the final perfection of the qualities of toughness and durability which has been the hitherto impossible goal of metallurgical hopes.

Electric Furnaces, Automatically regulated, produce inevitably similar results at every melt.

We are ready to assist your inquiry in every way possible.

**Write**

**Latrobe Electric Steel Company**
Latrobe, Pennsylvania

LESCO

STELLITE

*"Not Steel but its Master"*

STELLITE no longer needs an introduction to the trade, but new developments and applications are constantly arising and should be brought to your attention.

This can be most readily and satisfactorily accomplished by a personal interview with one of our representatives who can call on you at your convenience.

As an instance of how you might be benefited we submit the following:

"A large manufacturer of gears recently installed STELLITE Milling Cutters for roughing his bevelled gear blanks with the following results:

Table feed increased from 2⅝" with H.S. Steel to 3¼" with STELLITE, an increase of 23.8%.

Cutter revolutions increased from 60 r.p.m. with H.S. Steel to 90 r.p.m. with STELLITE, an increase of 50%.

Production between grinds increased from 10 with H.S. Steel to 15 with STELLITE, an increase of 50%.

And not only this, but he was able to make the cutters for 1-3 of what he had been paying for H.S. Cutters."

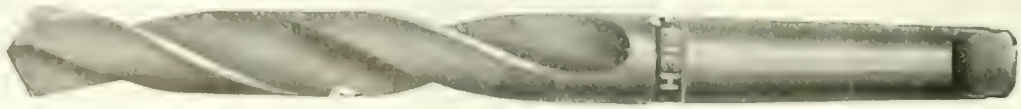
Why not benefit by his experience and write us for further particulars?

**Deloro Smelting & Refining Company, Limited**

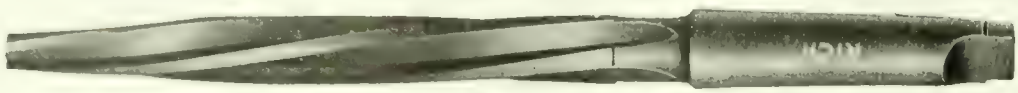
Head Office and Works—DELORO, ONT.

TORONTO
200 King Street West

MONTREAL
315 Craig Street West



# RICH DRILLS and REAMERS



**Machinery, Machine Tools, Factory and Mill Supplies**

Equipped for Prompt Deliveries

Highest Quality Products

Rich Drills are forged from the solid bar of the best grade of high-speed steel obtainable. They are twisted while hot and guaranteed to work with perfect satisfaction on your most difficult work.

**RICH for better drills and bigger production! Give them a trial.**

## Standard Machinery and Supplies, Ltd.

**260 St. James St., MONTREAL, Que., Can.**

Western Representative—Wm. W. Hicks, 567 Banning St., Winnipeg, Man.

**Coal**
**Coke**
**Iron Ore**

# Pig Iron

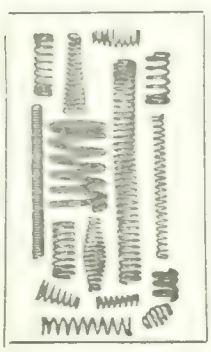
**Victoria** FOUNDRY & MALLEABLE

Made by The Canadian Furnace Co.
Port Colborne, Ontario, Canada.

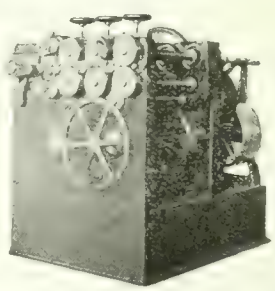
## M.A. HANNA & CO.

**Sales Agents, CLEVELAND**

*Canadian Office:*
**703 C.P.R. Bldg., Toronto**



## *The Machines that put the "Rings" in Springs!*



More Than Forty Standard Spring Making Machines.

High-Speed Automatics for Making Fuse and Small Arms Springs.

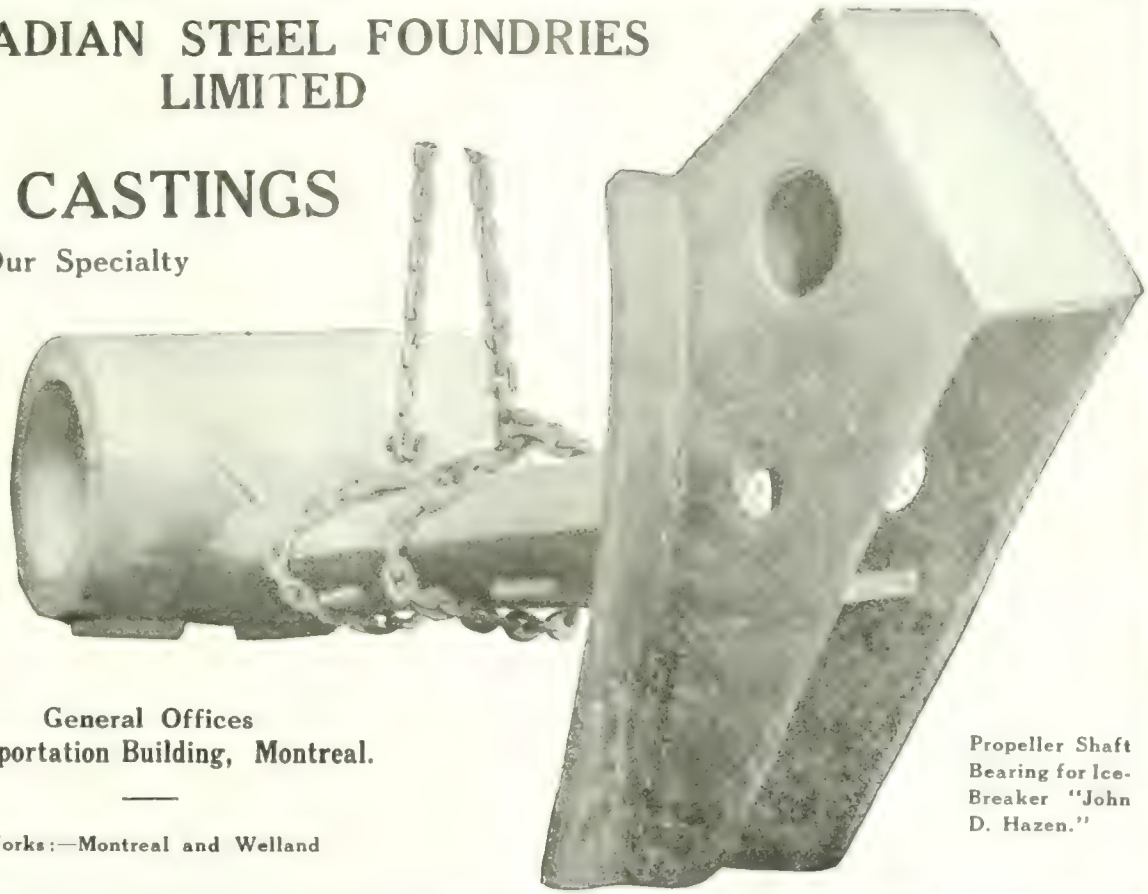
Flexible Metallic Tube and Casing Coilers.

Sleeper & Hartley, Inc., WORCESTER, MASS. and COATICOOK, P.Q.

# CANADIAN STEEL FOUNDRIES LIMITED

## SHIP CASTINGS

Our Specialty



Propeller Shaft Bearing for Ice-Breaker "John D. Hazen."

**General Offices**
**Transportation Building, Montreal.**

**Works:—Montreal and Welland**

Guaranteed Accuracy .00001"

## JOHANSSON GAGE BLOCKS

These Gages are the standard with such organizations as [illegible], Willys-Overland Company, Dominion Arsenal, Dominion Cartridge Company, The Turnbull Elevator Mfg. Co., [illegible]

Any one of thousands and thousands of measurements [illegible] moments.

They take the place of less accurate tools both for producing work and checking its accuracy. One use nowadays is to set and check Johansson Adjustable Snap Gages in those shops that have taken advantage [illegible]

Write us for further information. Better still, let us demonstrate in your own shop.

## H. E. STREETER

523 New Birks Bldg. - Montreal

Johansson Gage Blocks, Special Taps, Hobs, Reamers and Cutters; Bench Lathes, Surface Grinders, Magnetic Chucks, Prestowich Gages, Micrometers, etc.

ESTABLISHED 1840

# FIRTH'S SPEEDICUT HIGH SPEED STEEL

The ideal steel for machining SHELLS

## FIRTH'S CARBON TOOL STEELS

STANDARD BRANDS

Sold in every country where steel is used

WE SELL OUR OWN PRODUCT ONLY

## THOS. FIRTH & SONS, Limited

Norfolk Works and Tinsley Works

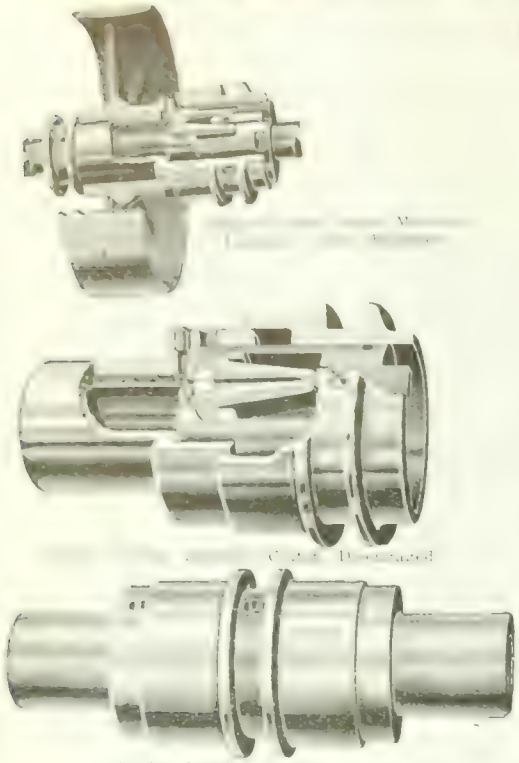
SHEFFIELD :-: ENGLAND

Works also at McKeesport, Pa., and Washington, D.C.

CANADIAN WAREHOUSES:

MONTREAL, 449 St. Paul St. West. J. A. SHERWOOD, Canadian Manager.
TORONTO, 78 Adelaide St. West.

# THE JOHNSON FRICTION CLUTCH



Double Clutch Exterior.

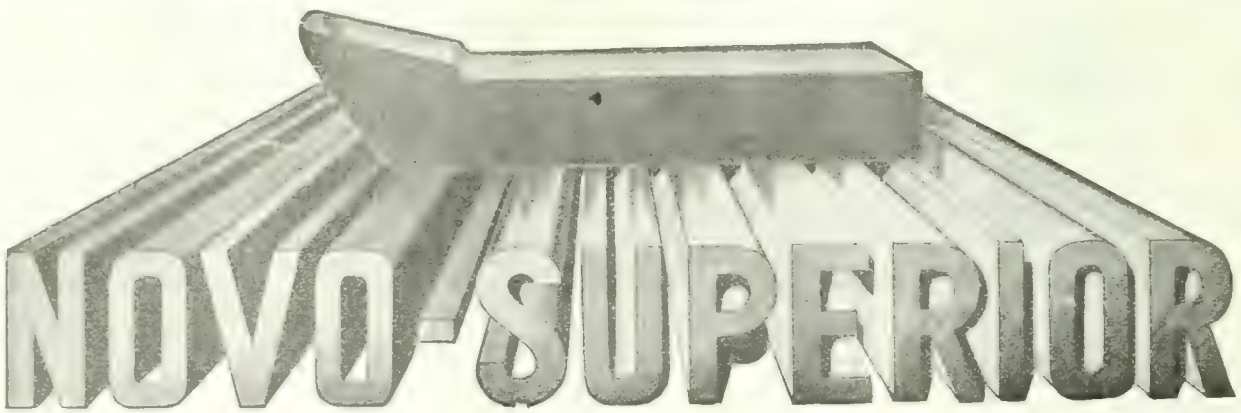
## THE CLUTCH THAT CLUTCHES

starting your machines without grating noise or jar. It is the Acme of Simplicity and is being adopted by the leading machine tool builders as a part of the machine tools they manufacture, and the Johnson Friction Clutch adds another talking point. Our booklet, "CLUTCHES AS APPLIED IN MACHINE BUILDING," is of interest to you and a copy will be sent on request. For countershaft or line shaft work the JOHNSON FRICTION CLUTCH gives the service you are looking for.

**Our Yellow Data Sheets describe the Johnson Friction Clutch in detail. Write for them to-day.**

AGENTS: CANADA—Williams & Wilson, 320 St. James St., Montreal; The Canadian Fairbanks-Morse Co., Ltd., Toronto and Branches. ENGLAND—The Efandem Co., Ltd., 159 Gt. Portland St., London W., Sole Agents for British Isles. AUSTRALIA Edwin Wood Pty., Hdwe. Chambers, 231 Elizabeth Street, Melbourne, Victoria. JAPAN—Andrews & George Co., 16 Takegawacho, Kiobashiku, Tokyo. SOUTH AFRICA—D. Drury & Co., Main St., Johannesburg. FRANCE—Anciens Etab. Glaenzer & Perraud, 18 Fauborg du Temple, Paris.

**THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.**




HIGH SPEED STEEL

INTRA STEEL GIBRALTAR STEEL

Tool Steel for Every Purpose

All Manufactured by

**Sir Joseph Jonas, Colver & Co., Ltd., Sheffield, England**

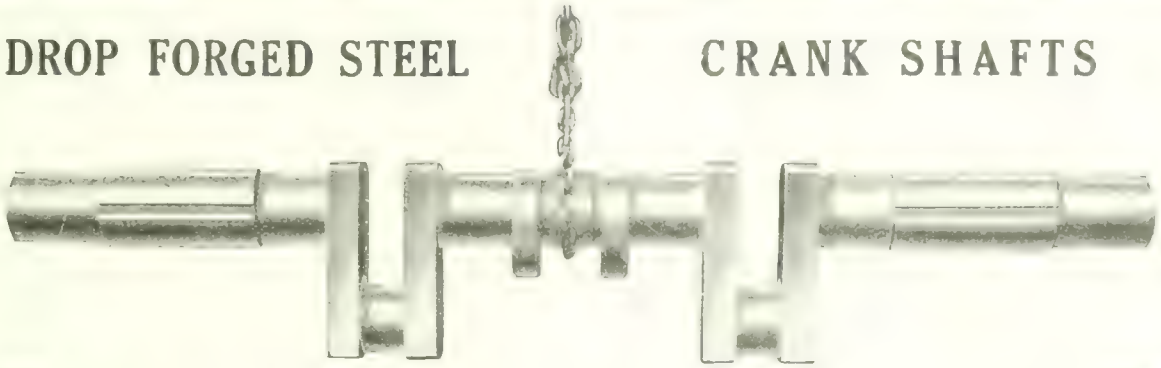
Twist Drills, Taps, Hack Saw Blades, Milling Cutters, Etc., Music Wire for Springs

Sole Agents for Canada H. BOKER & CO., INC. (Formerly Hermann Boker & Co.)

Established 1837 322 St. James St., Montreal, Que. Incorporated 1914

CANADA
# FOUNDRIES & FORGINGS
LIMITED

## DROP FORGED STEEL CRANK SHAFTS

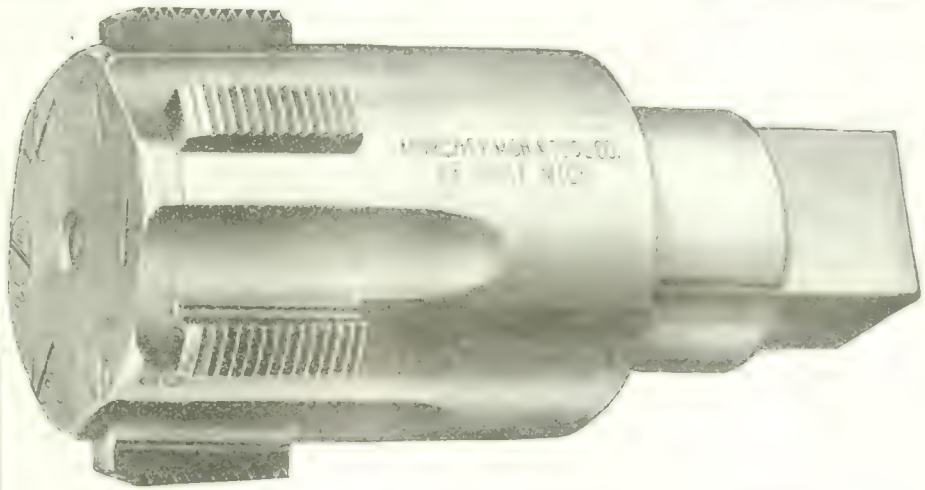


OUR PROCESS OF WORKING HOT STEEL NOT ONLY PROVIDES A MEANS OF SHAPING IT TO FORM, BUT ALSO REFINES THE GRAIN STRUCTURE AND TENDS TO INCREASE ITS DENSITY AND DYNAMIC STRENGTH.

*SMITHERIES AT WELLAND, ONTARIO*

---

# Our Six Chaser Model



Our Four-Chaser solid screwing tap made a big hit. Then there came a demand for a six chaser model. Here it is.

## How they Keep Expenses Down

Those six chasers may be ground over and over again, making them as good as new with each grinding.
This gives a distinct advantage to the Murchey Head Solid Tap over any solid tap.
Murchey Tools handle threading and tapping operations in one-half the time of ordinary tools. If you want to keep your expenses down and get work out fast, use Murchey Tools.

We make a specialty of quick service—no waiting on chasers.

**Murchey Machine & Tool Company**
75 Porter St., Detroit, Mich.

THE COATS MACHINE TOOL CO.,
Caxton House, Westminster, London, England, Glasgow Newcastle-on-Tyne

FENWICK FRERES & CO.,
15 Rue Fenelon, Paris, France.

# MURCHEY


*If any advertisement interests you, tear it out now and place with letters to be answered.*

# Iron and Steel

Soft Steel Bars, Plates, Structurals, Black and Galvanized Sheets, Diamond Pattern Floor Plates, Corrugated Roofing.

Boiler Tubes, Rivets, Norway Iron, Refined Iron, Wayne Iron, Machinery Steel, Crucible Steel, Tool Steel, Nickel Steel, Cold Rolled Steel, Shafting.

**Write for catalog and stock list.**

## Arthur C. Harvey Co.

**Boston, Mass., U. S. A.**

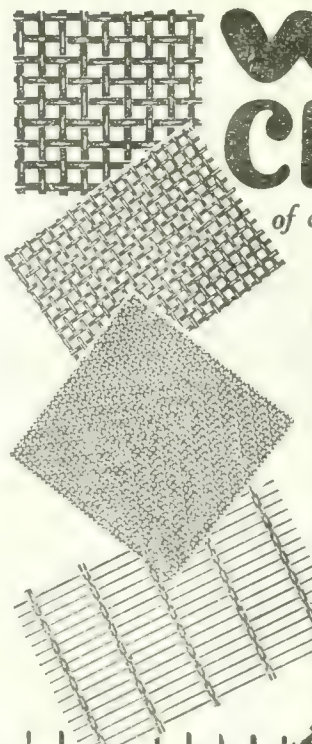
We build various sizes of these Water Tool Grinders, each size suitable for certain classes of work.

If interested, we will, on your enquiry reaching us, forward a copy of our New Grinder Catalogue. It will pay you.

**The Ford Smith Machine Co., Ltd.**
Hamilton, Ontario, Canada

# Wire Cloth

*of every description*



We make **Machinery Guards** of all kinds.

**Metal Lockers for Clothes.**

**Steel Shelving for all purposes.**

Drop a line for full details

**Canada Wire & Iron Goods Company**
Hamilton, Ontario
Eastern Representative:
H. E. O. Bull, 184 Mance St., Montreal, Que.

TRADE MARK "WACO"

# "WACO" BRAND HIGH SPEED STEEL

TRADE MARK

"Double Waco" Quality
Specially Adapted for Munition Work

"Turtle" Brand
High Class Tool Steel, Files, Etc.

WM. ATKINS & COMPANY, LIMITED
RELIANCE STEEL WORKS Established 1870 SHEFFIELD, ENGLAND

*Sole Representatives for Canada*

GEO. A. MARSHALL & CO.
70 Lombard Street, Toronto, Ontario

*Phone Main 3528*

# STEEL *for*

## Shrapnel Shells and Shell Blanks

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

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MONTREAL

Steel Ingots
*by the*
HARMET
Liquid Process

# HEATING and VENTILATING

"Keith" Fans will be found more economical and have a greater efficiency where conditions are unusually severe, because they possess advantages over other Fans used for the same purpose.

The "Keith" Fan is the one that will give you continued and unqualified satisfaction.

Our New Catalogue No. 55 has just come from the Press. Tell us where to address it and you will receive one by first mail.

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AGENTS:
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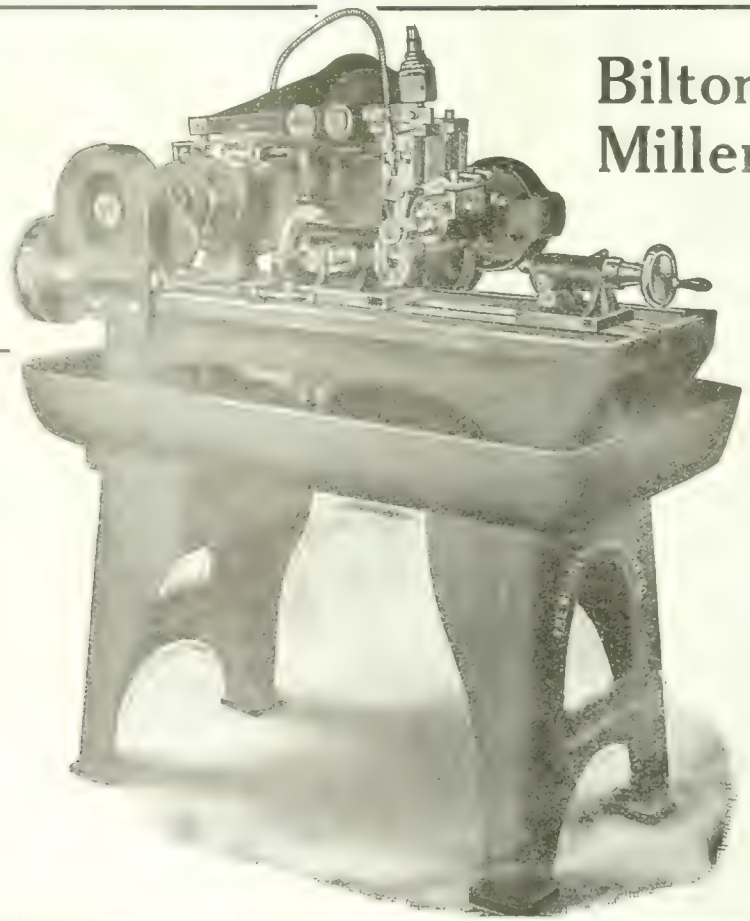

# Bilton Automatic Gear Miller

Spur or Bevel Gears. Capacity:
No. 1—15 pitch; No. 2—10 pitch; No. 3—8 pitch.
An efficient, economical and durable tool.

MACHINE TOOLS Bilton BRIDGEPORT

The Bilton line of machine tools include:
Plain Horizontal Millers
Automatic Millers
Bench and Column Drills
Riveting Machines
Milling Cutters
All capable and highly modern in design.

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Succeeding The Standard Mfg. Company
**Housatonic Ave., Bridgeport, Conn., U.S.A.**

Foreign Agents: Alfred Herbert, Limited; M. Mett Engineering Company; Chas. Churchill Company, Limited.

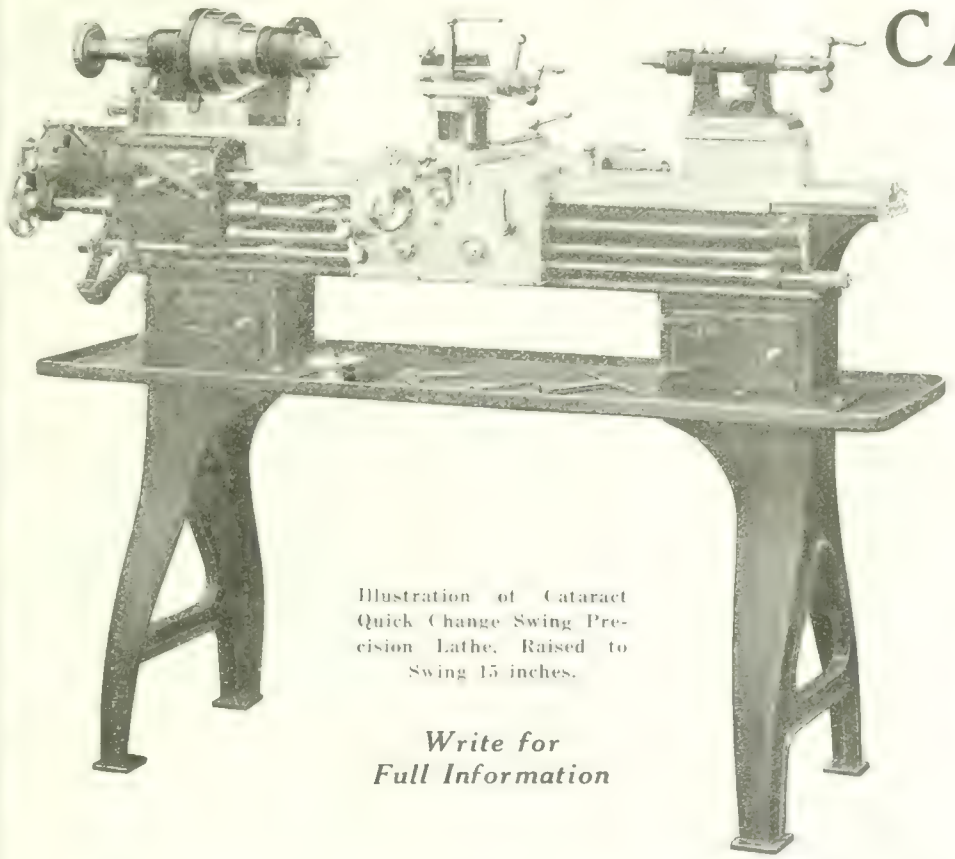

Illustration of Cataract Quick Change Swing Precision Lathe, Raised to Swing 15 inches.

*Write for Full Information*

# CATARACT

## QUICK-CHANGE PRECISION LATHE

and specially fine work. This Cataract lathe has accomplished so much in so many plants we'd particularly like YOU to know all the particulars of its unusual record.

| | |
|---|---|
| Length of Bed | 52 |
| Total Length of Lathe | 65 |
| Distance Between Centres | 28 |
| Swing | 9" and 15 |
| Swing over Carriage | 5½ and 11½ |
| Diameter of Lead Screw | 1 x 6 pitch |
| Diameter of Front Cover | 2 1-32" |
| Diameter of Rear Bearing | 1¾ |
| Length of Spindle | 15 |
| Hole through Spindle | 1¼ |
| Draw-in Chuck Cap | 1 maximum |

**Hardinge Bros., Inc.**
1770 Berteau Avenue
**Chicago, Ill., U.S.A.**

# THERMIT WELDING

WE are especially equipped to handle very large welds by the Thermit process.

We can do the job in your works.

We have expert Thermit welders to handle your breakdowns, and expert engineers to advise you as to the best method of handling your breakdown.

Some of the work that can be done by the Thermit process are as follows: Building in large teeth in pinions and gears, broken crank shafts, bulldozer frames, stone quarry castings, frames and bases of heavy machinery.

THE
**St. Lawrence Welding Co., Limited**

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A. M. BARRY, Mgr. Res. Phone Westmount 3483

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Manufacturers of Steel Tanks, Air Receivers, Welded Tanks, etc: Electric Welders, Oxy Acetylene Welders, Boiler Repairs, Lead Burning and Brass Foundry Work.

*If You Need a*
# POWER HAMMER

of uncommon strength throughout — a hammer constructed to deliver work of surpassing quality in great quantity, and to keep everlastingly at it—

## You Need Jardine's

Note a few particulars:

Hammer frame is a steel casting so as to give ample and commanding bulk for the same and machined from solid steel bar.

Hammer [illegible] and anvil block, so there's no

Jardine Combination Gravity Power Hammer has never failed.

Write for Catalog

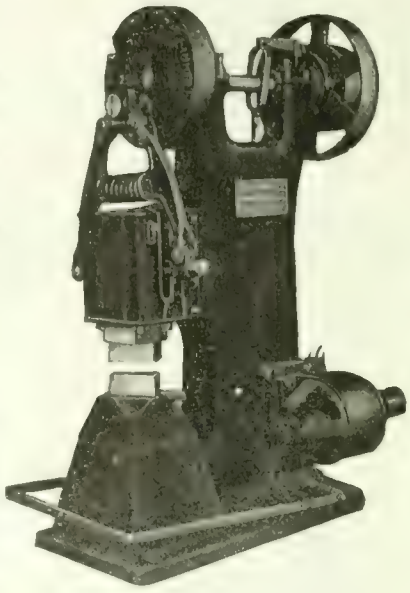
**A. B. JARDINE & CO.**
Limited
Hespeler, Ont., Canada

# Little Giant

*Belt Driven*

*Motor Driven*

# Power Hammer



**FIVE SIZES**

25 lb. ram, 400 R.P.M. Will forge up to 2" rd. Floor space, 16" x 27".
50 lb. ram, 350 R.P.M. Will forge up to 2½" rd. Floor space, 20" x 30".
100 lb. ram, 300 R.P.M. Will forge up to 4" rd. Floor space, 28" x 42".
250-lb. ram, 200 R.P.M. Will forge up to 7" rd. Floor space, 30" x 54".
500 lb. ram, 150 R.P.M. Will forge up to 9" rd. Floor space, 32" x 62".

**Guaranteed forever against defective material and workmanship.**

**Durability combined with machine gun rapidity and precision, and entire absence of vibration.**

All sales made subject to return at factory expense within 30 days after arrival of shipment if for any reason unsatisfactory to purchaser.

Special dies for any forging purpose. Prices quoted on receipt of drawings or sample of work to be done.

Operator carefully guarded against any chance of personal injury.

More than 6,000 Little Giant Power Hammers [illegible]

[illegible] of no Little Giant Power Hammer [illegible]

**Prompt shipments.** **Established A.D. 1876.**

## Mayer Brothers Company, 205 ROCK STREET MANKATO, MINN., U.S.A.

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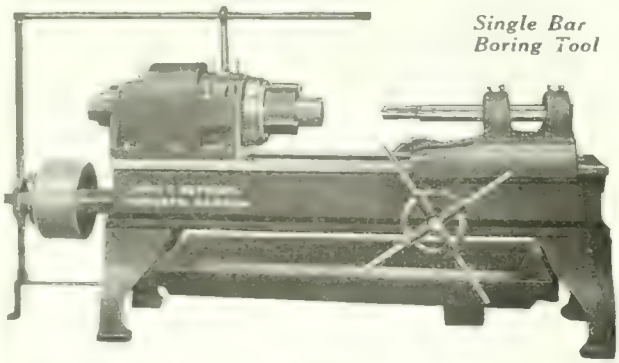

*Single Bar Boring Tool*

## *Experience Shows:*

1. That it will produce 6" shells faster and more efficiently than any ordinary lathes.
2. That it is exceptionally fast, powerful and accurate.
3. That it is the favorite shell special in many of Canada's best shops.

***Prompt Shipments***

## John T. Hepburn, Limited

18-60 Van Horne Street - TORONTO, ONT.

# Quadrupled Driving Gears

and driving mechanism of great strength and weight insure **power**; and the wide extra heavy housings extending to the floor and secured to bed by tongue and groove joints in addition to bolts and dowels insure **rigidity.** It is this power and this rigidity that make "Hamilton Planers," 48" x 48", rapid producers on heavy precision work. For more particulars

**Write**

**The Hamilton Machine Tool Company**
**HAMILTON, OHIO**

Rapid Production HAMILTON Machine Tools

*Sole Agents for Ontario:*

**H. W. Petrie, Limited**
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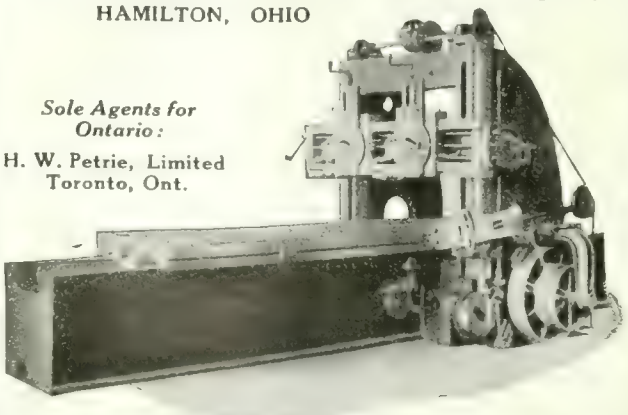
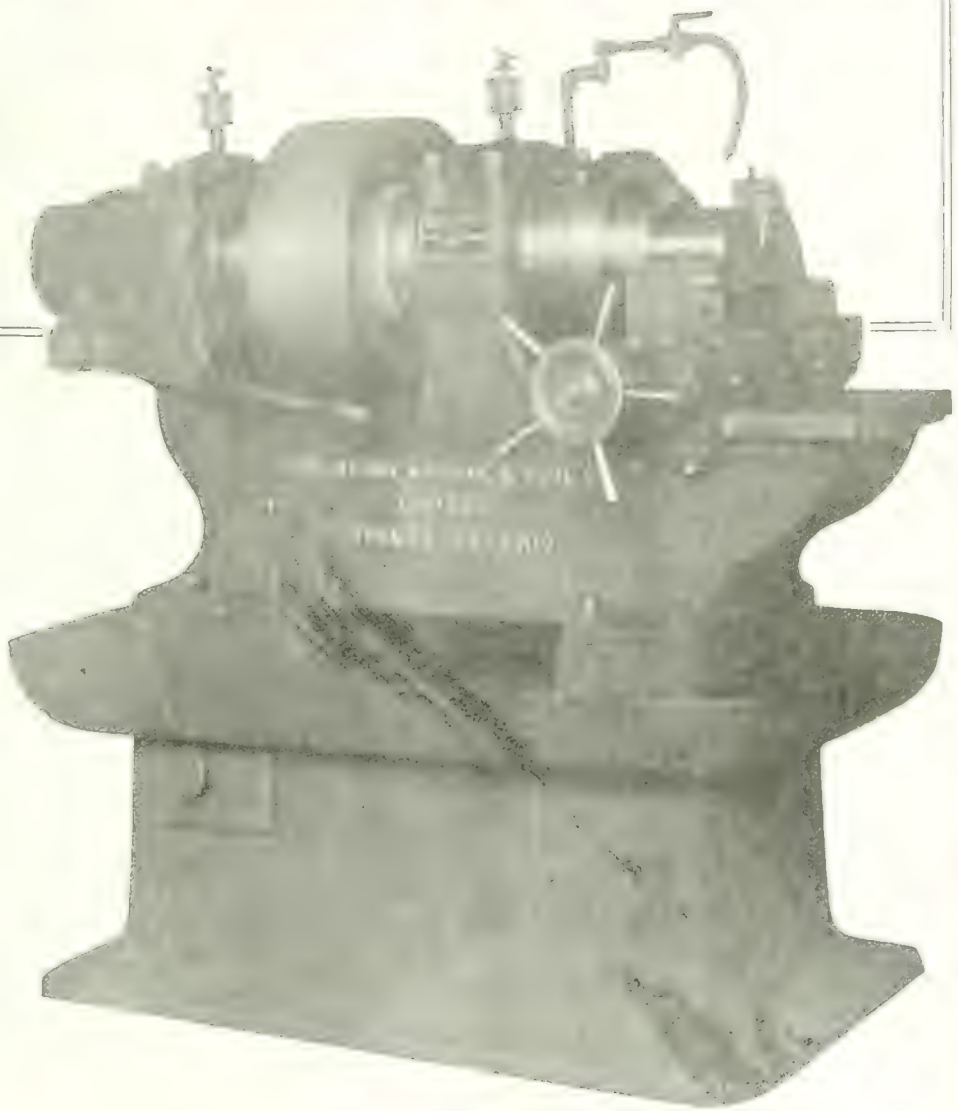


# Roelofson Banding Machine

***for 75 mm. and 155 mm. Shells.***



## Excellent Delivery

Our manufacturing facilities are such that we can make excellent delivery on machines for the above sizes. To shell plants changing over to the 75 mm. and 155 mm. shells this should be of especial interest.

## Experimenting in Munition Making is Past

AND likewise experimenting in munition machinery is past. The "experiments" are all in the discard and only the machines properly designed and carefully built have survived.

Roelofson Band Turning Machines have stood up consistently under three years of the severest service possible. They have met every requirement of production and serviceability and are still doing duty in many Canadian munition plants.

Don't experiment with your 75 mm. and 60 mm. shells. Use the machine that has a record of three years of service behind it.

**Note these features of construction:**

**Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.**

**Chucking with spring collet chuck insures accurate and speedy chucking.**

**Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.**

**Machines are also built for 15, 18, 60-pdr. and 6-in. shells.**

## Roelofson Machine & Tool Co., Limited

**Head Office: 1501 Royal Bank Building, Toronto, Canada**

**Works and Warehouse: Galt, Ont., Canada**

American Representatives:

**The A. R. Williams Machinery & Supply Corporation, Fidelity Bldg., Buffalo, N.Y.**

# Almond MICROMETERS

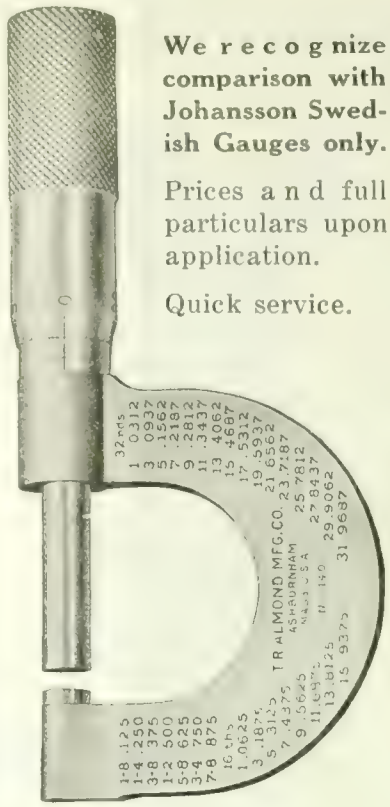
*Highest Quality Tools*

**Quick Deliveries**

If you want reliable, high quality micrometers specify "Almond." We can suit any requirement and are exceptionally well equipped to make prompt deliveries.

Almond Micrometers are made English measurements 1, 2 and 3-inch by thousands and ten thousands; metric measurements 25-50 and 75 m m by 1 000 m m. With or without Ratchet Stop.

ALMOND MICROMETER HEADS — For attaching to machines and tools where fine adjustments are necessary.




**We recognize comparison with Johansson Swedish Gauges only.**

Prices and full particulars upon application.

Quick service.

**T. R. Almond Manufacturing Co.**

**5 Maple Avenue** **Ashburnham, Mass.**

# JACOBS IMPROVED DRILL CHUCK

"Known throughout the World"

It's easy and convenient to open and close them quickly — requiring a mere twist of the wrist with the ever-ready key.

They hold drills firmly and accurately on center.

Their working qualities are unsurpassed.

Their proven superiority is the reason why they are so universally found in modern shops throughout the world.

**Made in U.S.A.**

JACOBS MFG. CO. HARTFORD CONN.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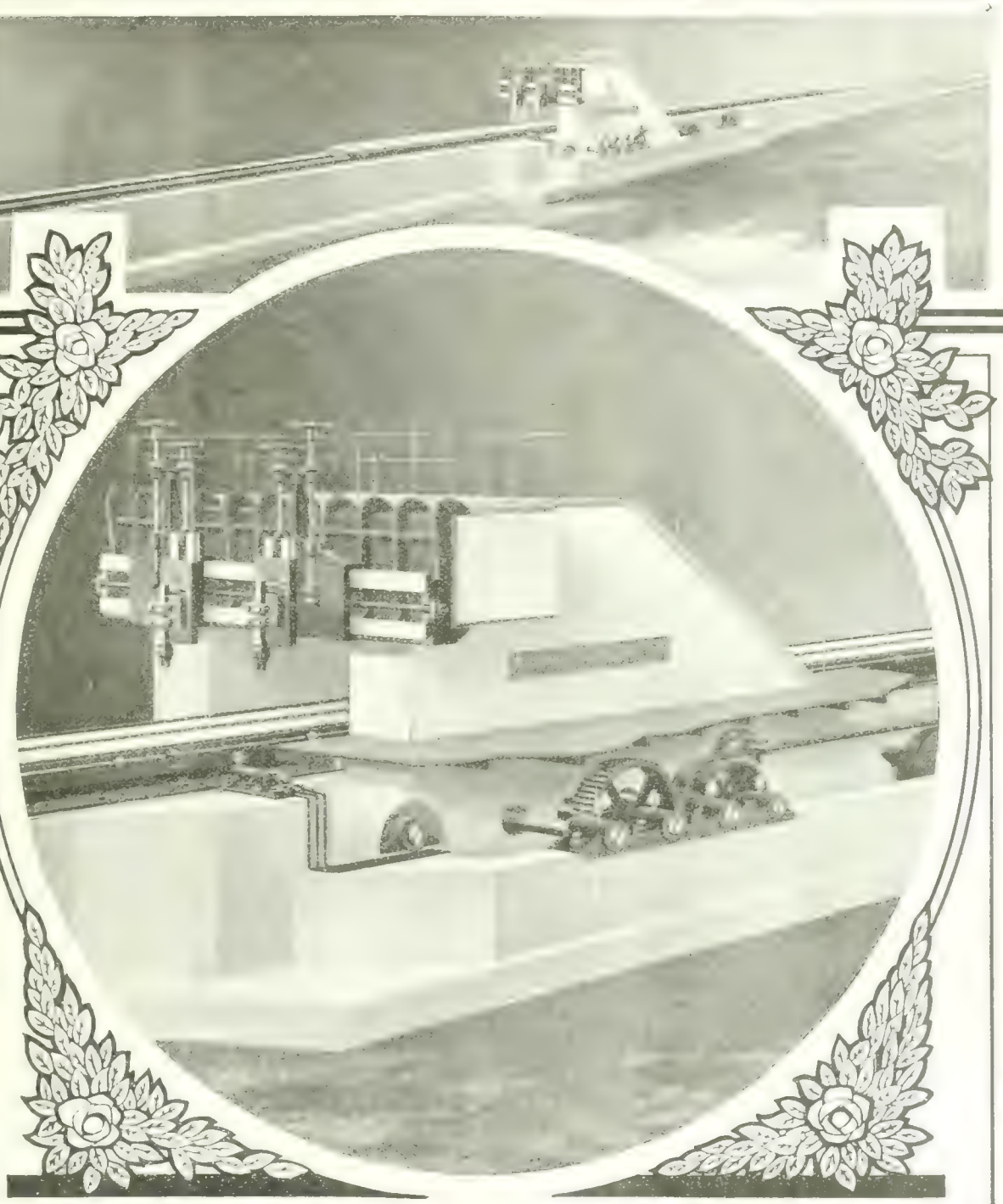


# A Machine and Its Product

As well as the production of machines of efficiency, prompt delivery has characterized Amalgamated Ammunition Corporation.

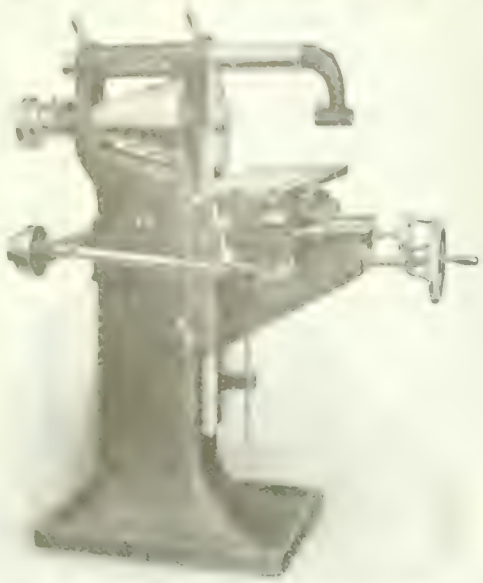
For that reason we have built special machines for the production of our product in the shortest possible time. This giant planer, the largest ever built, conveys in a limited way, an idea of our facilities.

Catalog and full information on request

**Amalgamated Machinery Corporation**
**72 W. Adams Street** **CHICAGO, ILLINOIS**

*If any advertisement interests you, tear it out now and place with letters to be answered.*

# GARVIN



No. 12 Garvin Milling Machine. Use Code Abrade

## NO. 12 PLAIN MILLING MACHINE

### FOR ALL LIGHT MANUFACTURING

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rapidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

Adjustments.....18 x 6 x 15 in.

**For Further Information** ASK YOUR DEALER or WRITE US DIRECT

**IMMEDIATE DELIVERIES**

***Send for Complete Catalog***

Manufactured by

## THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) 50 Years New York City

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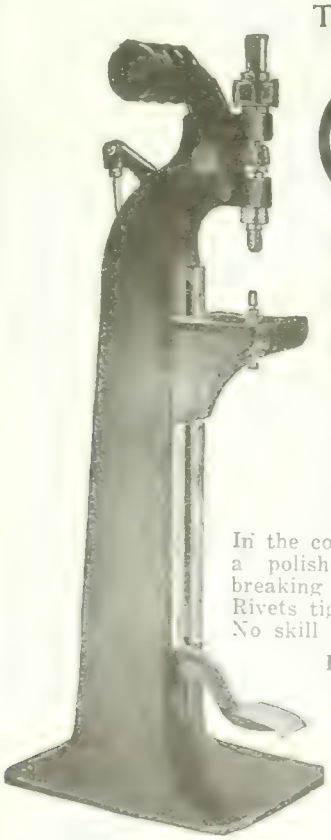
The

# GRANT

## Rivets Without Noise



If you want peace and quietness in your riveting department, the **Grant Noiseless Rotary Rivet Spinning Machine** is the tool you need.

In the course of a second it spins a polished rivet head without breaking or marring casting. Rivets tight or loose as you wish. No skill required to run it.

**It's a real cost-cutter. Write for more information.**

## GRANT

**Mfg. & Machine Co.**

BRIDGEPORT, CONN., U.S.A.

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## *For Rapid Production and Accurate Work*

USE THE

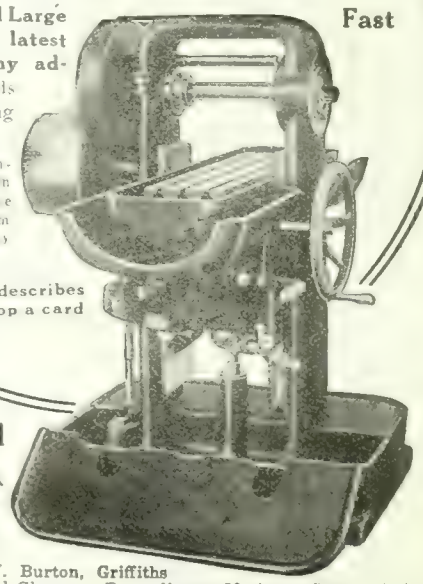
# "BRIGGS"

**The Briggs Miller handles work no other machine of its size can touch.** It is a manufacturing machine. On account of its rigid construction it will produce accurate work when running at a high rate of speed and feed.

**The Base Tank and Large Gear Pump is the latest addition to its many advantages.** Tank holds 20 gallons of cutting lubricant

Pump never requires priming and will deliver ten gallons per minute to the cutters, keeping them cool when run at very high speed.

**Fast**



Our booklet describes fully. Drop a card for it.

**Gooley & Edlund**

Inc.

Cortland, N.Y., U.S.A

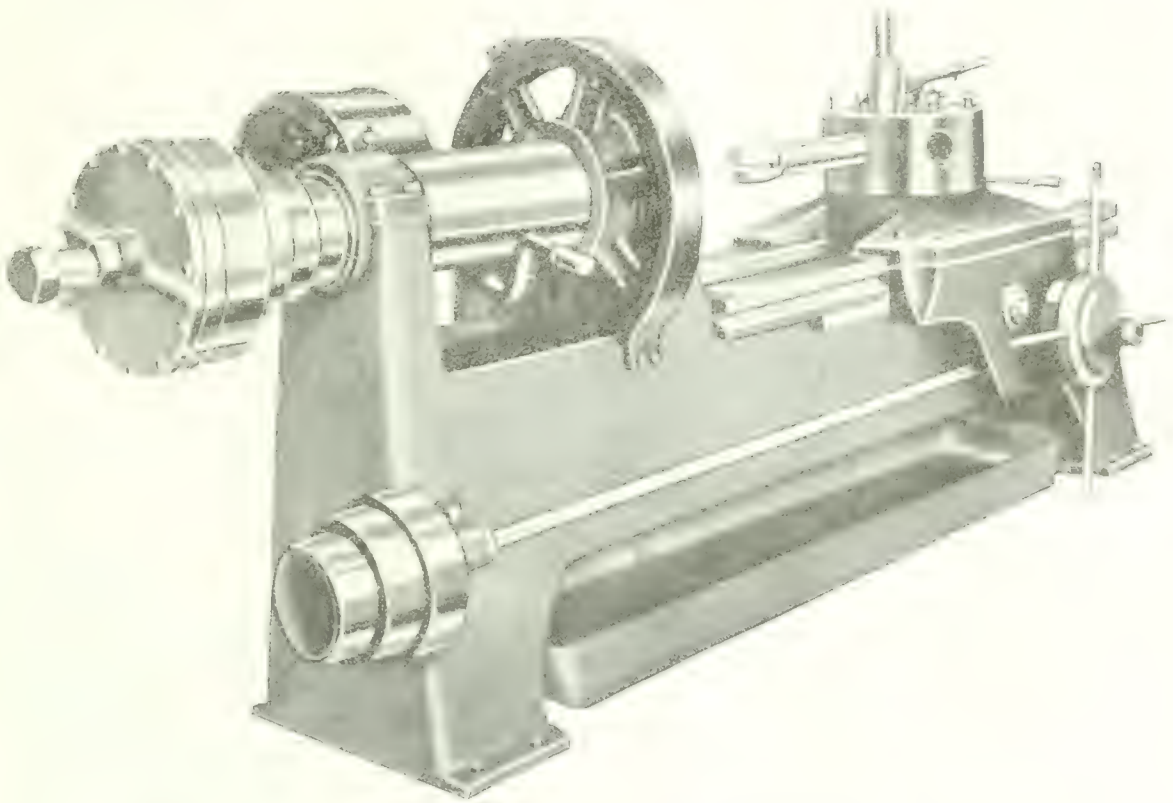
Foreign Agents: Allied Machinery Co. of America, Paris, Petrograd, Turin; Machinery Company of Russia, Scandinavia; C. W. Burton, Griffiths Co., London, Manchester and Glasgow; Barandiaran, Metivier, Gazeau & Cia., San Sebastian, Spain.

THE ORIGINAL "MONTREAL"

# 20-INCH
# HEAVY DUTY BORING LATHE

For 4.5", 6", or 155 mm. Shells

EQUIPPED WITH 6-HOLE TURRET AND AIR CHUCK



We also manufacture the "Montreal" Rough Turning and "Montreal" Base Boring Lathe.

*PROMPT DELIVERY*

***Full Particulars Upon Application***

## Standard Machinery & Supplies

**260 St. James Street - - Montreal, Que.**

**Western Representative: W. W. Hicks, 567 Banning St., Winnipeg**

## Oxy-Acetylene Welding and Cutting

### *Conservation vs. Waste*

Oxy-Acetylene Welding is proving a great economic factor in the Factories, Mills, Railroads, Mines and Machine Shops of Canada. The Nation's scrap pile is one of the worst enemies of Conservation. Hundreds of thousands of dollars' worth of damaged, worn or broken tools, castings, pipe and machine parts lie rusting on the scrap piles of this country. Much of this enormous waste is now being eliminated by Oxy-Acetylene Welding. Losses due to breakdowns—resulting in "tie-ups" of operating equipment are also being greatly reduced.

cylinders

**Prest-O-Lite PROCESS**

of metal and repair work. It handles repairs quickly and efficiently—often right on the spot—makes broken or worn parts strong as when new—saves time which would be wasted waiting for replacements—abolishes the "Scrap Pile."

The welding outfit is portable—available for outside work as well as for shop use.

No matter what other welding method you now use, a Prest-O-Lite outfit put to work in your shops will quickly pay you profits.

Write NOW for special literature and data that will point out ways to reduce waste and increase efficiency.

Address Dept. C107.

**The Prest-O-Lite Co., Inc.**

Canadian General Offices

Prest-O-Lite Building

corner Eim Street and Centre Avenue

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Branches at:

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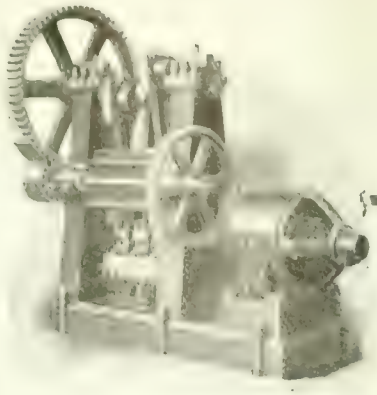
**World's Largest Makers of Dissolved Acetylene**





ASK US ABOUT

## Standard Heavy Duty Triplex Power Pumps

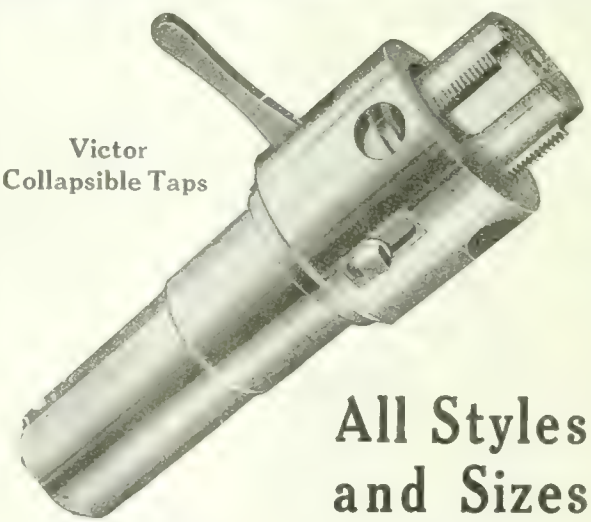
Direct Connected or Belt Drive.
Any Pressure up to 5,000 lbs.
Sizes up to 4¼" x 14".

*Full Specifications upon request.*

**The Hydraulic Machinery Co.**
LIMITED

**Montreal - - Canada**





Victor Collapsible Taps

## All Styles and Sizes

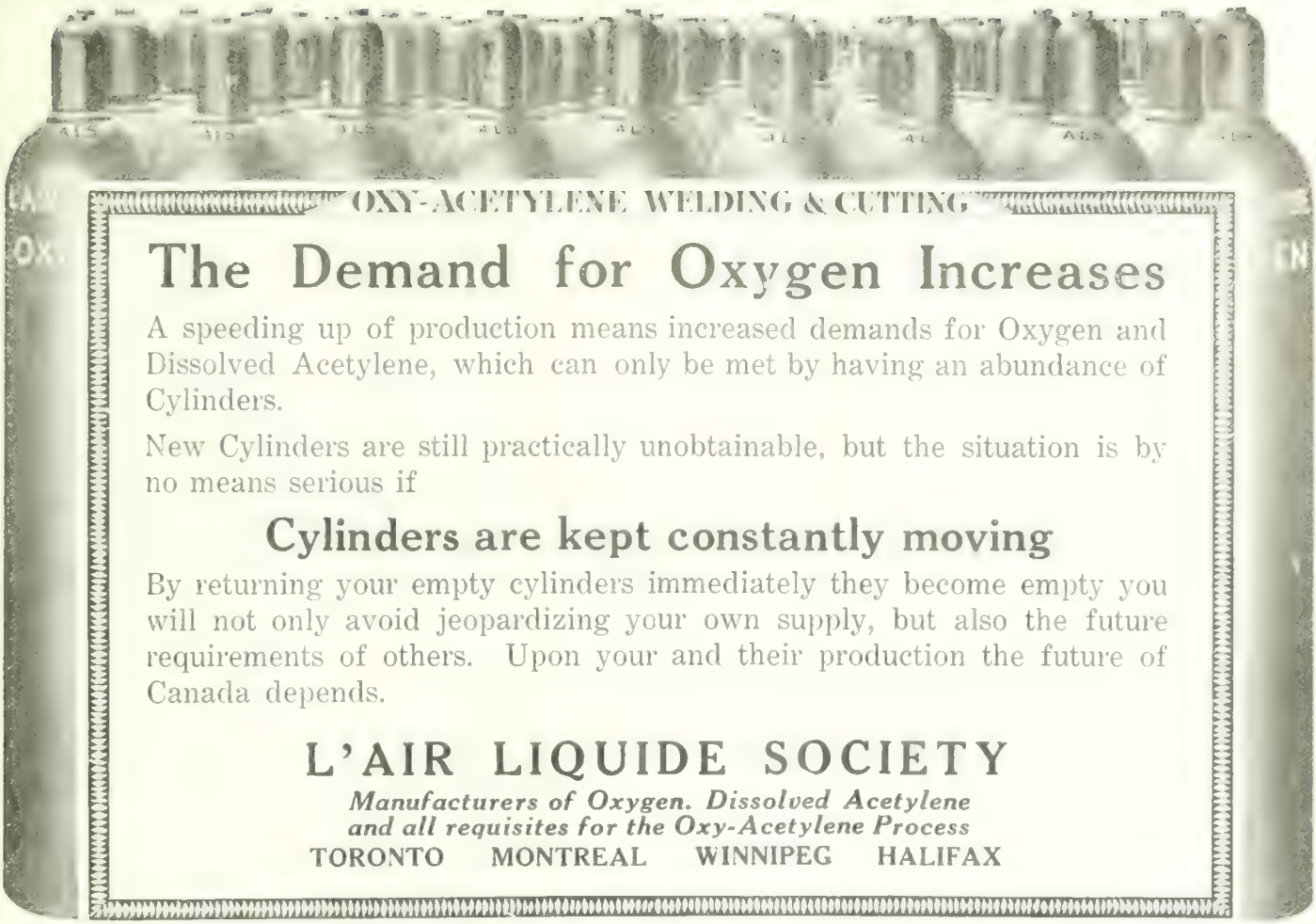
Victor Collapsible Taps are adapted to all classes and sizes of work.

If you are anxious to save time in your shop they offer you a real opportunity.

They save fully half the time on threading operations. Threads are smooth and clean. No possibility of a thread being roughed or torn through a tap clogging with chips when backing off. Does ideal work. Sizes 1" to 12".

Send blue-prints for estimates on Victor equipment.

**Victor Tool Company**
**Waynesboro, Pa., U.S.A.**



OXY-ACETYLENE WELDING & CUTTING

# The Demand for Oxygen Increases

A speeding up of production means increased demands for Oxygen and Dissolved Acetylene, which can only be met by having an abundance of Cylinders.

New Cylinders are still practically unobtainable, but the situation is by no means serious if

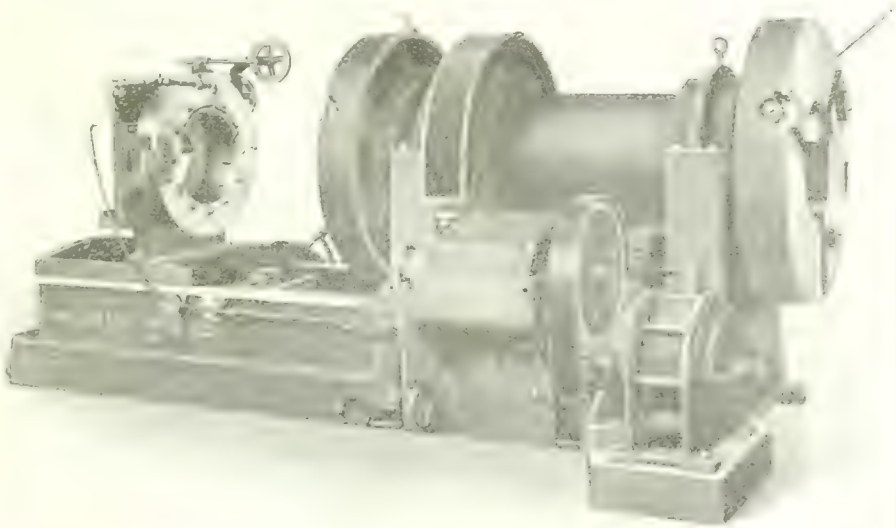
## Cylinders are kept constantly moving

By returning your empty cylinders immediately they become empty you will not only avoid jeopardizing your own supply, but also the future requirements of others. Upon your and their production the future of Canada depends.

## L'AIR LIQUIDE SOCIETY

*Manufacturers of Oxygen. Dissolved Acetylene and all requisites for the Oxy-Acetylene Process*

TORONTO MONTREAL WINNIPEG HALIFAX



# Threading Cutting

The value of these machines is in their capacity for work. Made in 11 different sizes and each machine including from 8 to 10 sizes. All sizes from ¼" to 18" in diameter may be cut or threaded.

The quality of the machine is amply proven by the fact that Williams carried off the honors at the Panama Exposition.

You should lose no time in sending for our catalogue which we will gladly furnish upon request.

## Williams Tool Company

Erie, Penn. U.S.A.

*Canadian Agents:*
The A. R. Williams Machinery Co., Ltd., Toronto, Canada

*European Agents*
Universal Machinery Corp.
London, England

THE Self-Oiling Bearings on all Consolidated Presses are another source of satisfaction to Consolidated Press users. A constant supply of lubricant is furnished to the main bearings, the crankshaft revolving on a film of oil, automatically applied.
Provision is made for draining off the oil to be renewed from time to time.

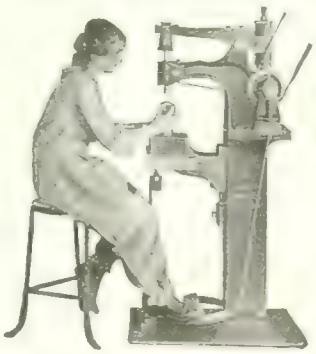
This is a feature you cannot conscientiously overlook.

## Consolidated Press Company

HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* MICHIGAN

Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver

## The Hammer With The Human Stroke



### HEADS RIVETS COLD

Heads 7/8in. rivets in cold, flush countersunk, or finishes [illegible] at the rate of—

A 7/8in. rivet in 1 1/4in. plate in 3 sec.
A 7/8in. rivet in 1in. plate in 2 sec.
A 7/8in. rivet in three 1in. plates in 3 sec.

Also all similar work for which machines to handle rivets up to 1 1/4in. are recommended.

Built in eight sizes.

Besides heading the High Speed Riveting Hammer does all kinds of peining, swaging, upsetting, etc.

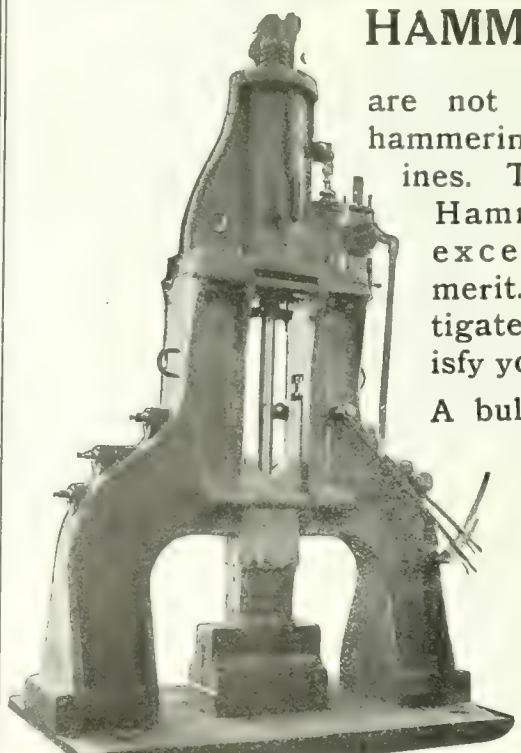
Send [illegible] or sketch of your work.

and

Let us [illegible] your forging problems.
Send for our High Speed Hammer Book.

THE HIGH SPEED HAMMER COMPANY, INC.
ROCHESTER, N.Y.

## "ERIE" STEAM FORGING HAMMERS



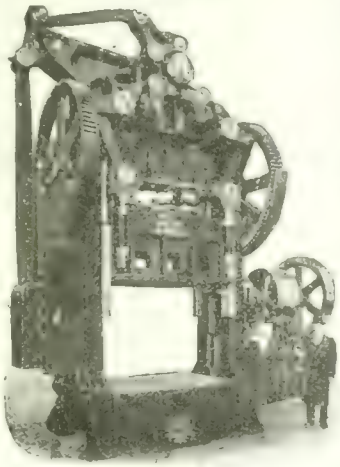
are not ordinary hammering machines. They are Hammers of exceptional merit. Investigate and satisfy yourself.

A bulletin for the asking.

ERIE FOUNDRY COMPANY
ERIE, PENNSYLVANIA, U. S. A.

# THE "TOLEDO"

## Toggle Presses



Single and Double Crank in 80 Sizes.

are helping Uncle Sam and thousands of the world's foremost manufacturers — their safety, efficiency and ease of operation overcoming, to a large extent, the shortage of skilled workers.

The simple, practical toggle mechanism eliminates wasters, exerts all the required power and smooth-running under perfect control of operator is assured.

They are adapted to an unusually wide range of deep stamping and forming work.

## The Toledo Machine & Tool Co.

TOLEDO, OHIO

Representatives: Allied Machinery Co. of America, 29 Rue de Rivoli, Paris, France; Via XX Settembre 12, Turin, Italy; 39 Seidelstrasse, Zurich, Switzerland.

# DeepThroat

"SIILES" No. 2 B

For reaching into the center of large sheets of metal, this model of the "Stiles" type of Press is provided. The massiveness of the frame and its special design make it rigid, even under the most severe punching strains.

## E. W. BLISS CO.

Brooklyn, N.Y., U.S.A.

1857 CHICAGO OFFICE — Peoples Gas Bldg. DETROIT OFFICE 1918 — Dime Bank Bldg.

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Reg. U.S. Pat. Office.

# TEST PRESSES

## For Applying Internal Pressure Physical Test to Shells

# BANDING PRESSES

## For Pressing in Copper Rotating Bands on Shells.

## Metalwood Manufacturing Co.

Detroit, Michigan

*Sales Representatives*

Canadian Fairbanks-Morse Co., Ltd., Montreal and Toronto. R. E. Ellis Engineering Co., 621 Washington Blvd., Chicago; Fairbanks-Morse & Co., Inc., 30 Church St., New York City

**The country has forgotten the length of Lincoln's legs; it only remembers that he got there.**

There are more men who have missed opportunities than there are who have lacked opportunities.

This Tire-Setter sets 'em cold in one minute. THIS is your opportunity.

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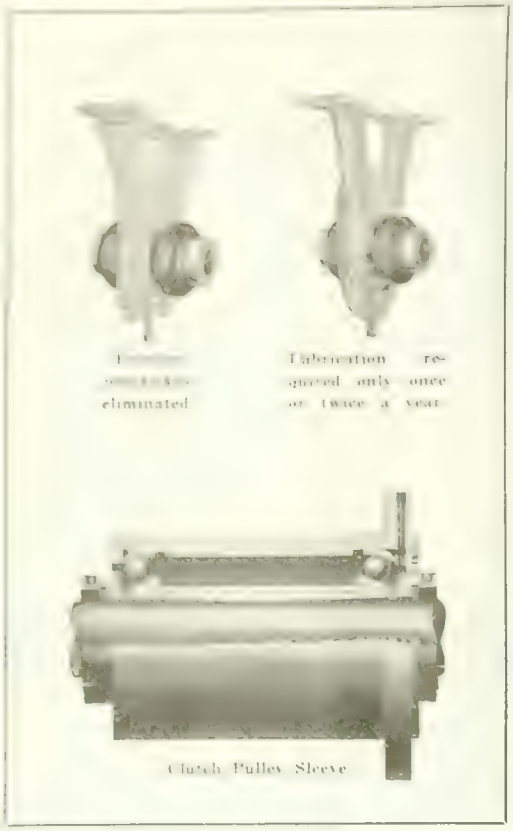


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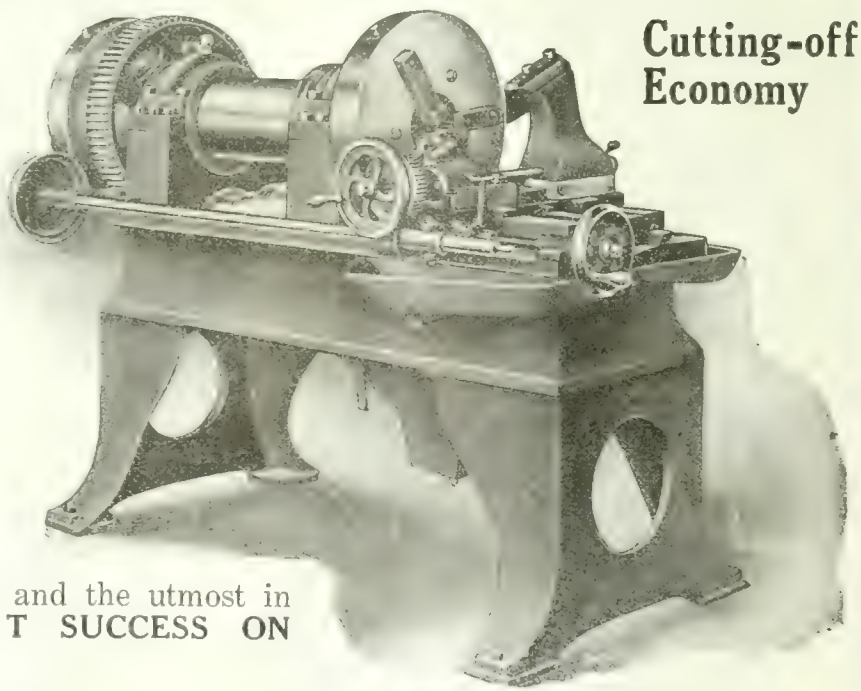

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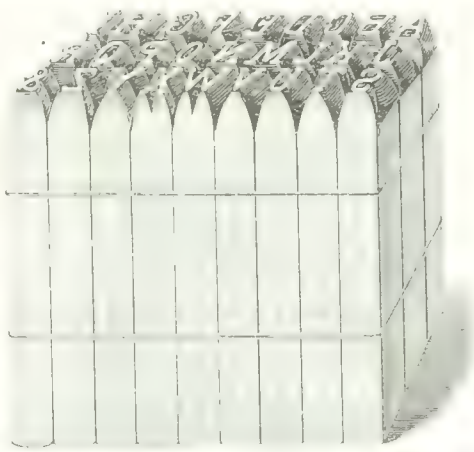

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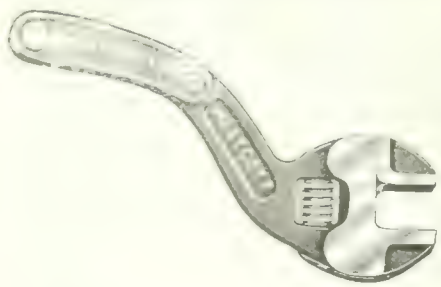

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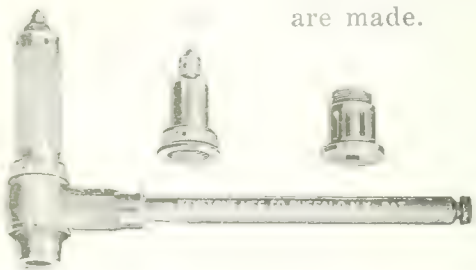

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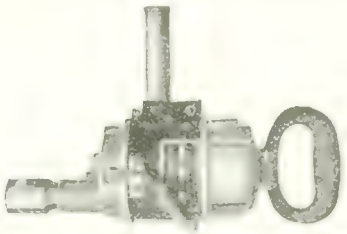

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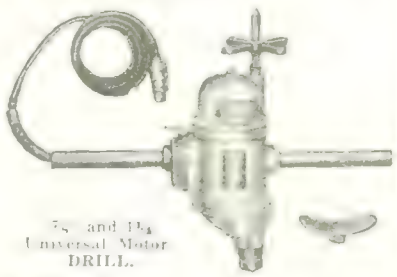

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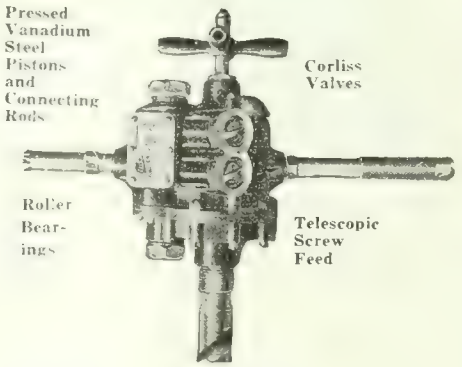


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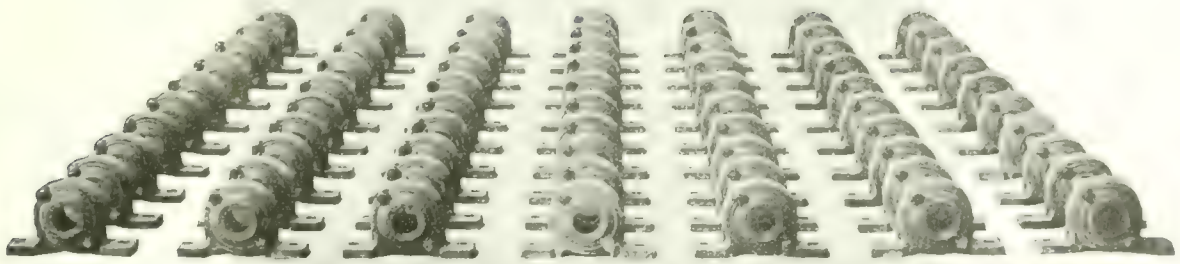

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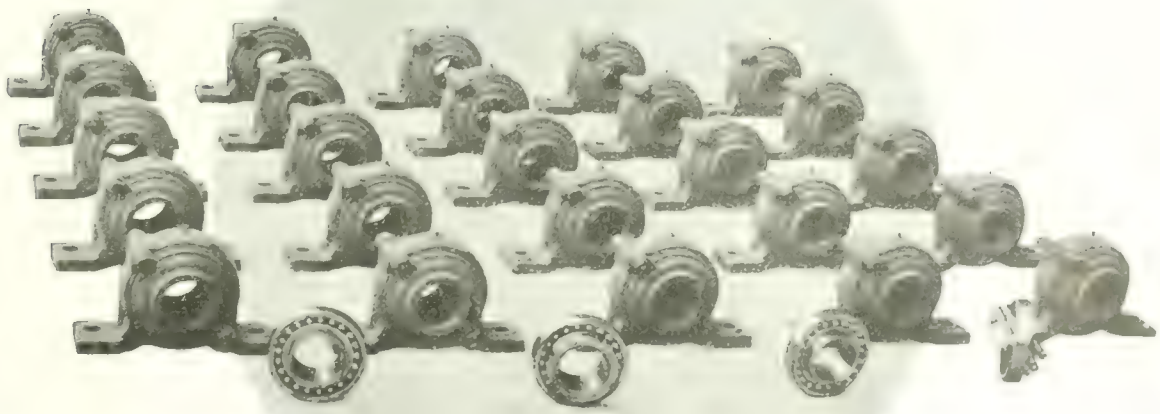

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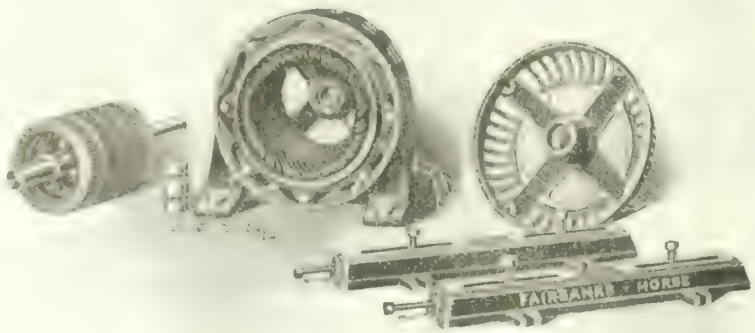


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A cut section of End Ring and Bar showing the perfect joint

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CANADIAN MACHINERY AND MANUFACTURING NEWS

Volume XXI. No. 26 June 27, 1918

# Producing 9.2 in. Shells with Women Operators Exclusively

## The Plant Where These Pictures Were Taken Employs Men as Foremen Only, Two Day and Two Night—Girls Operators do Toolsetting as Well as Shell Machining—How British Firms Meet Scarcity of Men

DESPITE the increasing demand for men by the British forces, the continued call for munitions on a gigantic scale is being successfully met by the producers in that country. The accompanying illustrations and data, which we reproduce through the courtesy of "The Engineer," are of a highly interesting series of tools for the production of 9.2 in. high explosive howitzer shells, specially designed by W. Littlejohn Philip, and operated entirely by girls. The only men employed on the production of the shells are two day foremen and two night foremen, who supervise the work throughout, and, assisted as far as possible by the girl operators, attend to the toolsetting.

### Types of Machines

The major machines employed on the production of the shell bodies are four in number, and are known as the A, B, C, and D machines. They are all of Mr. Philip's patented design. The fifth, or E machine, is a converted Herbert lathe. In Fig. 7 a self-explanatory diagram is given, showing the work performed by each of these five machines.

The first, or A, machine is illustrated in Fig. 1. The shell forging as received is placed over the mandrel A. The mandrel slides in a headstock, and with the shell in place can be rapidly pushed forward. In this way the shell is brought, with its bore correctly aligned, within the chuck headstock B. Two sets of six chucking screws are then tightened down against its exterior, whereafter the mandril is released and withdrawn, and the machine started up. On one side of the chuck the nose end of the shell is roughed down to about ¼ in. over size, and on the other side the base end is parted off and the exterior slightly coned, as indicated in Fig. 7. The coning is required in connection with an operation performed on the shell between the A and B machines.

Before the shell is passed on to the B machine it is centred by means of the cone turned on its base end in the press, shown in Fig. 2. This press is provided with a set of three tools that being advanced into the bore of the forging cut three light equally spaced grooves for a short distance up. These grooves, as revealed by the curled shaving left at their upper ends, can be seen in the bore of the shells on the bench behind the operator in the engraving. The grooves are required in connection with the driving of the forging in the B machine, and are, of course, turned out when the shell is bored in the C machine.

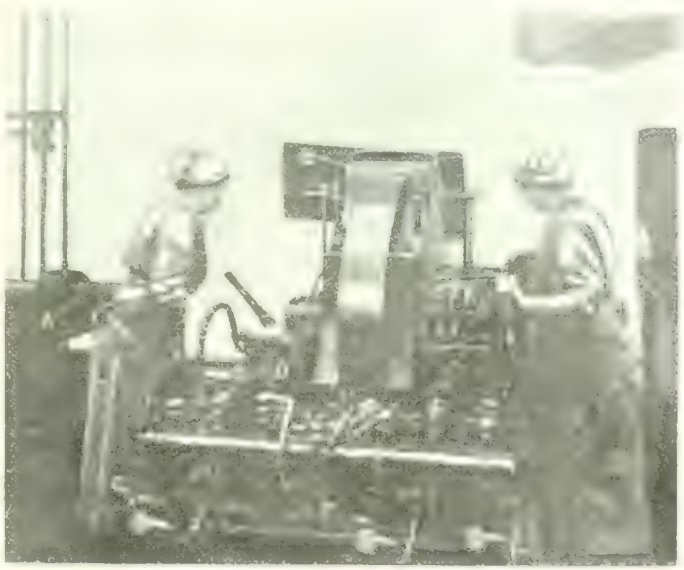


FIG. 1.—FIRST OPERATION MACHINE.

### Operating Details

The B machine is illustrated in Figs. 3 and 4, the former showing it engaged drilling the fuse hole, and the latter showing it reducing the parallel part of the body. Three sliding keys working against inclined planes cut on the mandril towards its rear end enter the grooves in the shell bore, while expanding dogs at the forward end centre the nose of the forging with the bore. The tailstock being drawn back, the machine is started up and the hinged boring fitment F is hinged back out of the way, and a hardened steel bush is driven into the fuse hole by means of the tailstock. This bush remains in position during the turning of the body and the nose, and supports the end of the forging on the back centre.

The cross slides carrying the roughing tools for the parallel body part, and the roughing and finishing tools for the nose, are operated in a manner similar to that followed in connection with the tools of the A machine. The finishing tool slide for the parallel body is fitted with a screw and hand wheel with a micrometer dial for fine adjustment. Both the saddle and cross slides work in conjunction with heavy, easily adjusted stops.

The C machine is illustrated in end view in Fig. 5. In this case the shell is held in a spring collet chuck, which is tightened up by means of a hand wheel and gearing at the rear of the headstock. The saddle of the machine carries a long cross slide, shown in the foreground of the engraving. The cross slide has four boring bars—two for the parallel bore and two for the bore at the nose end—which can be brought into position cross-wise, and when located by a stop rising from below and secured by locking bolts can be fed longitudinally.

The D machine illustrated in Fig. 6 is probably the most interesting of the series. In its arrangement of saddle and cross slide it somewhat resembles the C machine, but otherwise it is quite different, for it has essentially different duties to perform. The cross slide carries the thread milling attachment and all the other tools required except those used for undercutting the driving band groove. The machine is driven by belt during all the operations except that of

FIG. [illegible] CUTTING DRIVING SLOTS.

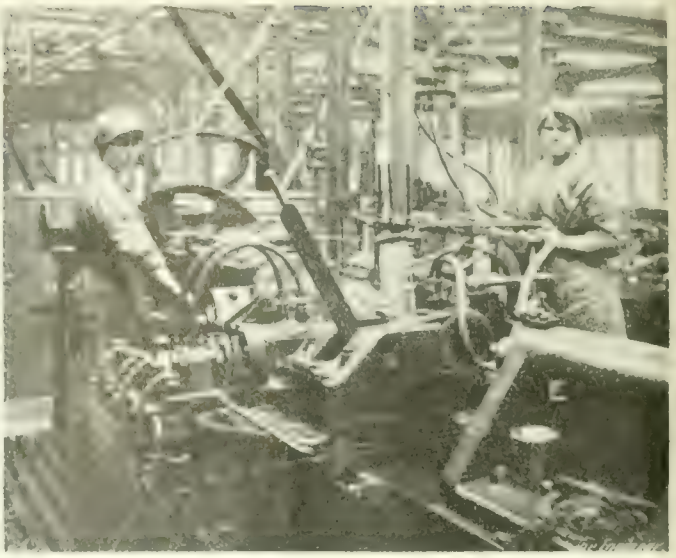


FIG. [illegible] DRILLING FUSE HOLE

[illegible] driven by an electric motor.

### Adapter Operations

In Figs. 8 and 9 the two machines employed to machine the base adapter are shown. The first operation faces the base of the adapter, turns its flange, and forms the recess behind the flange for the finish of the thread. The recess behind the flange is cut by a tool brought down vertically. The chuck on this machine is of the four-jaw independent type. The edge of the flange during the operation is not turned strictly parallel, but is formed slightly conical away from the operator. Thus when the adapter is turned round and inserted in the collet chuck of the second machine, the collet fingers, pressing down on the bevel of the flange, securely prevent the adapter from tipping or altering its position in the chuck.

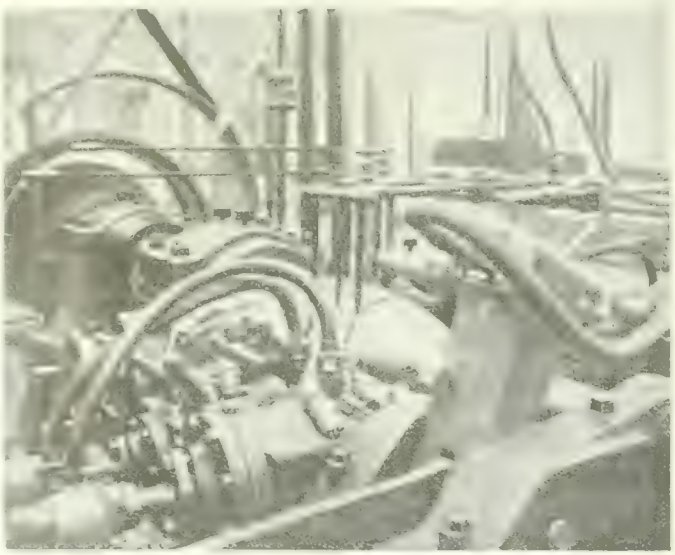


FIG. 4—TURNING.

The second operation machines rough and finish turns the body of the adapter, faces it, forms the small reduced parallel portion at its end, and threads the body. The machine is fitted with a turret, on which are tools for turning the body. Simultaneously in operation with these tools another, on a vertical overhead slide, descends and faces the end. The screw thread is then cut by means of a chasing arrangement on the turret. Leaving the second operation machine, the adapter is taken to a third machine, where the inner face of the flange is skimmed, and the bevel on its edge removed.

### Band Work

After the shell has been

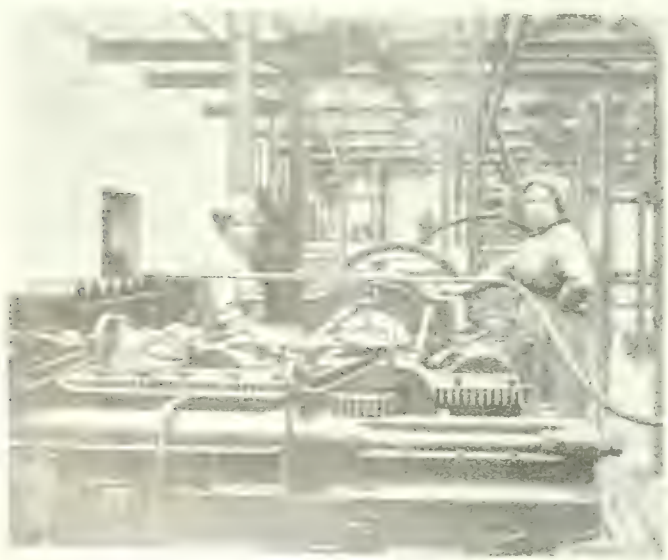


FIG. [illegible]

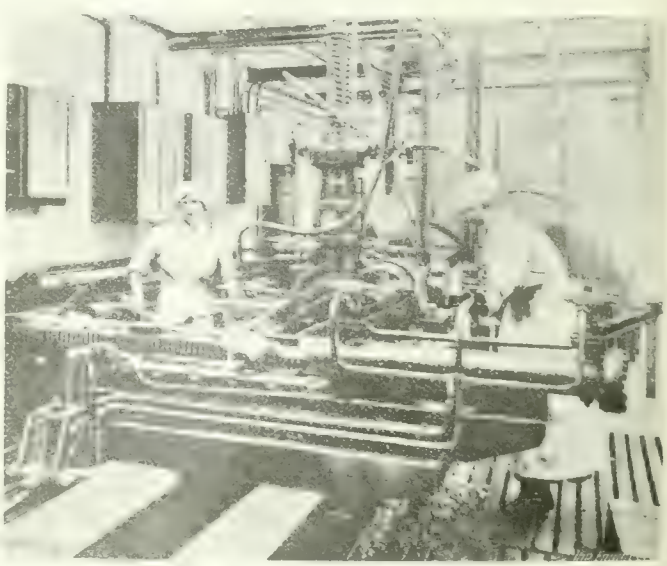


FIG. 6—THE D MACHINE

FIG. 10 COPPER BAND TURNING.

banded it is taken to the machine shown in Fig. 10, a copper band-turning machine representing an entire departure from the ordinary design. In it the shell is held nose downwards in a vertical spring collet chuck, tightened from the side of the machine. The rough forming tool is carried on a slide situated to the left of the machine, while the finish forming tool is carried on a similar slide on the right-hand side, but disposed at right angles to the first. The finish forming tool can then pass right across, and in both cases the cut is taken in one operation over the full width of the band. The machine is driven electrically. A machine on the same principle is employed, as shown in Fig. 11, for finishing the base of the shell after the adapter has been fixed in place.

The building in which the plant is housed was specially erected for it, and was completed in six weeks from the start of operations. The lay-out of the factory is such that the shells throughout practically never leave the level at

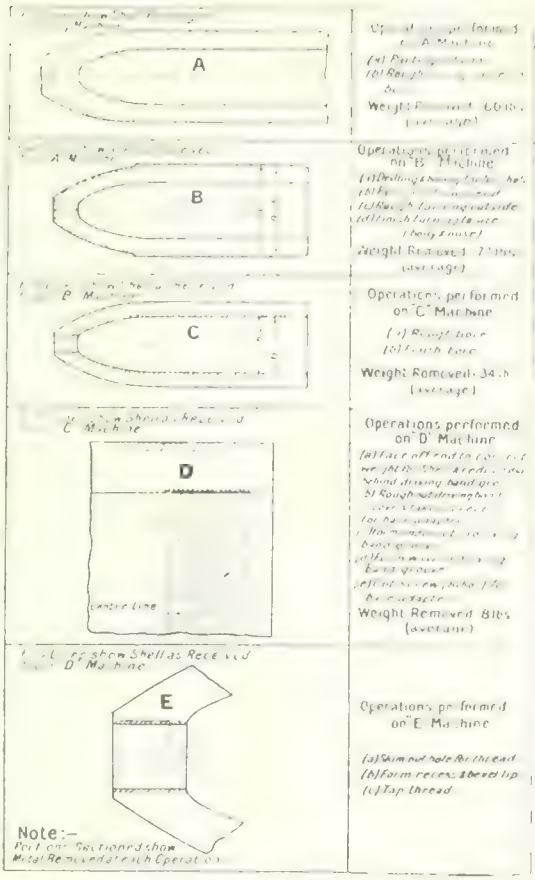



FIG. 1 DIAGRAM OF OPERATIONS.

which the machining operations are performed on them.

## DECIMAL COINAGE BILL

The text was issued recently of the bill introduced by Lord Southwark in the House of Lords to sanction a decimal system of coinage.

It is provided that "each coin shall be a thousandth part of the multiple of a thousandth part in value of a sovereign, and such part is in this Act called a 'mil.'" Bronze coinage is to be divided into one, two, three and four-mil pieces,

FIG. 11 FINISHING SHELL BASE.

and a five-mil and a ten-mil piece of nickel or other metal or alloy are proposed. The silver coins proposed are a quarter florin (25 mils), half florin (50 mils), florin (100 mils), and double florin (200 mils).

The bill, if passed, is to come into operation at such date as the King may by proclamation direct.

SOME interesting remarks on the present position and the future of the electrical industry in Australia were made by Mr. W. Corin when vacating the presidential chair of the New South Wales section of the Electrical Association of Australia. He pointed out that the war has given an impetus to the manufacture in Australia of electrical apparatus. He considers there is a distinct field for the development in New South Wales of the large electro-chemical and electro-thermic industries requiring a steady supply of power, and thinks eventually the water-power of the country will be utilized, notwithstanding the comparative cheapness of coal.

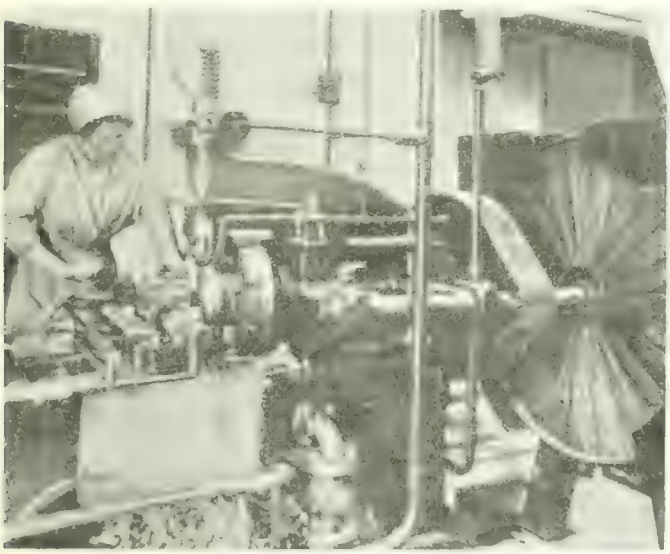


FIG. 8 MACHINING BASE ADAPTERS.

FIG. 9 MACHINING BASE ADAPTERS.

## UNSINKABLE SHIPS

By H. Stone

The safety of all seamen at the present time attaches towards making ships unsinkable by submarine action, and many ways and means have been proposed, one of which is by increasing the reserve buoyancy of ships, that is, making provision to convert the tremendous force of the torpedo explosion to the advantage of the ship. One of the methods of making ships unsinkable through the increase of their reserve buoyancy is that suggested by an Italian, whose method consists in lining all the available superficial parts of the ship's interior with a light substance such as cork. For instance, a steamer, a two-deck cargo boat, about 395 feet long and the usual lines, with a displacement of about 11,500 tons fully loaded, carries about 8,000 tons deadweight, and has about 423,000 cub. ft. of space available for cargo and bunkers under the main deck.

In order to render this vessel unsinkable it would be necessary to line the vessel internally with about 211,000 cub. ft. of cork composition having a specific weight of about 441 pounds to each 35 cub. ft. The cost of lining such a ship acording to this method would be about $200,000, whilst the capacity of such a ship would be decreased by 1,200 tons deadweight. The immediate objection to this scheme is that it is no easy matter at present to find cork in sufficient quantities to line ships. Now practicability and expediency are about the last things which enter the heads of those who propose means to safeguard ships against sinking after they have been struck by the deadly weapon known as the torpedo, against which nearly all schemes of protection adopted in the case of warships—which are not handicapped in the matter of internal subdivision through the necessity of reserving large compartments free from obstruction for the tonnage of cargo—have proved illusory, as is well demonstrated by the few instances on record of ships remaining for any length of time afloat after being struck in a vital spot by a well-aimed torpedo.

Still less commendable is a scheme put forward for increasing the buoyancy of ships by placing small watertight boxes in large numbers within the hull of a vessel and of distributing them in such a way as to interfere very little with the cargo capacity. The principle of the method proposed is that the aggregate floating capacity of the boxes will be sufficient to support the vessel and cargo after the hull is torn by a torpedo.

Another method has been suggested for attaining this end by reinforcing the hull covering the vital portions of a ship. And as time goes on other ideas and methods will be put forward, and time alone can tell which is the best method of safeguard, but there is little doubt that even as engineers evolved the submarine so other engineers will find the means of protecting vessels from these very annoying creatures of the sea.

## COMMISSION ADVOCATE DEVELOPMENT OF ST. LAWRENCE POWER

"Within a very few years there will be a demand for every horsepower that can be developed on the St. Lawrence River to which Canada is entitled for use upon the Canadian side," states Sir Clifford Sifton in the ninth annual report of the Commission of Conservation which has just been issued. "The situation with regard to Niagara will undoubtedly be duplicated," declares Sir Clifford, "and if we are foolish enough to allow vested interests to be created on the other side of the line we shall inevitably find ourselves handicapped and embarassed as we now are with respect to Niagara power." He contends that a thorough study of the situation reveals that there is only one sound method of developing these powers, viz., under "an international commission under which the best use of the powers will be made, the most economical development effected, and a just and equitable division of the power will take place for the benefit of the people who are directly concerned in its use."

Special prominence is laid in the report on power and fuel problems. Following a comprehensive review of the progress of conservation in 1917 by Sir Clifford Sifton, are addresses on "Peat as a Source of Fuel," by Dr. Eugene Haanel, "The Fuel Situation in Canada," by Fuel Controller C. A. Magrath, "Power Possibilities on the St. Lawrence," by A. V. White, "The Niagara Power Situation," by the same author, and a comprehensive treatment of the subject of railway electrification by S. T. Dodd of the General Electric Company, and W. F. Tye, C.E.

The results of the scientific investigations of the Commission to find out how best to regenerate the immense areas of cut-over pulpwood lands in Eastern Canada are also given. Dr. C Gordon Hewitt deals with the "Conservation of Wild Life in Canada," and Mr. J. P. Babcock with the "Salmon Fishery of the Fraser River District." In addition a full account of the work accomplished by the commission during the year in regard to water powers, town planning, mining, agriculture and game conservation is given. An interesting feature is a chart showing how the German metal-buying combination controlled the metal markets of the world before the war.

## MAY ESTABLISH LIGNITE PLANT

ESTABLISHMENT of a lignite briquetting plant, to be financed and operated by the Dominion, Manitoba and Saskatchewan governments, is recommended by the lignite committee of the Advisory Council for Scientific and Industrial Research. The committee report, which will be issued shortly, favors establishment of the plant in southern Saskatchewan at a locality where the lignites are of poor grade, with the idea that if it were successful at this point, it would be successful elsewhere in Saskatchewan and Alberta.

The report further states: "The art of producing carbonized briquettes has passed the laboratory stage and no further information can be got by laboratory methods. The producer must face the difficulties in commercial production, which are approximately of the same order as those within the smelting of certain ores. The road to success in the briquetting problem is strewn with the wrecks of amateur attempts to do this apparently simple thing, which accounts for the fact that private capital is so chary of such enterprises. The problem, therefore, in Saskatchewan is one which should be undertaken by the Government as a public utility, at least until such processes as may be adopted are demonstrated a commercial success."

Production costs at the plant for carbonized and briquetted fuel, covering operating costs and fixed charges, are estimated at not more than seven dollars per ton. In this estimate no finance allowance has been made for the recovery of by-products, which are stated to be large and valuable.

## AMERICAN TIN IMPORTS

THE practical suspension of the importation of pig tin into the United States affects an industry turning out at the present time over $100,000,000 worth of products. All of the tin used in the manufacture of the $100,000,000 worth of tin plate now produced in the United States is imported, more than 90 per cent. of it originating in the Orient, and with the partial suspension of shipments from that part of the world, recently announced, the United States becomes more dependent upon its South American neighbor, Bolivia, which produces about 20 per cent. of the world's tin and is practically the only world producer of tin outside of the Orient. Most of the tin imported into the United States originates in the Malayan Peninsula, the world's largest producer of tin. Certain of the Dutch East India Islands in the same general section of the globe also supply considerable quantities of tin, some of which is shipped thence to the Malayan Peninsula for smelting and reexportation. Hong-Kong is also exporting comparatively small quantities of tin, produced in China, and Great Britain produces tin from her mines in Cornwall, but not sufficient for her domestic use.

SCIENCE has destroyed, is destroying, simplicity, gentleness, beauty, but only through ignorance. Ignorance and destruction are synonymous, anyway. Pierce ignorance with the light of truth and destructive forces will become constructive forces.—Horton.

# The Design of General Purpose Agricultural Tractors

By Alan L. L. Chorlton, C.B.E.

*Mechanical appliances are of great importance in the growth, production and [illegible] needed to-day. The following article deals with the problem of co-ordinating the [illegible] separated pursuits of engineering and agriculture in the design of farm tractors and affords an interesting view of the problem as approached from the standpoint of English practice.*

THE problem of providing mechanical power, to replace that of the horse, etc., in the most suitable and efficient form for the purposes of agriculture, is one of no inconsiderable difficulty, the guiding factors being such variables as the size of the farm, the class of land, the nature of crop, road transportation and the financial ones of first cost, annual charges, etc. The information relating thereto is so diverse, so variable and difficult to relate to actual fact that the mechanical engineer investigating the problems on lines he is accustomed to, finds himself at some loss where to begin, and is driven in the end, owing to this lack of precise information, to provide much of the essential data by actual experiment.

In the preparation of this paper, which was undertaken at the request of the president, the author has found the difficulty of obtaining this precise information to be very great indeed. If such information does in reality exist, it would have saved him much trouble had he had the good fortune to have access to it. Undoubtedly, there is, apart from the actual mechanics of the problem, a considerable divergence of opinion as to the manner in which the problem should be met, while, agriculturally, the views held are seldom accompanied by those proofs upon which any engineer would rely.

In this problem the difficulty of bringing together the agricultural expert and the mechanical engineer is a very real one. This difficulty is reflected in the tardy progress in this country of mechanical agricultural science, which apart from the conservatism of the farmers themselves, has undoubtedly depended upon the cut-and-dry methods so familiar in the past, and not upon scientific and technical research, the need for which at the present day is so prominently before us, and in connection with which we are so constantly admonished by the daily press.

### General and Single Purpose Tractors

Though in the main the views held by farmers may be divided into two groups, those who favor a special power implement for each purpose and those who think a general purpose machine should be provided to deal with each and all, yet the problem should undoubtedly be considered, in the first instance, from the standpoint of capital expenditure and annual charges. The average farm in this country is comparatively small, and the farmer may find it financially impossible to purchase a special power-driven implement for each of his requirements, even should he be of opinion that such a policy is a desirable one. For example, if a light tractor were purchased for plowing alone, then a power unit would be needed for threshing, whilst on the road provision must be made for the mechanical power required for transport. A fourth power unit may even be required for other purposes, thus, a first cost of, say, £350 per unit might be increased approximately to £1,050, or even to £1,400, whilst the yearly writing-off of capital, interest, etc., would be increased proportionately, each requirement now having to bear the full charge of its special machine. The effect on the working costs of the writing-off of so large a capital expenditure incurred by unipurpose machines is very material; for example, the capital charges for a tractor costing £350 suitable for plowing alone, and allowing seven years' life, and 100 acres per year, would be 10s. per acre, for 200 acres 5s. per acre, and even if an allowance is made for performance of light land work, subsequent to plowing, the cost would probably amount to 3s., equivalent to the cost of fuel (at 3 gallons per acre), and as great as, if not greater than, the wages of two operators.

The financial consideration of the problem brings out the advantages of a multi-purpose machine, a power unit—if it could be designed—to meet the majority of calls of the farmer, instead of a special power implement for each purpose. Such a desirable combination should never be lost sight of in any general investigation of the fundamental factors of design.

Though beginning with the general aspect, the progress of the investigation revealed the extent of the field covered by the application of mechanical power to agriculture as too wide for the scope of this paper and the time at the disposal of the author, and it was, therefore, in the end, as the financial aspect was considered so important, narrowed down in the main to a consideration of the possibilities of a single power unit which would meet the majority of the demands called for on the farm. There will always be farms so large or special conditions of such a nature as to allow of the purchase of special machines for each purpose with a commercial advantage; such cases, however, must be considered individually, and are not dealt with here. There is no doubt, however, that despite the questionable soundness from a commercial point of view of the use of many special-purpose units for the average farm, there still remains a strong body of opinion that the use of [illegible] implements [illegible] thing, and only the showing of the future, when the farmer has purchased on these lines, will clearly demonstrate whether due consideration had been paid to the financial aspect of the problem.

### Reconciliation of the Various Duties to be Performed

It is essential to bear in mind the incidence of the various duties called for from the tractor; will they so fall as not to conflict? That is to say, can the uses of such a power unit be reasonably well divided to cover the agricultural year with the help of horses which will be always available to a limited extent? It is held that they can, though each farmer must with his own conditions in front of him judge for himself. The requirements called for from a power unit during the agricultural year are:

(a) Plowing, dragging, rolling, drilling.
(b) Reaping, binding and leading.
(c) Threshing, pumping, pulping, chaff cutting and grinding.
(d) Transport work to the station.

These duties are not likely to exceed 70 per cent. of the total working days of the year.

It is not possible here to consider these operations in further detail, for we must confine our examination to the mechanical factors of the problem. The three principal uses which, by their requirements, govern the design of the tractor are:

(b) Land work—plowing.
(a) Road work—transport.
(c) Farmstead—threshing, etc.

(a) governs the minimum axle loading, (b) governs the maximum axle loading, (c) governs the minimum power required.

### 1. Road Work

The basic factors governing the application of mechanical power for traction purposes are adhesion and resistance.

Tractive Adhesion.—The adhesion of the driving wheels on the road must be sufficient to utilize the power developed by the engine in overcoming the tractive resistance of the load and the tractor combined. There exists a considerable amount of data relating to tractive resistance, but for tractive adhesion on common roads, little, if any, can be found. For traction on rails, the locomotive engineer has plenty of data obtained by the use of dynamometer cars, and from these have been developed recognized constants. The standard figure of adhesion is 0.25, i.e., one-quarter of the load on the driving axles can be used in drawbar-pull. It is stated that this figure rises to 0.35, but it is not advisable to use such a value in practice.

*A paper read before the Institution of Automobile Engineers.

| Road | Location | Tract. Res. lb. | Res. per ton |
|---|---|---|---|
| [illegible] | Near Davis | [illegible] | 27.6 |
| [illegible] | Near Davis | [illegible] | 30.0 |
| [illegible] | Near Davis | [illegible] | [illegible] |
| [illegible] | Near Davis | 155.0 | 51.6 |
| [illegible] | Near Davis. | [illegible] | [illegible] |
| [illegible] | Near Davis | [illegible] | [illegible] |
| [illegible] | Near Davis | [illegible] | [illegible] |
| [illegible] | Near Sacramento | 244.0 | 81.3 |
| [illegible] | Near Davis | [illegible] | [illegible] |
| Good condition. | On Causeway, near Davis | [illegible] | [illegible] |
| [illegible] | Near Davis | [illegible] | [illegible] |
| Good condition | Near Davis..... | 278.0 | 92.6 |
| [illegible] | Near Davis | [illegible] | [illegible] |
| Mud, stiff, firm underneath .... | Near Davis..... | 654.0 | 218.0 |
| [illegible] | Near Davis..... | 789.0 | 263.0 |

[illegible] accelerated when the test was stated

| Type of Tractor | Wt. lb. | B.H.P. | Dia. in. | Stroke in. | Revs. per min. | Np. lb. per sq. in. | Np. wght. tons | Vol. swept per min. cu. ft. | Vol. swept per B.H.P. cu. ft. | Vol. swept. wght tons |
|---|---|---|---|---|---|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | 900 | 65 | 50 | 340 | 13.6 | 254 |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | 475 | 48 | 10 | 534 | 19.0 | 214 |

As no adhesion values were available for steel tyres on common roads, experiments have been made to determine them. In these experiments a steam tractor was employed towing a loaded [illegible] of a recording dynamometer. In order to obtain maximum results the experiments were extended so as to traverse a steep hill, and even with this additional resistance it was still necessary to apply the brake to the wagon before the maximum value was exceeded, and slipping began. It will be seen clearly that these experiments also afforded an opportunity of testing traction resistance constants, and this was done. To make the results still more useful, the same tractor was fitted with rubber-tired wheels and tested under similar conditions. The whole forms quite a useful combination of data for the designer of tractors for common roads, and the author is much beholden to Messrs. Ruston, Proctor & Co. for enabling the tests to be carried out. These results are shown in the diagrams of experiments, Figs. 1 and 2.

From these it will be seen that the maximum value—i.e., with slipping just beginning—is for steel tires 0.56, and for the rubber tires 0.6. It is suggested that [illegible] practice where country roads have to be taken into account, a safe value for steel tires would be 0.45, and for rubber tires 0.55, or if long life of tires is desired 0.5. This means, in effect, that in getting out the design of the tractor for road transport, which duty limits the minimum weight, the propulsive effort cannot be taken as exceeding 0.45 times the weight on the driving axle for steel tires. The high cost of rubber tires for road purposes with their special wheels seems hardly justifiable for the condi-

[illegible]

From the experiments, Figs. 1 and 2, the tractive resistance for a good macadam road comes out at just over 50 lb. per ton, the diameter of the hind wheels of the loaded wagon being 4 ft. by 9 in., that the front 3 ft. 6 in. by 9 in., with steel tires. The values given in table 1 are the results of experiments lately carried out over roads in California. For the purposes of this investigation a value of 60 lb. per ton has been taken.

Having now the values for adhesion and resistance, it is necessary to inquire as to the load a farmer will require for road transport. As it is desirable that the tractor should work on the land with practically the same efficiency as a special-purpose machine, heavy axle loading is prohibited, and it becomes necessary to proportion the tractor weight to fulfil this condition, and yet permit of the requisite adhesion for hauling the load on the road.

When the tractor is hauling a wagon in ordinary service the load may be adjusted to any condition or gradient. Is there, however, any other governing condition in which this adjustment cannot be made? A load that is in one, so to speak—and here a full-sized 4 ft. 6 in. threshing machine may be taken as a guide—such a machine weighs 4½ tons, as a safe maximum, say, 4.5 tons.

The next consideration is the reasonable maximum gradient a tractor may be called upon to face. If a maximum gradient of 1 in 10, and a tractor weight of 50 cwt. is assumed, we have 224 + 60 = 284 lb. as the total resistance per ton. Then the total load of 4.5 tons plus 2.5 tons equals 7.0 tons, or a total propulsive effort of 1,988 lb., which gives us, with a 0.45 traction adhesion, a load of 4,400 lb. on the driving axle. Obviously with a tractor of a total weight of but 2.5 tons (say, 15 cwt. on the front axle and 35 cwt. on the back), this axle weight cannot well be provided. The increased loading on the axle due to the reaction of the drive, the values of which are shown in Fig. 3, provides, however, a

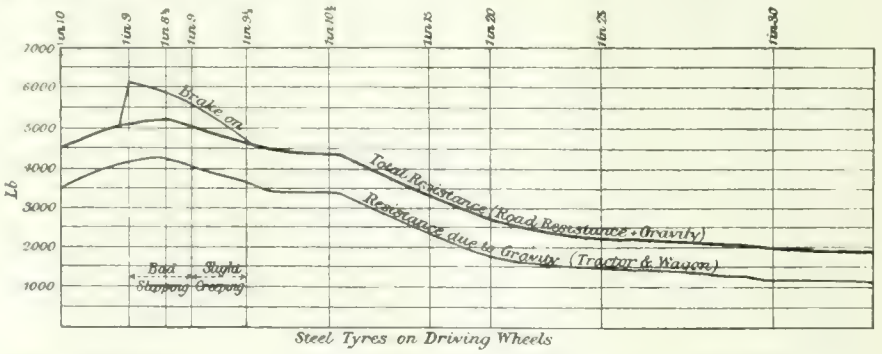



FIG. 1—RESULTS OF ROAD RESISTANCE AND ADHESION TESTS, SEPTEMBER 12, 1917.

Gross weight of tractor = 7.1 tons.
Gross weight of wagon = 8.7 tons.
Gross weight of complete train = 16.1 tons.
Weight on driving wheels (3'6"x12") = 10,000 lb.
Adhesion factor, without slip 0.46. With slight creeping 0.56. Max. 0.62.
Road resistance per ton, av. 53 lb.
Average speed 1⅞ m.p.h.
Road surface, very good macadam, dry.

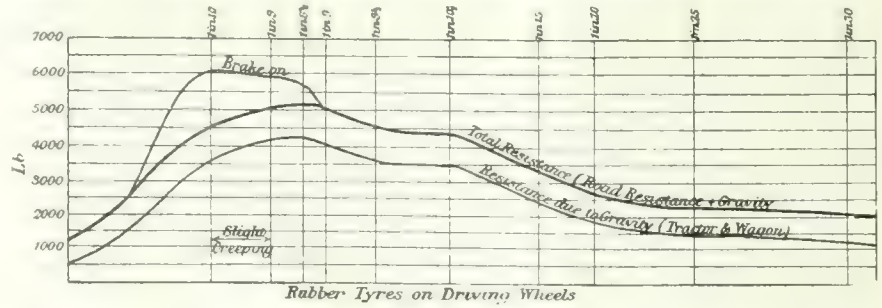



FIG. 2 RESULTS OF ROAD RESISTANCE AND ADHESION TESTS, SEPTEMBER 11, 1917.

Gross weight of tractor = 7.1 tons.
Gross weight of wagon = 8.7 tons.
Gross weight of complete train = 16.1 tons.
Weight on driving wheels (3'4"x10") = 10,000 lb.
Adhesion factor, without slip 0.58. With slight creeping 0.6.
Road resistance per ton, av. 53 lb.
Average speed 1½ m.p.h.
Road surface, very good macadam, dry.

means of meeting this difficulty. The alternative method is to adopt artificial loading on the axle. Resolving the drawbar pull into engine power at 2 miles an hour, at 70 per cent. gearing efficiency we get a brake horse-power of the engine of 15.2, and at 80 per cent. efficiency the power would be 13.2 approximately. For still heavier loads or steeper gradients a larger power is required, and it is desirable, therefore, that this be provided if not incompatible with the other factors.

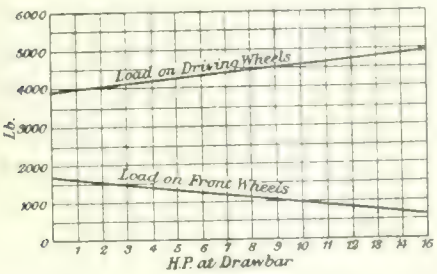



FIG. 3 DISPLACEMENT OF WHEEL LOADS DUE TO TURNING MOMENT AND DRAW BAR PULL.

Weight of tractor in working order, 2½ tons
Wheel base 8 ft.
Diameter of driving wheels, 4 ft.
Height of drawbar from ground, 1 ft. 8 in.
Power cost in ploughing test at 2 m.p.h. taken at 70 per cent.

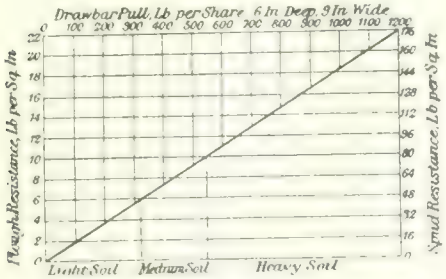
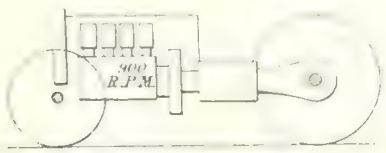

Drawbar Pull, Lb. per Share, 6 In. Deep, 9 In. Wide
Plough Resistance, Lb. per Sq. In.
Speed Resistance, Lb. per Sq. In.
Light Soil
Medium Soil
Heavy Soil

FIG. 4 RELATION OF SPEED TO PLOW RESISTANCE

| | Lb. per sq. in |
|---|---|
| Oil tractor in use | |
| With extension | 16 |
| Steam tractor | 17 |



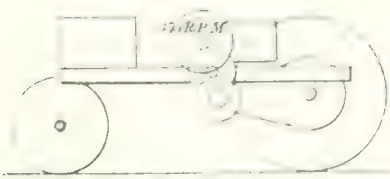




FIG. 5—UPPER, REDUCTION REQUIRED FOR 2 M.P.H. 4 TO 1 APPROXIMATELY.
FIG. 5 LOWER, REDUCTION REQUIRED FOR 2 M.P.H. 4 TO 1 APPROXIMATELY.

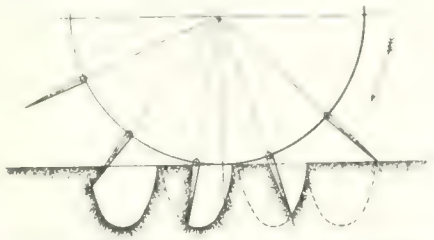
### 2.—Work on the Land

The governing factors of successful working on the land are not easily determined, and apart from the difficulty of carrying out experiments there are such intangible things as the varying opinion as to allowable pressure on the soil to be taken into account.

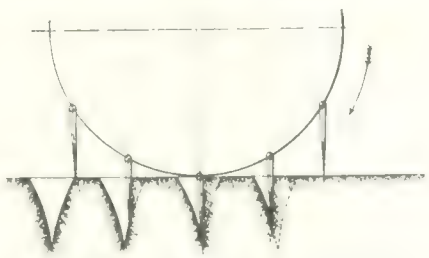
It may be said generally, however, that weight is a very important consideration, and must not exceed a certain maximum, whilst additional tractive effort in excess of that consistent with this weight must be obtained by other means, projections on the wheels, spuds, etc.

The pressure which worked land will bear without injurious effect upon the crops, varies, of course, according to the nature of the soil. From the mechanical point of view the limit of pressure is set by the necessity to prevent sinking into the ground, an occurrence which is seldom due to excessive weight. What usually happens is that owing to inadequate gripping power the driving wheels rotate and act as milling cutters, scraping out the soil from beneath.

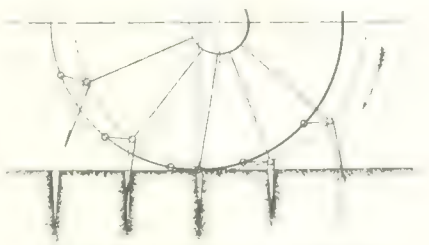
The relative values of weight and spud area are very difficult to allocate so as to be able to make comparisons. For instance, a machine with a 30-cwt. axle loading and short spuds pulls partly by adhesion and partly by grip, and the latter is rendered more effective by the weight of the wheel holding the ground down during this action. On the other hand, a lighter tractor with 15-cwt. axle loading must pull very largely by grip alone, and the effectiveness of the grip is modified and reduced by the lighter weight behind it, and the greater rolling resistance per ton set up by the spuds. Hence it will be seen that the data to be ascertained are the proper relation of pressure on the land, the pressure



EFFECT OF FIXED RADIAL PROJECTIONS INDICATING LOSS OF POWER AND INCREASE IN TRACTION RESISTANCE.

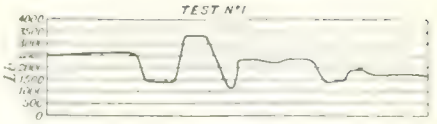


ACTUATED PROJECTIONS, PARRALLEL MOTION.



ACTUATED PROJECTION, ECCENTRIC MOTION.

FIG. [illegible] VARIOUS SPEED ARRANGEMENTS.




land.
Mean drawbar pull, 2,300 lb.
Mean drawbar h.p. 9.65 3.21 h.p. per share.

Ploughing at 2 m.p.h. in stubble. Medium soil.
Mean drawbar pull, 1,000 lb.
Mean drawbar h.p. = 8 2.66 h.p. per share.
Rolling resistance of tractor with [illegible] at 277 lb. per ton.
Power used in ploughing 8.0 h.p. = 42.5 per cent. of total h.p.
Power used in rolling [illegible] h.p. per cent. of total h.p.
Power used in transmission [illegible] per cent. of total h.p.
Weight of tractor [illegible]
Weight on driving wheels, 5,000 lb.
R.p.m. of engine [illegible]
Driving wheels, 4 ft. 6 in. dia., 15 in. wide.
Plough, Ransome three-share, cutting 6 in. deep 9 in. wide.

FIG. 7 TESTS OF TWO CYLINDER TRACTOR USING KEROSENE

against it, and the action of the rim projection, strake, spud or grouser.

We have thus three prime conditions to be met for the majority of cases:

(a) Driving axle loading.
(b) Pressure against grips or spuds.
(c) Effect of rolling resistance.

Considering first pressures that have been usual on land work, we have:

| | Lb. per Sq. In. |
|---|---|
| Man's shoes | 8.5 |
| Horse's hoofs | 20 |
| Cart tires— | |
| Load 2 tons | 40 |

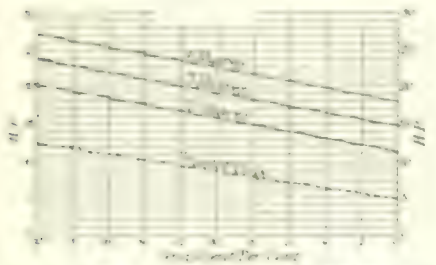
Assuming from our previous figure a static axle loading of 3,920 lb., then with the driving wheels of the tractor 48 in. diameter by 12 in. wide, we get, with a contact area of 288 sq. in. (sinkage of wheel ¾ in.), a pressure per square inch of 13.6 lb.

The second part of the problem is more difficult owing to the absence of data, but concluding that the strength of the ground is represented by its resistance to plowing, Fig. 4 is useful.

Taking the first pulling by grip alone (light tractors in Fig. 5) the suggested allowable pressures against a spud are given, and for average land 50 lb. to 75 lb. per square inch may be taken as corresponding to approximately a plow resistance of 9 lb. per square inch. If it is assumed that the drawbar pull is 2,000 lb., and the loading 50 lb. per square inch, the pull if taken by one spud in each wheel would be 1,000 lb., so that for a 12-in. wide wheel the spud would be 1.67 in. long for average land.

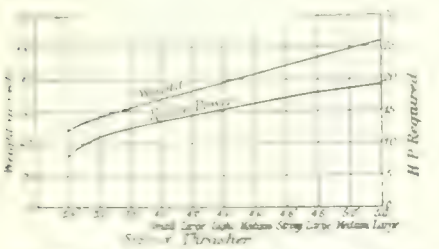
For light lands when the strength of the soil is low, with the same drawbar pull, this depth would have to be increased about four times, i.e., the spud would be 6.7 in. based upon the relative resistance given in the above table. This cannot be considered as a proposition to be recommended owing to the necessarily greatly increased rolling resistance of the tractor, and a special device becomes necessary, such as an actuated spade,

varying conditions of soil and weight of



PLOUGHING MEDIUM SOIL.

tractor. On very soft land the wheeled spud pressure, is not suitable, and one of the caterpillar type becomes essential. This, however, cannot be said to be at all



necessary for the majority of English agricultural conditions.

From the tests at 2 m.p.h. (see Fig. 7) when the drawbar pull is 500 lb. per share, the curves in Fig. 8 have been got out in which the important effect of gradient is indicated. For four shares and a gradient of 1 in 10 it will be noted that the load at the engine is 23 brake horse-power, and it is desirable that this should be obtainable if not inconsistent with the other governing factors of the design, for with four shares instead of three, 25 per cent. extra plowing will be effected for the same cost of labor.

From the tests made in dragging the tractor, the 900-lb. drawbar pull for a 3½-ton tractor is equivalent to a rolling resistance of 277 lb. per ton on land. As the tests show the loss in the gearing of the tractor is 32 per cent. of the total power, had the gear of this tractor been constructed on the lines of motor-car practice a considerably higher efficiency would have been obtained.

From the other test at 1.57 m.p.h. the drawbar pull is 2,300 lb., or 766 lb. per share, the drop in speed allowing the engine to deal with the stronger land. The peakiness of this curve shows the value of large flywheel effort on the engine.

### 3.—Work on the Farmstead

The highest power which a tractor when acting as a stationary power unit is called upon to provide is generally accepted as that for threshing.

Diagram, Fig. 9, gives an approximate [illegible] curve for different sizes of threshing machines. From this it will be seen that 20 h.p. is not exceeded, though it is usual to allow 25 h.p. for large machines. For grinding the powers are less.

Summing up now, and allowing a margin of safety on the results so far arrived at, the fundamental values for the [illegible] purpose tractor may be taken as:

| | Required Power h.p. | Driving axle Loading lb. |
|---|---|---|
| [illegible] | 18 to 20 | 4,400 |
| [illegible] | 22 to 25 | 4,400 |
| [illegible] | 20 to 25 | Stationary |

(To be continued.)

## MAY TRANSFER ROYAL NAVAL COLLEGE

THAT the decision has been practically reached to transfer the Royal Naval College from Kingston, Ont., to Esquimalt, B.C., is the announcement made recently through the offices of the capt.-supt. of the Esquimalt dockyard. The naval college, which was removed to temporary quarters at Kingston following the disaster last December, is to be transferred here temporarily, pending the erection of new college buildings at Halifax. It was announced that the naval students will be accommodated in one of the large buildings available in the Esquimalt dock yards, which can easily be converted for the purpose. It is understood that the naval students will be installed at Esquimalt by August.

## CLEANING BLAST-FURNACE GAS BY ELECTRICITY

THE gas that comes off from the top of a blast-furnace is too heavily charged with fine dust to be usable economically in hot-blast stoves and under boilers, and quite unfit for use in gas-engines. The older method of cleaning the gas consisted in natural precipitation of suspended matter in large tubes and chambers and subsequent "scrubbing" of the gas in washing apparatus. This had the disadvantage, so far as heating purposes are concerned, of reducing the temperature of the gas before combustion, which obviously is uneconomical. Consequently various dry-hot methods of cleaning have been introduced. One of these, which has proved very successful, is the electrical process. The gas is passed through a chamber, which need not be more than 15 to 20 ft. long, and subjected to high-tension electrical discharges, which precipitate the dust almost immediately without affecting the temperature of the gas. The dust can be handled much more conveniently than the wet "sludge" from the washers of the wet-cold process, especially if it has to undergo subsequent treatment for the extraction of valuable constituents. The method is cheap and extremely efficient. After one electrification, or at most two, the gas is fit for use as gas-engine fuel.

## BIG INCREASE IN CANADIAN TRADE

FOR the nine months of the fiscal year ending December 31 the total trade of the Dominion aggregated $2,068,400,971, as compared with $1,700,337,790 for the same period last year. For December alone it was to the value of $213,305,664, as against $201,193,194 for December, 1916.

Exports from the Dominion for the nine months' period included domestic products to the value of $1,257,684,900. Domestic exports for the same period last year were to the value of $851,629,813. These figures are exclusive of coin and bullion.

Manufactured goods headed the list in point of value, products of this class worth $522,963,430 being exported during the nine months' period. Last year during a like period manufactured goods were sent abroad to the value of $317,841,414. Agricultural products were in second place, with a value of $475,338,003, as compared with $317,451,444 last year.

Goods were entered for consumption to the value of $772,630,263, on which duties amounting to $125,796,830 were collected. For the like period in 1916 importations aggregated $265,635,897, on which duties amounting to $106,378,729 were collected.

Customs revenues are now dropping off a little in consequence of war conditions of transportation, scarcity of supplies and more general realization by the public of the necessity of thrift. Imports of wheat, which may be classed as "luxuries," are now considerably less than for the corresponding period of last year. The high water mark for Customs revenue was passed some time ago, and increases are not to be expected until normal conditions prevail again after peace is declared.

Allowing for a gradual dropping off in Customs revenue from now on until the end of the fiscal year, it is estimated the total revenue for the twelve months will be about $260,000,000.

ACCORDING to the *Revue de Chimie Industrielle*, the best composition for dressing the hulls of sea-going vessels is made up as follows: Six parts of tallow, melted hot, to which the following are added, and the mixture constantly stirred: six parts carbonate of lime, two parts of powdered quicklime, four of charcoal, four of sulphur, four of felspar, two of dried zinc white, thirty-three of spirit varnish, twenty-three of coal-tar naphtha, sixteen of 92 per cent. spirits of wine, and ten of ordinary varnish. To this mixture is added the coloring matter desired, in a dry and powdered form. The following additional ingredients are said to increase the efficiency of the composition: Tallow, six parts; copper, ten; iron, three; brown hematite, twenty-five.

# Principles & Practice of Mechanical Sketching & Drawing--II.

**Every Mechanic Should Know How to Make and Interpret Mechanical Drawings and Sketches of the Simpler Types—A Practical Course Prepared Especially For Younger Men and Newcomers in the Industry**

By Terrell Croft

## TAKING MEASUREMENTS FROM OBJECTS

IT has been aptly stated by some mechanically-inclined philosopher that there are three essential elements involved in the production of an engineering drawing. These three elements, arranged in the order of their importance, are: (1) accuracy, (2) neatness, and (3) **speed.** It is almost obvious that accuracy is by far the most consequential of the three, because if a drawing is inaccurate it is worthless, regardless of its appearance or the rapidity with which it was produced. Again, neatness is, in general, particularly for the beginner, of more moment than speed. The reason is that, while one may—at least when he is learning the game—be able to produce a smudgy, unsystematic sheet more rapidly than he can a neat, readily-decipherable one, the original producer is not the only fellow who must work from that sheet. It may be that many different men will have to refer to the sheet, and if it is not tidy and legible each one of them may waste considerable time in obtaining information which should be obvious.

Furthermore, if the beginner establishes for himself the rule of producing only neat drawings, regardless of the time required, he will soon become sufficiently experienced in turning out this one grade of good work that he will then be able to create a tidy, trim drawing almost as quickly as he can a dingy, illegible one. Remember: (1) accuracy, (2) neatness, and (3) speed.

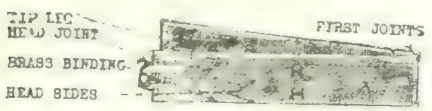



FIG. 1 TWO-FOOT BOXWOOD POCKET RULE.

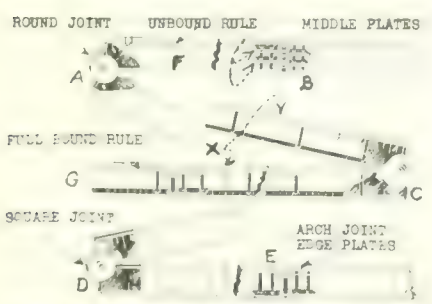



FIG. 2 CONSTRUCTION OF DIFFERENT GRADES OF RULES

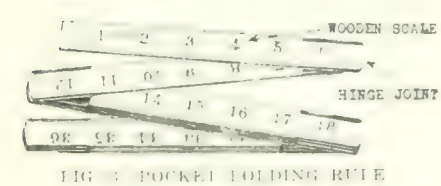



FIG. 3 POCKET FOLDING RULE

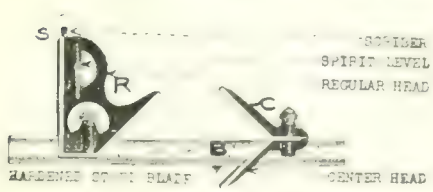



FIG. 4 COMBINATION STEEL SQUARE

### Making a Working Drawing

The general procedure in making a working drawing or sketch is about as listed in the following schedule. The different operations (Nos. 1 to 6) are given in the order in which they are usually of necessity, or at least most conveniently, performed. Under certain conditions it may not be possible or even advisable to do the work in the sequence suggested. Thus the steps are:

(1) Determine which views of the object will be shown and where they will be located on the sheet.

(2) Draw the views. (For a finished drawing the views should be drawn to scale. But for a sketch they are drawn freehand, either on plain or squared paper, to approximate scale by merely judging the general dimensions and distances with the eye. For a sketch, no dimensions are taken from the object for these plots, except, possibly, a few general ones to assist the draftsman in establishing correct proportions).

(3) Determine what dimensions are necessary to completely specify the size and form of the object and draw the necessary dimension lines and extension lines and plot the arrowheads on the dimension lines.

(4) Determine the dimensions of the object by measurement and insert the correct dimension values on the sketch.

(5) Indicate which surfaces are to be finished.

(6) Letter in the title of the sheet. (This title should consist of the name of the object and the name of the machine, if any, of which it forms a part. The part number, if there is such, should be specified and the serial number of the machine given. The date of completion should always be shown on a sketch or drawing because this information may be required some time most unexpectedly as law-suit or patent-case evidence).

The reason that the sequence above outlined is usually the desirable one is that if it is followed the draftsman in completing steps 1, 2, and 3 does not have to touch the object, which is usually dirty or oily. Thus he can readily keep the sketch sheet clean. In taking the dimensions from the object (operation No. 4 above) the hands will likely become soiled. But, by using a piece of scrap paper under the hand when transferring the dimensions to the sketch, the sketch sheet can be kept clean.

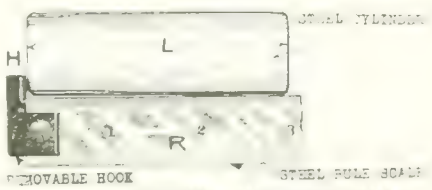
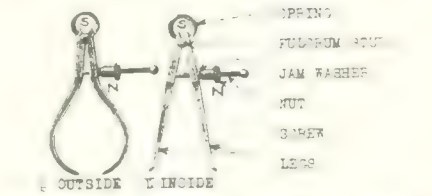
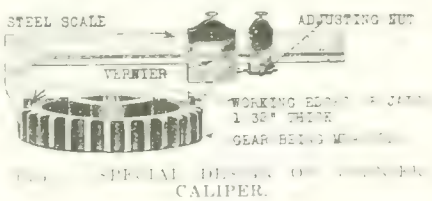



FIG. APPLICATION OF HOOK




OUTSIDE AND INSIDE CALIPERS



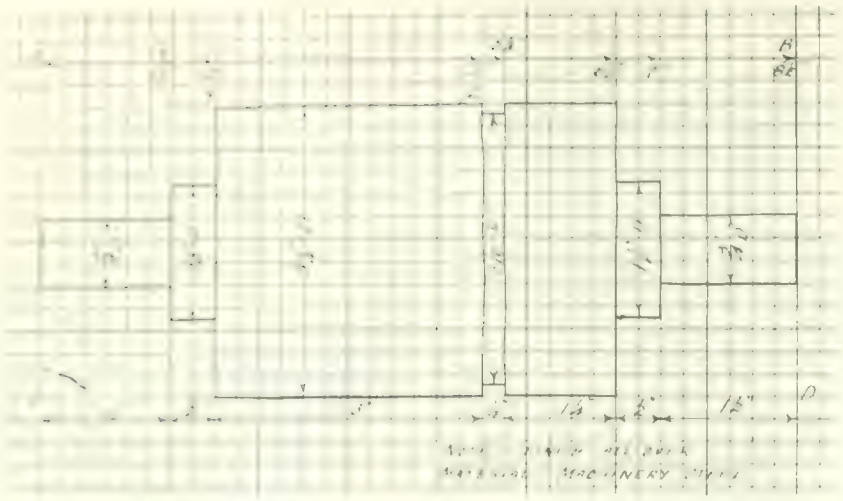

SPECIAL DEVICE FOR CALIPER.

### Use of Tools and Instrument

In obtaining accurate dimensions from objects, certain tools and instruments must be used. Some of these will be described in considerable detail in paragraphs which follow. While most of the tools to be described are in common use, the reader should not infer that he knows all about them and their characteristics. It is, therefore, advised that the paragraphs which follow be perused carefully because they contain considerable very useful information which is not generally known.

The Two-Foot Boxwood Rule (Fig. 1) is the most frequently used measuring tool. While these wooden rules are not as accurate as steel scales (which will be described later) they serve admirably for average work, can be carried around easily, and they are nearly always available. The smallest divisions on boxwood rules are ordinarily 1 16 in. or 1 10 in. It is not feasible, because of the nature of the boxwood material, to impress ac-

FIG. METHOD OF USING STEEL SCALE AND SQUARE IN MAKING DRAWING



SHOWN IN FIG. 3 DRAWN IN SKETCH PAPER

...ame and constructions of boxwood rules. It is well for him to be familiar with these, so the drawings of Fig. 2 have been included.

Boxwood rules may be full-bound, half-bound, or unbound. A full-bound rule has a sheet-brass binding, X (Fig. 2), riveted to both the inside and outside edges of each leg. A half-bound rule has the binding only on the outside edges of the legs. An unbound rule has no binding. There is no doubt but that for the average mechanic, the full-bound rule will justify its cost because of its greater serviceability. However, here is a warning: metal-bound rules of any sort are undesirable for an electrician who must take measurements around operating electrical machines or wiring installations. Disastrous short circuits have been caused by mechanics endeavoring to obtain, with a brass-bound rule, measurements around live electrical equipment.

There are three types of head-joints used on boxwood rules. These are shown at A, D, and C in Fig. 2. The round head-joint shown at A has but one wing and is used only in the cheapest rules. The square head-joint, D, has two wings and is more expensive and serviceable than that shown at A. The arch head-joint, C, is of the same general construction as that of the square joint but it contains more material and extends further along the sides, and, therefore, provides a more durable instrument.

The folding or zig-zag rule (Fig. 3) is made of flexible wood and is very useful in taking measurements where the distance involved exceeds two feet and is not greater than six or eight feet. The folding rules are not useful for the same services as are the two-foot box-

of the folding rule is that it can be used to measure the width of openings several feet wide where a tape could not, without an assistant, be used. The folding rule comprises a relatively-stiff measuring stick when unfolded, and thus can be placed across an opening, in order to determine a dimension, without being supported at the far end. It will be found that rules of this construction are most useful when one is making lay-outs of a station or taking dimensions from a building or from some relatively-large completed machine or other object.

Tapes, either steel or linen, are utilized to advantage when taking dimensions from large objects. Steel tapes of the

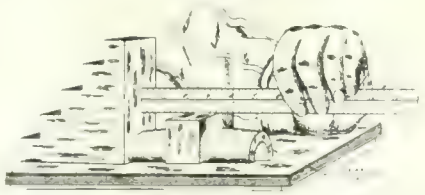


FIG. 10—OBTAINING LONGITUDINAL DIMENSIONS OF A BEARING BOX.

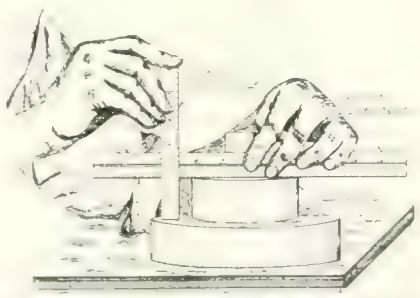


FIG. 11—USING TWO SCALES TO DETERMINE A DIMENSION

higher grades are very accurate and can be used for very close work. Linen or cloth tapes are not as accurate as the steel and are, therefore, useful only for general lay-out and building construction work where extreme accuracy is not essential. Note that a steel tape should never be used in taking measurements around operating electrical machinery or circuits for the same reasons advanced above for the undesirability of brass-bound rules for electrical work.

### Steel Scales and Calipers

The combination square comprising a steel scale and suitable heads (Fig. 4) constitutes an outfit which is almost essential to any one who proposes to make dimension sketches of machine parts. The scale or blade, B, is of hardened steel and may be obtained in any reasonable length between 4 in. and 24 in. These blades are ordinarily graduated in 1/8, 1/16, 1/32, and 1/64 of an inch, but other graduations can be obtained if desired. The blade, as suggested in some of the following illustrations, can be used without the heads. Where one of the heads is used on it the head is grooved to accommodate the blade and a dowel extends from the head into a channel cut in the back of the blade. Set screws are provided to temporarily fix the heads on the blade at any location desired. A steel scriber, S (Fig. 4), for marking metals is held by a friction clamp within the regular head. The applications of the centre head, C, and the regular head, R (Fig. 4) will be explained in subsequent paragraphs. Both soft heads and hardened heads can be purchased. The hardened heads will usually justify their additional cost.

A hook scale (Fig. 5) which is merely an ordinary steel scale with a hardened steel "hook," H, accurately adjusted at one of its ends, is a useful tool for measuring the lengths of objects which have rounded corners. In Fig. 5 the instrument is being applied for the measurement of the length, L, of the steel cylinder. Scales of this type are also convenient for measuring through the hubs of pulleys or for setting inside calipers. In the design shown in the illustration, the hook can be removed quickly by turning the eccentric stud through one-half of a revolution.

Calipers (Fig. 6) are utilized in many different ways when taking measurements. Their principal application is for obtaining a dimension such as a diameter where a scale cannot be used directly on the object. The tool used in measuring outside diameters, such as a diameter of a shaft or of a pulley (Fig. 6-I) is called the outside caliper. That for inside diameters, such as the hole through a pulley or the opening for a steam pipe, is called the inside caliper (Fig. 6II). Both of the tools illustrated are of the spring type. That is, they may be adjusted by turning the thumb nut, N, against the tension of the spring S. Calipers of this design are much more convenient for taking measurements than are the old-fashioned ones which have no springs or thumb nuts and which have to be tapped against an object in order to open or close them.

Vernier calipers (Fig. 7) are particularly useful for obtaining the dimensions of gears and gear teeth. In fact, they can be used to advantage for obtaining any dimension within their range which

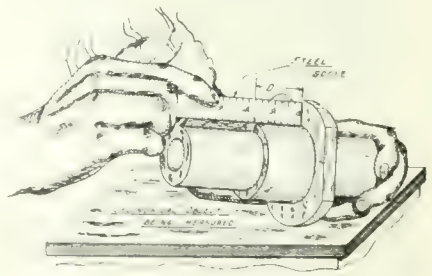


FIG. 12—METHOD OF USING STEEL SCALE.

must be measured to the nearest one-thousandth of an inch. In Fig. 7 the caliper is shown in use for determining the bottom diameter of a gear. The jaws of the tool are beveled down to a thickness of only 1/32 in. which permits their insertion in locations where a thick blade could not be used.

### Taking Dimensions

Methods of taking longitudinal dimensions from objects will now be considered. These will be discussed under two general headings, (1) small objects, and (2) lay-outs. It is impossible to describe every case which may be met in practice. The more common ones will, however, be treated and from a consideration of these the reader should be able to attack effectively any problem likely to be encountered.

In measuring longitudinal dimensions with a steel scale the general principles delineated in Fig. 8 are followed. Thus, it is usually necessary to first place the end of the object, E, against some plane surface, P, preferably a surface plate. Then the scale, R, is laid along the object with one of its ends, F, bearing against the plate. The dimensions are then read from the scale and plotted on the sketch. Fig. 9 shows the dimensions from the cylinder O of Fig. 8 plotted on squared paper. The procedure above outlined is necessary because the ends of objects—often when they are new and more often when they are worn—are rounded. Hence, unless the end is butted against a surface plate while obtaining a measurement, the observations are liable to be inaccurate. Fig. 10, reproduced from a photograph, illustrates the application of the method just described in obtaining dimensions from a bearing shell.

Occasionally the contour of an object is such (Fig. 12) that measurements may be taken along the surface of the object from one plane to another without its being necessary to use a surface plate.

To project the planes of intermediate

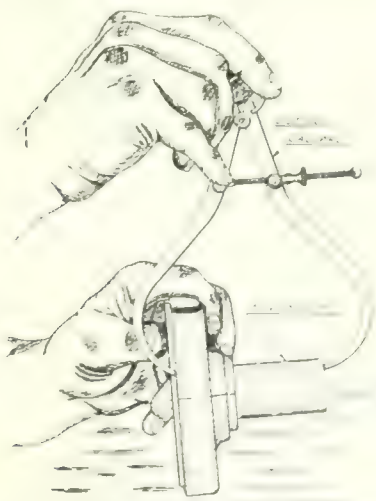


FIG. 12. MEASURING AN OVERALL DIMENSION WITH THE CALIPERS.

transverse surfaces to the measuring scale another smaller scale must be used. For example, in Fig. 8 the plane MN is projected up to the scale R with a smaller scale S, whereby it may be recorded that the distance of the plane MN from E is equal to the distance FA or 1½ in. An example showing the use of two scales to obtain the width of the face of a step on a step pulley is given in Fig. 11.

Calipers are sometimes used for measuring lengths (Fig. 13). With certain forms it is difficult or impossible to meas-

FIG. 14. DETERMINING OUTSIDE DIMENSIONS, FOUND WITH OUTSIDE CALIPERS.

ure the length directly with a scale, but with the outside calipers it may be feasible to do it. In such cases, the instrument is first adjusted to the length of the object as diagrammed in Fig. 13. Then the measurement required—the distance between the caliper tips—is

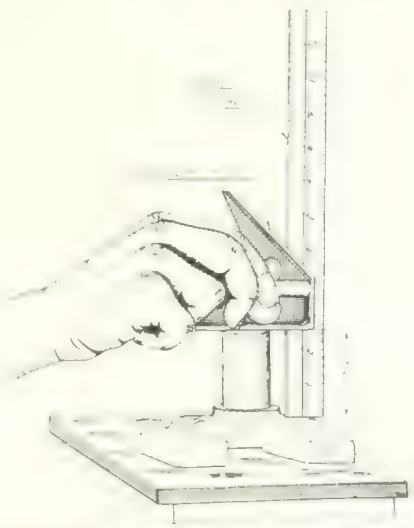


FIG. 13. FINDING AN OVERALL DIMENSION WITH THE REGULAR HEAD AND BLADE OF A COMBINATION SQUARE.

taken from the scale, as shown in Fig. 14. The tip of one of the caliper legs is held with the thumb and fingers in such a way that it bears against the end of the scale. Under the other tip the required dimension is read.

## USE OF ELECTRICITY FOR WELDING

IN spot-welding the material is placed between copper diepoints supported on the ends of two arms, and the points are brought firmly together on the metal by the use of either foot or motive power. The current is then turned on. Copper being a good conductor, provides an easy path for the flow of the current, which, however, must pass through the metal to be welded to complete the circuit. This metal is a poor conductor, and in attempting to carry the large volume of current becomes heated, and when heated to a sufficient degree, pressure is applied either by hand, foot or automatically, and the weld completed.

In case of automatic control, the current is turned on and off and the necessary welding pressure automatically applied by the controlling mechanism, driven preferably by a variable-speed motor. In this process the nicety of electric control is completely demonstrated. The current is applied to a certain definite spot only, and in just the quantity and for the length of time desired. On account of the intense heat and the rapidity with which it can be generated, several thousand welds per hour can be made in small, light stock, but the number for the heavier and more bulky stock is more limited on account of the time taken to adjust it in the machine and additional time necessary to complete the weld.

### Butt-Welding

Butt-welding is very similar to spot-welding, except that the ends of the metal are brought in contact. This junction offering the greatest resistance to path of the current, the abutting ends instantly begin to heat. The hotter the metal the greater the resistance becomes, with the result that the heat spreads to the adjacent parts until a uniform heat is obtained, at which time lateral pressure is applied and the weld completed.

Owing to the difference in cross-section of the metal at the junction in tee-welding, it is necessary to heat the larger piece to a bright red and then bring the other to the pre-heated larger piece and again turn on the current. Otherwise the piece of smaller cross-section would burn before the welding heat of the larger could be obtained.—Society for Electrical Development Bulletin.

## BALL BEARING MANUFACTURE IN SWEDEN

The British "Board of Trade Journal" states that a large company, which was formed in Sweden last October for the purpose of manufacturing ball bearings, has now started work, and will be in a position to make about 800 different kinds of ball bearings. The ball bearings manufactured by the company are of a special type, their essential feature being a pecking device whereby the bearings are made imperviable to dust, dirt, water, etc. They are thus particularly well adapted for use in vehicles and agricultural machinery. It is stated that the ball bearings for vehicles made by the company can be sold at a price which will bring them within the reach of farmers in general.

**Coal for Canada.**—Arrangements to ship 28,000,000 tons of coal to Northwestern States and portions of Canada via the Great Lakes were made by the Washington Fuel and Railway Administrations. Approximately four million tons of this quantity will go to Canada.

# FROM THE MEN WHO PRODUCE

Methods, Machining Devices, Systems and Suggestions From Shop And Drafting Room

## FIXTURE FOR STAMPING BASE OF SHELLS

By P. Washington

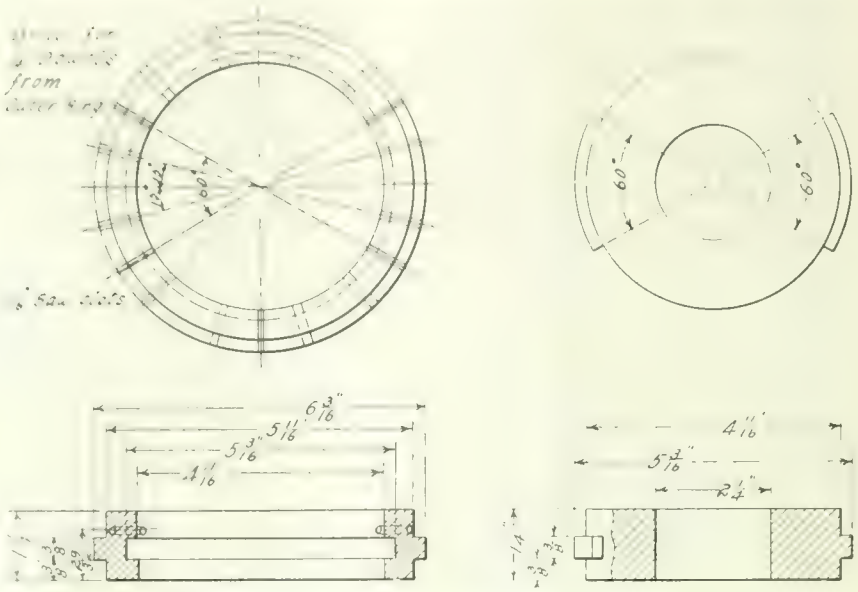
DIFFICULTY [illegible] in stamping the [illegible] on the base end of the shell.

A number of special power driven machines have been made with a cam action [illegible] to impress the stamping by means of a die. Owing to the excessive [illegible] on the machine and the difficulty experienced in holding the shell against the die such machines did not [illegible]

Some manufacturers performed this particular operation by placing a die plate over the base of the shell and dropping a heavy weight on it. This machine is so constructed that the weight is lifted by air pressure and guided by two steel rods. This device is not adaptable to rapid production and the stamps used in the die must be replaced continually.

The accompanying cut shows a handy, cheap and very efficient device for this operation, it has been used for the past three years continually in the successful stamping of various sized shells, one fixture being capable of stamping from 900 to 1,000 shells per day.

The assembly drawing shows the outer ring, which is clamped over the base of the shell by means of the two hand screws, the distance pieces which help hold the fixture together and the centre-piece are also shown.

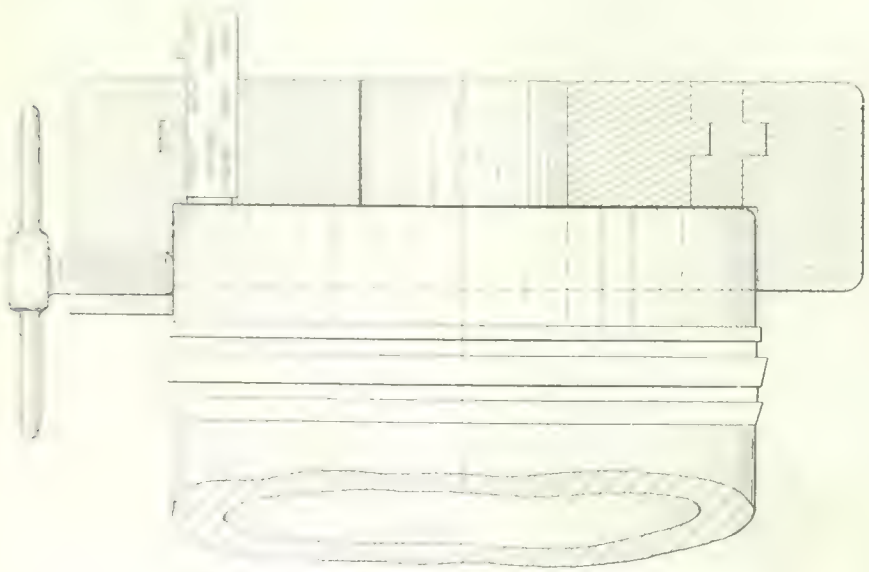



DETAILS OF FIXTURE USED IN STAMPING

Rings from which spacers (blanks to insure proper spacing of the stamps) are made are shown in detail. The detail drawings of the outer ring, centre piece, hand screw and dowel pin will enable the reader to fully understand the construction of this simple device. The blanks from which the stamps are cut are also shown in detail. These rings were turned up on a lathe, cut to the desired width and then sent out to a concern which makes a specialty of cutting steel stamps.

The length and width of the ring for distance pieces, also the spacers as well as the stamps will of course depend upon the actual stamping required, but this type of fixture can be successfully applied to any shell requiring stamping upon its base.

The shell desired to be stamped is rolled along the bench into a cradle (made of hard wood) with its base pointing upwards at an angle of about 30 degs. from the horizontal, its nose resting on a piece of heavy copper plate. The fixture is then clamped over the base of the shell and by the use of a copper hammer the impression made. By looking at the detail drawing of the stamps the protuberance at the upper end which prevents the stamp from falling out of the fixture will be noticed. A little practice will enable the operator to secure results entirely satisfactory to the government inspectors.

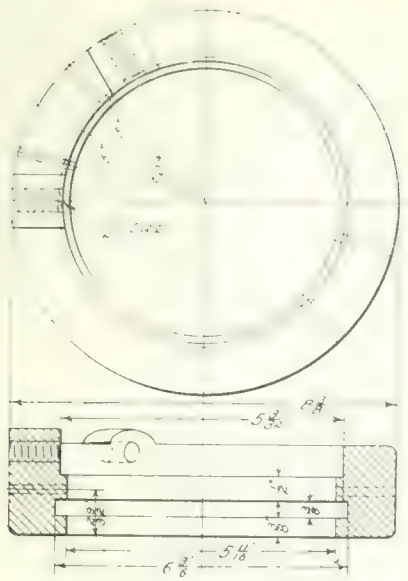


FIXTURE FOR STAMPING THE BASE OF SHELLS.

## JIG WORK ON A GUN PART

By H. Middleton

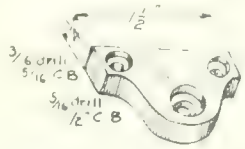
THE steel piece shown in the sketch is a gun part required in quantities. There are two sizes of holes and two counterbores. Before the war this had been done in four operations, but the speed-



DETAIL OF CLAMPING RING.

ing up process developed the arrangement shown by the photograph.

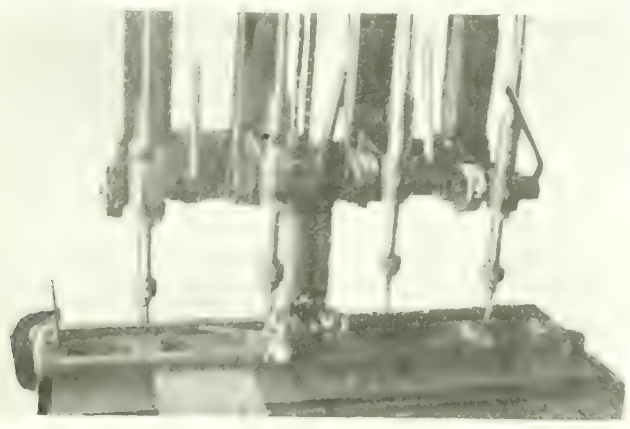
A four-spindle drill press was put on the job with a new jig and the track arrangement seen in the foreground. The work pieces were held in the jig, one at a time, and clamped by the movement of the rod seen at the left and by the latch which is shown open and which also carries the bushings for drilling the three holes. A catch at the right side of the jig holds the latch



DETAIL OF GUN PART.

down. The jig is an easy sliding fit in the track and it is gibbed down. It is thus impossible for the driller to make any unnecessary movements (with loss of time) except to slide the jig along.

The large hole is drilled by the right hand spindle and the other two by the second one. Then the catch is pulled back and the latch raised, leaving the piece still clamped, ready to be counterbored. Counterbores are used in the two spindles to the left and stops govern the depth. This completes the piece at one setting and it is more accurate than before, besides being made in less than half the time. A brush is used to apply the lubricant; this was found by trial to be more satisfactory in this case than a pump system. The feed lever on the right hand spindle has been bent to bring it more within the driller's reach and with this he easily works at all four spindles without moving in his seat.



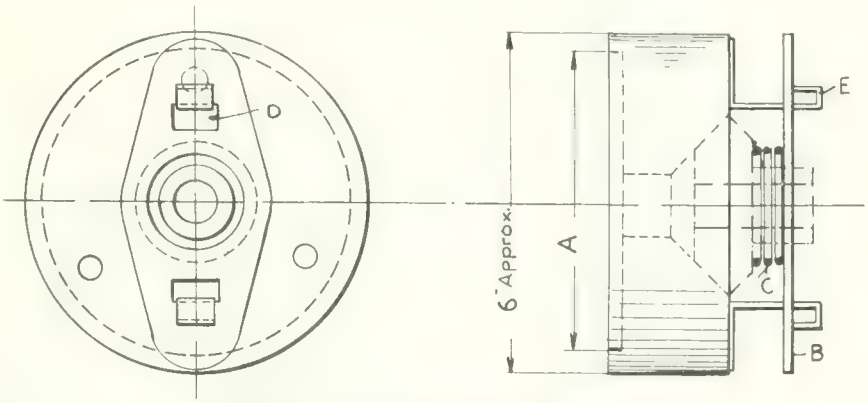
FOUR SPINDLE DRILL USED IN MAKING GUN PART.

## CHUCK FOR BEVEL GEARS

By Timesaver

SOME time ago our firm was up against the problem of turning out a large number of bevel gears for auto differential cases. Our greatest trouble was delivery, and as time was short we devised the following chuck for grinding the box. The chuck body was screwed to the chuck plate of the grinding machine and turned out at the front to suit the face angle of the wheel, the chuck plate itself being fitted to the recess A. The plate B, which is of sheet steel had the spring C soldered to it. The two side springs E, which are made of spring steel and fastened to the body, pass through the slots D in the plate B.

In operation, place the gear in the body of the chuck and push the plate B over the springs E and the bevel gear is then held in place between the chuck and plate B by the spring C. The gear is released by pushing the two springs E toward the centre and then pushing them through the slots D, thus allowing the plate B to come away; the gear is then free to be removed. This was found to give a very satisfactory result with speed and efficiency combined.




CHUCK FOR HOLDING BEVEL GEARS.

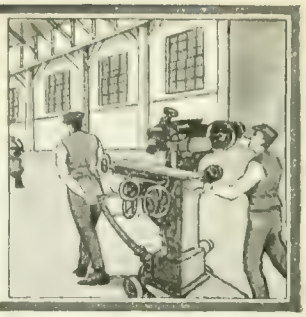
## WAYS AND TOOLS OF THE JOB SHOP

By H. Middleton

THE shop that does repair work and jobbing is the parallel to the general practitioner in the medical profession—it takes everything that comes its way and is expected to be expert and capable no matter how hard the problem and how different from the average that thing may be. It is this sort of experience that develops thinking powers and ingenuity that makes the job shop an interesting place to work in because of the variety, that makes the apprentice trained in the shop the good all around man so scarce these days. Incidentally, like the country doctor, the shop gets little credit for overcoming the handicap of inadequate tool equipment for the widest range of work and turning out jobs in a hurry without previous notice for preparation. Many job shops now take on manufacturing and tool work which gives them a chance to call themselves by the more modern and stylish name of "'contract shops"—some very small shops are self-styled as such and never make an estimate on a single piece of work, but who shall deny them the right in these days when efficiency and labor turnover are flung right and left as substitutes for shorter and simpler terms?

ALL is science if we but realize it. Nature herself recognizes only positive, working laws. Some of these laws we have mastered, some we have not, some we shall never master. But the little old laws governing my actions and your actions under certain conditions are known to some few intelligences. Let us try to make the knowledge of these few intellects the knowledge of all.—Horton.

# DEVELOPMENTS IN SHOP EQUIPMENT



*Makers of equipment and fixtures for use in machine shop and metal working plants should submit descriptions and illustrations to Editorial Department for review in this section.*

## NEW HAND AND POWER FEED MILLING MACHINE

A HAND and power feed milling machine recently placed on the market by the Davenport Mfg. Co. embodies several features of merit.

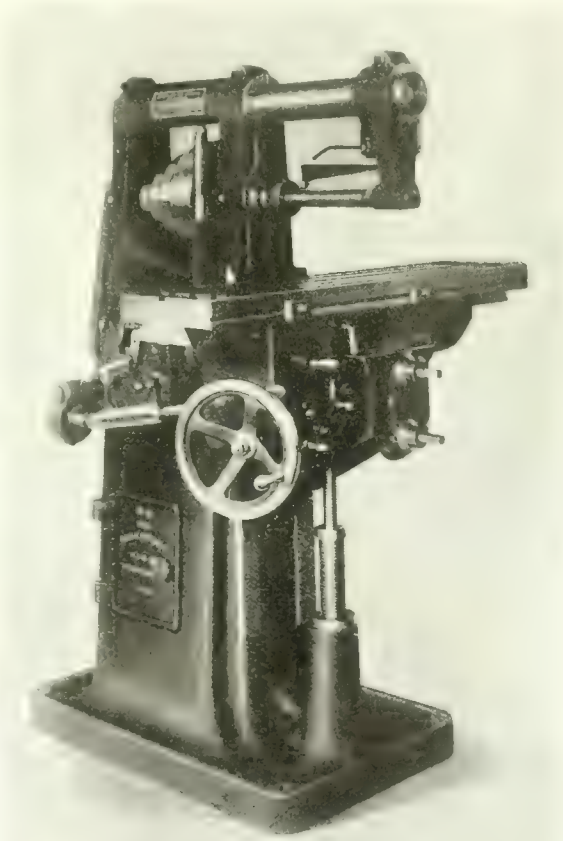
The hand feed to table is obtained either through hand lever, which gives rapid movement of table, one full movement of lever moves table five inches, or through a hand wheel, which gives a slower and more sensitive feed; the table moves ¼ in. for each revolution of hand wheel. The hand lever is made exceptionally long, and may be set at any point most convenient to operator, or may be disengaged entirely by a spring plunger. The hand wheel is located at an angle with the apron, thus making it very convenient for the operator.

The power feed to the table is obtained through a chain-driven feed box, giving six changes of feed. The feed change mechanism is contained in a single unit, assembled complete, and placed in the column, so that it becomes an integral part of the machine. It is located high above the floor which adds greatly to its handiness. All feed changes are made by two levers, and feed may be changed at any time, even while machine is operating under heavy cut. Feed reverse is obtained through push rod on feed box. All parts of the feed change mechanism are oiled from one large oil pocket easily filled through opening in column.

The feed trips have been designed with special attention towards the quick operation of the machine and are exceedingly sensitive. The automatic feed trips may be set to trip the feed at any point of table motion and to leave either the hand lever or the hand wheel connected to table motion as desired.

The oiling of the spindle is accomplished through wicks, which are supplied with oil from annular oil pockets cast around the spindle bearings. Glass indicators show the level of the oil in these pockets at all times.

The feed screws for the transverse and vertical movements are fitted with adjustable graduated dials for gauging the depth of cut. The elevating screw is made telescopic, thus doing away with the necessity of cutting a hole through the floor. Ball thrust bearings at its top make the vertical movement of the table very sensitive to the touch.



HAND AND POWER FEED MILLING MACHINE

## POWER DRIVEN HYDRAULIC STUMPING MACHINE

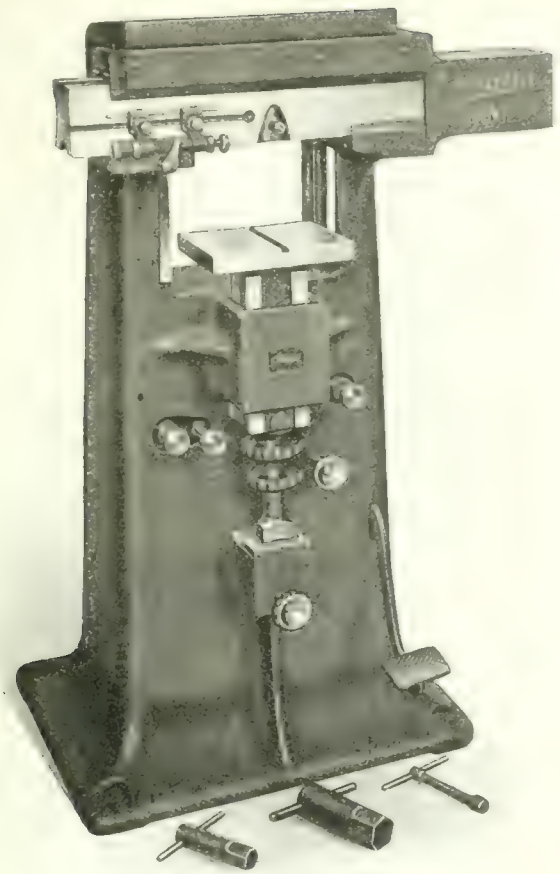
The Martin Machine Company, Greenfield, Mass., have placed a hydraulic marking machine on the market, which offers several interesting features of design.

An important feature in the design of this machine is its ability to mark even and clear impressions irrespective of the uneven working surface of the article being marked—that is, the marking pressure varies with the resistance encountered by the die in impressing the lettering.

This is effected through the compounding system inside the column of the machine, pressure beneath the work-table being automatically increased when the action of the slide in forcing die across the work becomes harder. Thus, should the pressure required for marking suddenly change during the stroke, the result would be to automatically increase or decrease the hydraulic pressure under the work-table and supply an amount of pressure to give an even impression, irrespective of the amount of lettering on the die and the unevenness of the surface being marked.

Power is received on driving pulley on rear of machine, and operates a rotary pump for the purpose of operating the hydraulic system. By means of this pump the oil pressure is maintained, and this pressure operates both the vertical table that raises the work to the marking dies and also the horizontal die-holding slide. In operation, pressure upon the foot treadle causes oil pressure to raise the work-holding table to operating point, and when this point has been reached the oil pressure also commences to act upon the slide, and then traverses the die across the work to be marked. As soon as the die has completed its marking an adjustable stop on the slide trips the reverse lever, which operates valve, releasing pressure that has moved slide forward and allowing the oil pressure to return the slide to the starting point. At the same time oil pressure beneath the work-table is immediately released and table drops back ready for the removal of the work.

The machine will mark either cylindrical or flat work, and by using special fixtures irregular work may be handled.



HYDRAULIC MARKING MACHINE.

MARKING HAMMERS BY MEANS OF THE HYDRAULIC MARKING MACHINE

In marking flat work, roll dies are used that turn as they are rolled across the article being marked. In marking round work, a flat die is used and work rolls as the die is traversed across.

All adjustments provided are readily accessible for increasing or decreasing the pressure on table, speed of slide, etc. Capacity is from 1 to 10 lines of ⅛ inch letters; maximum length of lines, 7 inches.

A feature of the machine is its simplicity and practically automatic operation, requiring almost no adjustments on the part of the operator. It may just as effectively be operated by girls and unskilled labor. For continuous marking, the foot treadle may be depressed and caused to catch, allowing the operator to devote his or her entire time to inserting and removing the work. In this connection the machine may be set at any desired speed and run continuously just fast enough to allow the work to be removed and inserted between strokes. The amount of production, therefore, depends wholly on the ability of the operator to handle the work with rapidity.

## DEMAGNETIZER

A valuable adjunct for use with magnetic chucks and holding devices is illustrated herewith. In grinding operations magnetic chucks would be more frequently used than at present if the demagnetization of the work pieces could be done more readily and efficiently. The Smith demagnetizer manufactured by the W. F. Davis Machine Tool Co., New York, demagnetizes any work instantly and completely. The speed with which the operation is carried on is limited only by the operator's ability to feed the material, and, as may be gathered from the illustration, the work passes through the demagnetizer to the hopper or box below. The cost of operation is extremely low, and little or no maintenance is necessary. The apparatus is made in any size corresponding to the size of work.

DEMAGNETIZER IN OPERATION

## THE METHANEPHONE

A YOUNG Welsh professor in London has recently perfected an invention with which he hopes to considerably relieve the mine worker from the fear of methane gas. The little instrument has been appropriately named the methanephone.

It consists of a small wooden box about nine inches in height, containing an electric battery. At the top of the box is a fuse head cap, upon which a tiny light always glows from the battery beneath. As soon as a certain low percentage of methane gas enters the working its presence causes a tiny explosion in the fuse head, the explosion in its turn melting a fine wire filament, which starts a bell to ring continuously. The men in the vicinity are thus notified that gas is in the working and can take the necessary precautions.

The leaders of the Miners' Federation of Great Britain have witnessed effective tests of the methanephone.

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J. M. WILSON, Editor. A. R. KENNEDY, Asst. Editor.

W. H. SUTHERLAND

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## SHRAPNEL DEMAND IS URGENT

IT is understood that the renewed demand for shrapnel will be more than sufficient to tax the resources of the Dominion to the utmost. Some time ago when British types were restricted to 4.5 and 6 in., most plants were changed to suit or else disposed of otherwise. Following this came numerous American contracts which absorbed much capacity as it became available.

The supply of shrapnel now required will necessitate renewed effort by many shell factories, and while past experience will enable preparations to be made rapidly and effectively, the changed situation with regard to labor and material will militate against a repetition of former spectacular accomplishments.

Patriotic impulses prompted many experienced mechanics above military age to enlist as mechanics, etc., and recent calls have taken numerous young men of high productive ability, whose places cannot be adequately filled by women. New firms starting up now will therefore be doubly handicapped—lack of experienced toolmakers for starting up and maintenance of the special machines for women workers, or, on the other hand, experienced mechanics to make the best use of such standard machines as may be immediately available.

Recent advances in machine shop practice and materials can be counted on to balance much of these possible handicaps and close study of war time developments will well repay those who may for the first time be contemplating [illegible].

## PRESENT EMERGENCY INSURES FUTURE ECONOMY

IT is a foregone conclusion that past practice in the matter of shipbuilding will not be allowed to return and dominate output as it has in the past.

The recent statement of Secretary Daniels regarding the expedited building of destroyers in U. S. yards reveals such a tremendous discrepancy between possibilities and accomplishments that it is incredible that any sane man [illegible] in the quickest way a return to former conditions.

It would seem that organization is the keynote to the whole situation. Because destroyers were wanted in a hurry, the various officials and yards concerned cooperated to an extent not hitherto equalled, with the result that the actual time from the laying of the keel to the launching was 17½ days. The conditions were such, however, that the time referred to is nearly all assembling time as much of the structural work was prepared in advance ready for erection and assembling before the keel was laid; likewise bulkheads, deckhouses, bridge structure and a section of the keel were riveted up ready for assembling in place on the ways.

With suitable preparation almost any desired record might be put up. What really counts is the actual total time on all the material in a ship, not just in putting them together.

As a matter of production management the instance is illuminating, especially when compared with results of twenty years ago when the average time from the laying of the keel to launching was almost two years. It is against all principles of economy to tie up a building slip with its equipment for twenty-four months when less than three weeks suffices. Probably much of the work now done in shops ashore was formerly carried aboard and fabricated in detail instead of being manufactured in quantities and assembled en masse.

Shipbuilders who look forward to remaining on the active list will find much profitable study in such performances. Quick delivery will always be a factor of importance in securing orders, and if this feature is accompanied by largely reduced overhead charges per hull, the present emergency will alone be memorable for having effected such changes in recognized practice.

## NEW WORLD VALUE OF MANUAL WORK

THERE used to be a current phrase which, in the new scale of transposed values, has fallen into desuetude; the term was contemptuous and its use proof of a lack of understanding on the part of the user—the phrase was, common working man.

The appellation was given indifferently to all manual workers by those unable to discriminate, and was justifiably resented by some of the most intelligent members of society.

Not so long ago it appeared that the line of demarcation was drawn between different classes solely on the ground of manual work irrespective of quality. If the war has done nothing else, it has educated the general public so that no such misconception can become current hereafter.

The truth is that the phrase separated producer from non-producer—the maker from the man on the make—for while brains can employ numberless indirect tools it is the manual worker who after all carries into being the work of designer and expert, to say nothing of the commerce founded on his toil.

The majority of men are common in that they are human, and it is the lot of most to perform common tasks—the word does not imply inferiority but rather equality. Moreover, there are only two classes in the community, those who work and those who idle, and the man who works keeps all. Man is a term of dignity and to claim the title involves much more than most critics allow. To be the man for any particular purpose is a distinction, so that the term with its implied reproach has a validity it were well to claim, not avoid.

It is upon the broad back of the common working man, that industry and national well-being rest. The manual worker is the most indispensable in the whole community, in mechanism is certainly at least the equal of most. For the combination and interplay of muscle and mind demanded by skilled manual work makes for a satisfying life, it involves both bodily and mental health and contributes directly to both. After all perhaps to be healthily tired enough to sleep soundly is among the most welcome of gifts and in this the mechanic having exercise of brain and body has a pull over many more envied men.

---

IF the success of industrial efforts in the future is to rest on the basis of "one man—one job," then civilization may well be considered to be a partial failure. The leaders of industry, and the men in the upper ranks—who have not specialized too narrowly—are able to work for longer hours and do far more work, precisely because of the interest and variety of their work. "Interest-power," which is the most important factor in efficiency is here at its maximum.

# BUSINESS GROWS AS RESULT OF HARD WORK

**Windsor Machine & Tool Works Developing on Solid Lines of Good Business**

THE careers of A. Morrell and L. Wilkie, the two partners in the Windsor Machine & Tool Co., Windsor, Ont., have been such as to ultimately fit them for the work upon which they are now engaged. Adolph Morrell is a few years senior to Lorne Wilkie but both take an equal interest and responsibility in the conduct of the business. They claim that they take it in turns to manage the two sides of the business, one looking after the commercial end and the other the shop end of the business alternately. They change about each year and are thus able to keep in touch with both aspects of the business. At the same time if the truth were told Mr. Morrell would probably admit that he preferred being in the shop and his partner in the office.

L. WILKIE

Adolph Morrell was born near Montreal in 1878; his father at the time was working for the contractors who were constructing a section of the Lachine Canal. In the same year the Morrell family moved to Detroit, Adolph being at the time about six months old. In 1884 his parents returned to Canada and settled down in Windsor, Ont. When Adolph's school days were over he became an apprentice, finishing this period with the Canadian Typograph Co., of Windsor. During the following ten or twelve years the subject of the sketch worked in various shops in the district, one of these being the Kent Engine Works. During this time Mr. Morrell, being ambitious, devoted all his time to acquiring a thorough knowledge of his trade and developed into an expert tool maker. In 1909 Mr. Morrell started on his own account in a small way, making dies, etc., in fact this may be said to have been the real start, although the following year, 1910, the partnership with Mr. Wilkie was formed and the Windsor Machine & Tool Works inaugurated.

A. MORRELL

Hard work combined with a natural aptitude for mechanics has been responsible for much of Mr. Morrell's success in life. Mr. Morrell was not born with the proverbial silver spoon in his mouth, so it has been a case of hard plugging. In this connection he has a word of timely advice to young mechanics for having been through the mill he knows what the younger generation are up against. Mr. Morrell believes in boys and young men doing general work rather than specializing, by doing so they get a more thorough training and a broader knowledge of their work. He also believes in hard work, application and study, a combination which, if intelligently applied, cannot help but turn out a good mechanic.

Lorne Wilkie, Mr. Morrell's partner in the Windsor Machine & Tool Works, was born on July 10, 1891, in Stormount county near Morrisburg, Ont. At the age of ten his mother died, leaving a family of seven others. About a year later the family moved to Windsor and have lived there ever since. Mr. Wilkie finished what education he had in the Windsor Public schools, and being also mechanically inclined went to work for the Evans & Dodge Bicycle Company in Windsor. He later worked for the Penberthy Injector Company as a monitor hand, and quit a job paying a dollar and a half a day to go to work for the Olds Motor Company in Detroit to learn the machinist's trade at sixty cents per day, a step which is very hard to convince the average young man to-day as being advisable. The Olds Motor Works burned down about a year later and from there Mr. Wilkie finished his time in approximately forty-two other shops in Detroit, which fitted him to a nicety to the new environment he found himself in when the partnership was formed and the Windsor Machine & Tool Works became a reality. Mr. Wilkie was a young man when he joined Mr. Morrell in 1910. Both partners have similar views on engineering or mechanical matters, and by applying their ideas have been able to build up a nice business from a very small beginning. A "worn-out chicken coop," they say was the title given to their shop by the inhabitants of Windsor in the early days. Needless to say there is no indication now that their shop was used to such purpose. Both Mr. Morrell and Mr. Wilkie are very enthusiastic about their business and future prospects.

They believe that production in the future will be more on a standardized basis, which will necessitate the use of gauges and other instruments of precision. By this means, not only is greater accuracy obtained, but output is increased with lower operating costs. These conditions will tend to greater accuracy in workmanship.

## Speaking of Picnics

Ah! a picnic is a joyous thing—it surely is a lark to leave the noisy city streets and scamper in the park. You take a basket on your arm, of course it's filled with grub—to go to such a thing without would stamp you as a dub.

Then someone rings a bell and says, "We're going to have the races," and hairpins decorate the turf, with corset stays and laces.

The fat man hides behind a stump, not anxious for the fray, but sure as guns he hears the cry, "The fat men come this way!"

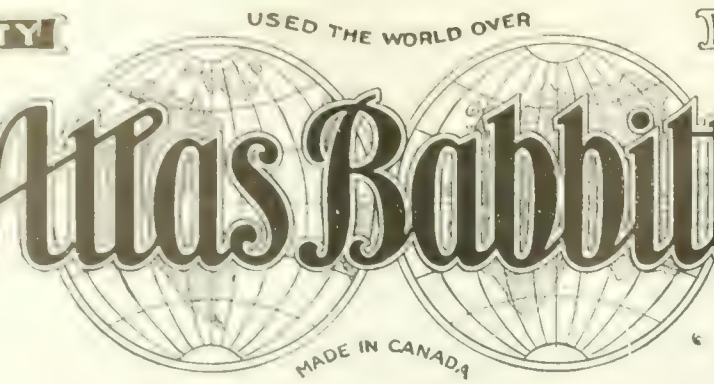
He waddles down for fifty yards as graceful as a cow, he's squeakin' badly at the joints, the sweat drips from his brow.

Then comes the feed, and on this spread the whole crew make a raid, and some poor simp is called upon to dish the lemonade. They shoo the flies from off the cake, chase spiders from the cheese, while forty different kinds of bugs look on from stumps and trees.

There's sure to be among the crowds some killing, nifty guy, who plants his white duck trousers on a juicy cherry pie.

They eat an awful lot of stuff, these joyful picnic folks, and loud hee-haws are sure to greet the stalest, punkest jokes. At last they hook up fists and sing a verse of Auld Lang Syne, and every Ananias lisps, "We've had a dandy time."—A.R.K.

UNIFORMITY

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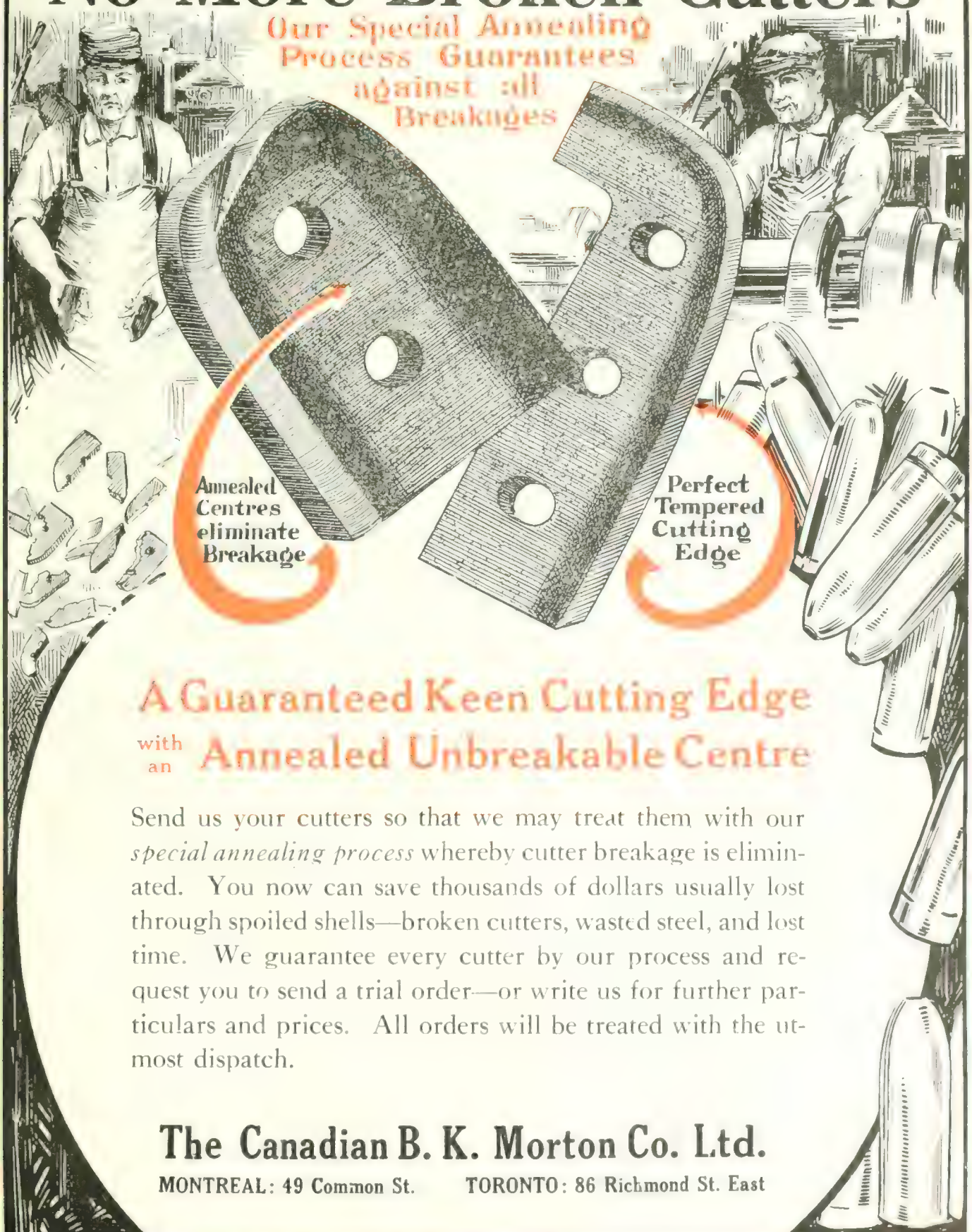


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# MARKET DEVELOPMENTS

## Price Fixing is Taking On Form Now

### Forms Sent Out to Jobbers Contain Reference to the Selling Price of the Commodity—Single Purpose Machinery Being Purchased For Use in the Shell Shops —Supplies Are in Good Demand

PRODUCTION of iron and steel keeps up remarkably well at the great producing points in United States. When iron and steel are mentioned coke is included as a matter of fact. The warm months which are so hard on men in furnace work or rolling mills have not yet arrived, and output gains to that extent. The whole industry in United States is running well up to 95 per cent. of possible production. It is quite evident that the Canadian War Board is taking definite steps toward the fixing or controlling of prices to be paid for steel and iron products. The entire output in United States has been subjected to such a ruling for many months, and it was intimated in these columns some weeks ago that the matter was under advisement at Ottawa. Forms which are being sent out now for use in releasing material from warehouses ask the jobbers to state the price per pound at which the sale was made. There is, as would be expected, not a little opposition to this move. The jobbers claim that the government want them to do business on about a five per cent. margin, and it is claimed that they cannot do this. They urge that the control of prices should go back further to the mills. As a matter of fact Canadian warehouse men will have to more and more depend on the output of the mills in Eastern Canada, as warehousing orders cannot be passed on to the mills in United States.

Several Canadian business men are in Washington this week in connection with the completion of orders for the American government. Plants are being fitted out at this late hour in the shell-making industry for the execution of large 155-mm. orders, and single purpose machinery is being purchased in large blocks for the purpose.

Orders for boiler tubes for repair work to heating plants in large schools and other institutions that close during the summer are reaching the jobbers. Fortunately in most cases the size called for is three-inch and over, but even at that there is hard work in finding material to supply the need. The tube situation does not improve. As a matter of fact it is much worse than it has been for months back, especially for the two-inch size.

Foundry owners are scouring the market for pig iron. They will go long distances to secure any odd lots, and the odd lots are few and far between and usually very small. There is in consequence a very keen demand for good scrap, but unfortunately this is hooked up with a very poor supply. Foundrymen prefer good machinery scrap to anything in the line of railway stock, but it is very hard to secure in appreciable quantities.

New munitions orders, and the element of haste that enters into them all keeps up a steady flow of business for the dealers in supplies, especially in high speed lines. There is a tendency on the part of dealers to carry more stock as it is found that orders very often go to the point of quickest delivery. Price changes have been almost entirely absent during the week.

## MONTREAL MUNITIONS SHOPS WILL TRY TO HANDLE ALL ORDERS OFFERING

Special to CANADIAN MACHINERY.

MONTREAL, June 26.—The announcement by the Imperial Munitions Board to the effect that the output of the 18-pdr. shell would be immediately doubled at the request of the British Ministry of Munitions has been the feature of the week, as the orders of a few months ago were that the work on this particular shell would be greatly reduced. The reason of this change of attitude is not quite clear, but the direct bearing on industrial activity has been to stimulate the action of shell manufacturers to renewed efforts in production. The advent of the American orders into Canada makes it a little difficult to immediately accede to the new demands, as many have turned their old equipment over to the new duties, so that in order to return to former fields it will be necessary to instal additional equipment to handle the extra business. Many shell makers, however, are acceding to the wishes of the board, and it is anticipated that within a very short time the required output will be attained. To utilize every available transportation facility an order has recently been issued by the Canadian Railway War Board asking for the co-operation of manufacturers and shippers in seeing that all cars are loaded to their capacity. This is essential, as additional cars will be required in the near future to move the crops in the West. Machinery demand has increased following the revived activity in connection with shrapnel shells.

### Steel

Little more can be said at the present time than that the steel situation generally remains unchanged, with the pressure on the mills and furnaces as great as ever. Warehouse stocks are virtually at the disposal of the Government. A fair supply of steel for urgent purposes is coming through, but none can be sold to consumers without first receiving the approval of the governing board.

While no definite announcement has been made regarding the outcome of the recent negotiations in the States relative to a new price on steel to meet the coming advance in freight rates, it is intimated that a readjustment will be made in connection with prices of ore and pig iron, but that the old prices will remain in effect on finished steel. An interesting situation has arisen over the supply of steel rails that are now lying on the Pacific Coast awaiting their disposal to the Russian Government, the initial pur-

chasers. The unsettled condition in that country makes it impossible to locate any authority with whom negotiations can be started, but certain Canadian interests are endeavoring to secure purchase of the material which is sufficient to lay about 150 miles of track. The local situation is much the same, with dealers reporting a market that is virtually controlled by the dictates of the Government and the needs of the war. A change has been made in the base price of iron and steel bars here, this being represented by a decline of approximately ¾c per lb. Iron bars are now quoted at 4.55, steel bars at 4.80 and reinforced bars at 4.50. Band steel, No. 10 gauge, is now listed at 4.80. One dealer here reports that the quotation on heads or circular plates is 25 per cent. above the base price of $10 per hundred, and intimates that the demand for such material is very light. The quotation on plates formerly noted as ¼ inch to ½ inch is now ¼ inch up, as this price relates to all thickness of ordinary plate.

**Metals Quiet, But Firmer**

The general market is one of strength, but active buying is not a feature. The steadier position of certain of the metals is more as a result of recent developments and the uncertainty of the future trend than any actual change in current conditions. Copper is strong on a steady demand. Tin is losing its nervous tone, but continues in strength. Labor conditions may place spelter on a higher basis. Lead is apparently scarce, and dealers have advanced prices. Antimony and aluminum are steady and firm.

**Copper.**—The trade, or some portions of it, are still looking forward to a further consideration of the regulation price on copper. The fact that the president has not as yet confirmed the renewal of the prevailing price for a further period, and also to the coming advance in the transportation charges, which will add to the producing costs of the metal, has been taken as a possible indication that the price may yet be advanced to cover the higher expenses entailed by recent developments. Dealers here report a steady demand for metal, and some have the impression that an upward revision in the market price is not unlikely. Present quotations remain firm at 29c and 30c per lb.

**Tin.**—The situation in tin is assuming a more encouraging aspect, although the visible supply is still short of the trade requirements, a factor that has the tendency to maintain prices at a high level. The Canadian market is still influenced by the inability to secure sufficient metal to satisfy the needs of the consumers, and, therefore, dealers are maintaining the high figures that have prevailed for the past several weeks. The situation in the States has taken on an easier tone, but little change is noted in the nominal quotations that are still a feature. The market here is not so acute, but the available metal is not ample to meet the demands of all comers. Dealers are still quoting $1.25 per lb., but state that the undertone is weaker.

The further placing of American war orders in Canada and the additional requirements that will be entailed by the renewed activity in connection with shrapnel shells has added to the pressure under which machine tool builders are operating at present. Owing to the fact that many shell makers that were working on the 18-pdr. have turned over their equipment to the production of American ammunition the supply of available tools for the increased demands for the British shell is not sufficient to meet the requirements, so that additional machines in some cases will need to be installed. Dealers report a good inquiry for the smaller sizes of special shell lathes and also for some of the heavier sizes. Shipyards are still good buyers, although their requirements are showing a falling off. The brisk inquiry and sales of small general supplies indicate the continued activity in all lines of manufacturing enterprise. Dealers report more regular delivery of material and machines from the States, but in some instances the delay is such as to cause considerable inconvenience to purchasers. The dealers here are uncertain regarding the conditions that are likely to develop after the increased freight rates go into effect, but would not be surprised if present prices on machinery and accessories were advanced during the next few weeks.

Despite the activity that continues throughout all lines of the iron and steel industry the general business in the old material market is comparatively quiet, not that the demand for scrap has fallen off, but the dealers are not receiving the volume of the business that marked the earlier activity in this direction. Much of the steel scrap that was previously placed on the open market and handled by the dealers is now disposed of between the producer and the consumer direct, facilities being provided whereby material can be again utilized without passing into the hands of the dealer. Dealers are still doing a good business in old machinery scrap, as many foundries are still unable to obtain sufficient pig to meet their requirements. Trading in the non-ferrous scraps is quite active, and quotations would indicate that the undertone is one of strength; this is particularly pronounced in relation to old lead and zinc scrap. The only price change to report is on that of zinc, this having advanced ½c to 6½c per lb.

## POINTS IN WEEK'S MARKETING NOTES

**Pig iron production is right up now at United States points with the output of coke. More furnaces could be blown in were there a supply of coke.**

**United States firms were counting on being able to buy up munitions plants in Canada, but can't do it because Canadian plants have taken on new orders.**

**One order for 300,000 kegs of wire nails for delivery in France has been placed. This is the largest single order ever placed for wire nails, whether for military or other purposes.**

**War steel requirements continue to grow at a rate greatly in excess of the ability of the Government to handle them.**

**U. S. steel mills find that under Government control they can "blame the Government" when orders for steel are turned down as non-essential to war winning.**

**Single purpose war machinery is still very much in demand, especially lathes for rough turning and boring.**

**Orders for tubes for repair work to Toronto school heating plants are being passed by War Board, although dealers find difficulty in filling them. Tubes are a scarce article.**

**Forms now used by the War Board for jobbers request the latter to state price per pound at which the sale was made. Jobbers are not satisfied with the arrangement as in force now.**

**The demand for pig iron is still far ahead of available supply, and firms continue to resort to larger mixtures of scrap.**

## A TIN MARKET THAT HAS VANISHED

Prohibition of the export of tin from Holland is now a fact, but the large stocks that were available earlier in the war have practically vanished, and the only tinfoil factory in Holland cannot execute orders because of the shortness of raw material. The price of tin today is nominally equal to £400 per ton. The production in the Dutch Indian Islands of Banca and Billiton shows a decrease, and the metal, instead of being sent to Holland for sale by public auction at Amsterdam or Rotterdam, as was done before the war, is now sold in the Dutch Indies. The Dutch government intends to abolish the auction sales in Holland altogether after the war, and to continue to sell its tin in Batavia, so that the tin market in Holland, which in any event was not of great importance, will cease to exist. . . . Tin is one of the few metals which almost entirely disappear in use, not one-twentieth part of the tin which is consumed being recovered in the form of old metal, and for that reason there is practically no market for scrap. Old tin jugs and statuettes, however, are being melted down now in Holland for solder, the present price of solder in the country being equal to from £12 10s. to £15 per cwt. Tin plates have practically disappeared from the market.

## PRICE FIXING IS BEING ATTEMPTED

New Forms Ask Jobbers to State Price at Which They Sell War Goods

CANADIAN MACHINERY

the new release sheets sent to the jobther problematical, and the ar- t would have to be rather in- rect, as the matter affects largely the product of mills outside this country.

up material to combat the short- steel is also in big demand, and equally small supply. There is a tendency to use large amounts of scrap—larger than usual, and this is keeping the market practically stripped of surplus.

off. There is a demand now for the single purpose machine tools the same as there was when the making of munitions was a new thing in this country. The dealers in supplies will no doubt feel the full effect of this a little later on when the plants are in actual operation.

Price changes are very few this week. Values for the most part are on a very high level just at the moment, and any advance that comes has to be well justified. It is predicted that there will be a general advance in the prices of all kinds of chains in the very near future. In fact it is doubtful if present quotations can really be counted upon as being the actual basis of selling.

### Regulating Prices

Advice from Ottawa to CANADIAN MACHINERY intimates that a new form has been issued by the War Trade Board called an "Application for Release From Stock." The questions on the form aae much the same as those that have been used for some time past, but they go further. They are as follows:

Material required and weight thereof.

Nature of contract for which materiai is needed, and by whom.

State whether for war work. If so, give the particulars.

Have you no stock on hand or substitute therefor?

State urgency.

State selling price per pound.

It is the last item that makes the difference between the former forms used and those now sent out. And it is right here that the indication comes that price-fixing is being more than merely considered at Ottawa. Just how it is going to work out depends on several things. Canadian warehouses cannot import now for stock, and as a result they are turning more and more to the mills of Nova Scotia for supplies. Jobbers were asked this morning for their opinion of the new form asking the selling price. There was not any anxiety to discuss it in detail, but opinions secured from other points make it clear that as a rule the jobbers are not satisfied with the new form. They claim that the regulations should go back to the mills. One dealer states that the Government expects them to do business on a basis of five per cent., which he says is a figure at which they could not keep going. There seems to be no doubt about it the jobbers will have to turn more than ever to the Canadian rollers for warehousing purposes, although the majority of their direct orders will by a large majority still be with the U. S. points.

### Orders Being Filled

Dealers are having some difficulty in filling orders for tubes. The situation does not improve—rather does it get worse every day. Orders that are receiving attention now are being farmed out between dealers in many cases, or where they have two agencies the tubes will be supplied fifty-fifty between the two. Several school orders are being placed for Toronto institutions, where repairs are carried on during the summer vacation. These are mostly for the three-inch variety, and have been attended to. "The tube situation," remarked a dealer this morning, "is getting very close to the stage where it is being peddled around."

Although no change is noted on today's lists, it is likely that another week will see an advance in the figures given for fire weld steel chain, BBB, BB or B, and there seems to be good reason for believing that the increase will be around the twenty per cent. mark. The chances are that electric weld will move up also.

### Scrap Metals

Dealers in scrap report no price changes, only a normal amount of business, with a keen demand for lines with which they are not heavily stocked. Foundrymen continue to visit the yards looking for good substitutes for pig, which is becoming increasingly short, with small prospects of much improvement right away. Foundrymen prefer machinery scrap to railroad stuff, as the latter is inclined to be much harder. Heavy melting steel is a scarce article, and very much in demand, but as is often the case, very little of it is to be had when the need is quite marked. Lead and spelter are firmer, but the movement is not of sufficient size yet to warrant a change in the listed prices.

### Machine Tools

The extent to which war work stuff figures in Canadian business can be judged from the fact that complete outfits of single purpose machinery are still being put up in Canadian cities to handle American orders. The Otis-Fensom have a satisfactory contract. They are using their Hamilton shop, where they previously handled 4.5 orders, but the equipment for the 155 mm. is entirely new. There are some few details to be worked out yet in connection with the order, but the main features are settled. It is understood that the first order will run the firm well on toward May of next year.

Supply dealers are handling a nice volume of trade. Prices have varied hardly at all. Screw plates are up ten per cent. on the list. The new munition orders keep up a steady flow of orders for dealers who are in a position to give reasonable deliveries. In fact in many cases the preference is for the man who stocks standard sizes for immediate delivery. There is not much improvement in the matter of securing delivery for Old Country high speed steel. The whole energy of the country is taxed to the limit on direct and serious war work, and although the high speed is an essential war product in this country, there are the added difficulties of rail and water transportation to contend with at present.

## THE LARGEST ORDER YET FOR WIRE NAILS

### Has Been Placed for Delivery in France During the Next Few Months

Special to CANADIAN MACHINERY.

NEW YORK, June 26.—Canadian manufacturers of projectiles have received additional contracts for shells from the United States Government. As a result of similar contracts previously placed, it is reported here that Lyall's Ltd., Montreal, has already begun the construction of a new plant and purchased equipment for the manufacture of 155 mm. shells. Carson Bros., also of Montreal, will build a new plant for the manufacture of the same size shells for the United States Government. Some makers of projectiles in the United States who expected to buy machine tools from Canadian shell makers will probably be disappointed because of the heavy demand for such machinery from Dominion plants.

The Midvale Steel & Ordnance Co. has issued a list for 120 large tools and 27 electric cranes for the manufacture of 16-inch howitzers for the new gun shop it is building at Nicetown, for the United States Government. The tools inquired for include lathes, planers, slotters, shapers, boring and turning mills, grinders and drills. The U. S. Steel Corporation has also put out tentative inquiries for machine tools to be installed in the Neville Island plant. The Corporation expects to manufacture 1,500 12-inch, 14, and 16-inch shells a day.

### Canadian Business

The U. S. Ammunition Co., Poughkeepsie, N.Y., which recently took over the Fiat automobile factory, is buying tools for the manufacture of 6-inch and 9.2-inch shells. This company is owned by Canadian capital and if tools cannot be purchased to advantage here, they will probably be brought from the Dominion. Other makers of guns and shells are buying tools, including the Bartlett Hayward Co. of Baltimore and the Grant Motor Car Corporation of Cleveland; the latter has purchased $200,000 worth of machinery.

### For Shipbuilding

Shipbuilders continue to place heavy orders for tools, cranes and other machinery and large contracts are still

# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

### PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 75 |
| Lake Superior, charcoal, Chicago. | 37 50 |
| Standard low phos., Philadelphia. | ..... |
| Bessemer, Pittsburgh | 37 25 |
| Basic, Valley furnace | 32 00 |

Government prices.

| | Montreal | Toronto |
|---|---|---|
| Hamilton | ..... | ..... |
| Victoria | ..... | 50 00 |

### FINISHED IRON AND STEEL

| Per lb. to Large Buyers. | Cents |
|---|---|
| Iron bars, base, Toronto | 5 25 |
| Steel bars, base, Toronto | 5 50 |
| Steel bars, 2 in. to 4 in base. | 6 00 |
| Steel bars, 4 in. and larger base. | 7 00 |
| Iron bars, base, Montreal | 4 55 |
| Steel bars, base, Montreal | 4 50 |
| Reinforcing bars, base | 4 50 |
| Steel hoops | 7 50 |
| Refined iron | 5 50 |
| Norway iron | 11 00 |
| Tire steel | 5 50 |
| Spring steel | 7 00 |
| Brand steel, No. 10 gauge, base | 4 80 |
| Chequered floor plate, 3-16 in. | 12 20 |
| Chequered floor plate, ¼ in. | 12 00 |
| Staybolt iron | 11 00 |
| Bessemer rails, heavy, at mill | ..... |
| Steel bars, Pittsburgh | *2 90 |
| Tank plates, Pittsburgh | *3 25 |
| Structural shapes, Pittsburgh | *3 00 |
| Steel hoops, Pittsburgh | *3 50 |

F.O.B., Toronto Warehouse

| | |
|---|---|
| Steel bars | 5 50 |
| Small shapes | 5 75 |

F.O.B. Chicago Warehouse

| | |
|---|---|
| Steel bars | 4 10 |
| Structural shapes | 4 20 |
| Plates | 4 45 |

*Government prices.

### FREIGHT RATES

Pittsburgh to Following Points

| | Per 100 lbs. C.L. | L.C.L. |
|---|---|---|
| Montreal | 23.1 | 31.5 |
| St. John, N.B. | 38.1 | 50.5 |
| Halifax | 39.1 | 51.5 |
| Toronto | 18.9 | 22.1 |
| Guelph | 18.9 | 22.1 |
| London | 18.9 | 22.1 |
| Windsor | 18.9 | 22.1 |
| Winnipeg | 64.9 | 85.1 |

### METALS

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $30 00 | $28 50 |
| Electro copper | 30 00 | 28 50 |
| Castings, copper | 29 00 | 28 00 |
| Tin | 125 00 | 125 00 |
| Spelter | 10 50 | 9 50 |
| Lead | 9 50 | 9 50 |
| Antimony | 15 50 | 16 00 |
| Aluminum | 50 00 | 50 00 |

Prices per 100 lbs.

### PLATES

| | Montreal | Toronto |
|---|---|---|
| Plates, ¼ up | $10 00 | $10 00 |
| Tank plates, 3-16 in. | 10 50 | 10 10 |

### WROUGHT PIPE

Effective Feb. 5, 1918.

Standard Buttweld

| | Per 100 feet Black | Galvanized |
|---|---|---|
| ⅛ in. | $ 6 00 | $ 8 00 |
| ¼ in. | 5 16 | 7 29 |
| ⅜ in. | 5 16 | 7 29 |
| ½ in. | 6 55 | 8 12 |
| ¾ in. | 8 28 | 10 41 |
| 1 in. | 12 24 | 15 39 |
| 1¼ in. | 16 56 | 20 82 |
| 1½ in. | 19 80 | 24 89 |
| 2 in. | 26 64 | 33 49 |
| 2½ in. | 42 72 | 53 53 |
| 3 in. | 55 85 | 70 00 |
| 3½ in. | 70 84 | 87 86 |
| 4 in. | 83 93 | 104 10 |

Standard Lapweld

| | | |
|---|---|---|
| 2 in. | $ 29 60 | $ 36 08 |
| 2½ in. | 44 46 | 54 70 |
| 3 in. | 58 14 | 71 53 |
| 3½ in. | 72 68 | 90 62 |
| 4 in. | 86 11 | 107 37 |
| 4½ in. | 97 79 | 122 56 |
| 5 in. | 114 00 | 142 82 |
| 6 in. | 147 80 | 185 28 |
| 7 in. | 192 80 | 241 57 |
| 8 L in. | 202 50 | 253 75 |
| 8 in. | 233 30 | 292 32 |
| 9 in. | 279 50 | 350 18 |
| 10 L in. | 259 20 | 324 80 |
| 10 in. | 333 70 | 418 18 |

Prices—Ontario, Quebec and Maritime Provinces.

### WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

### OLD MATERIAL

Dealers' Buying Prices.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $19 00 | $19 00 |
| Copper, crucible | 22 50 | 22 50 |
| Copper, heavy | 22 50 | 22 50 |
| Copper wire | 22 50 | 22 50 |
| No. 1 machine composition | 22 00 | 21 50 |
| New brass cuttings | 16 00 | 14 00 |
| Red brass turnings | 18 00 | 17 00 |
| Yellow brass turnings | 12 50 | 12 50 |
| Light brass | 10 00 | 9 50 |
| Medium brass | 12 00 | 12 00 |
| Heavy brass | 15 00 | 14 00 |
| Heavy melting steel | 24 00 | 21 00 |
| Steel turnings | 12 00 | 12 00 |
| Shell turnings | 12 00 | 12 00 |
| Boiler plate | 27 00 | 20 00 |
| Axles, wrought iron | 30 00 | 24 00 |
| Rails | 26 00 | 23 00 |
| No. 1 machine cast iron. | 34 00 | 30 00 |
| Malleable scrap | 21 00 | 20 00 |
| Pipe, wrought | 22 00 | 17 00 |
| Car wheels, iron | 26 00 | 30 00 |
| Steel axles | 38 00 | 35 00 |
| Mach. shop turn'gs. | 9 00 | 8 50 |
| Cast borings | 12 00 | 12 00 |
| Stove plate | 19 00 | 19 00 |
| Scrap zinc | 6 50 | 6 50 |
| Heavy lead | 7 00 | 7 00 |
| Tea lead | 5 50 | 5 75 |
| Aluminum | 21 00 | 20 00 |

### BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, ⅜" and less. | 10 |
| Carriage bolts, 7-16 and up. | net |
| Coach and lag screws | 25 |
| Stove bolts | 55 |
| Plate washers | List plus 20 |
| Elevator bolts | 5 |
| Machine bolts, 7-16 and over. | net |
| Machine bolts, ⅜ and less | 10 |
| Blank bolts | net |
| Bolt ends | net |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | 10 |
| Machine screws, fl. and rd. hd., brass | add 20 |
| Machine screws, o. and fil. hd., brass | add 25 |
| Nuts, square blank | add $1 50 |
| Nuts, square, tapped | add 1 75 |
| Nuts, hex., blank | add 1 75 |
| Nuts, hex., tapped | add 2 00 |
| Copper rivets and burrs, list plus | 30 |
| Burrs only, list plus | 50 |
| Iron rivets and burrs | 25 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, flat, bright | 72½ |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, brass | 37½ |
| Wood screws, O. & R., brass | 32½ |
| Wood screws, flat, bronze | 27½ |
| Wood screws, O. & R., bronze | 25 |

### MILLED PRODUCTS

| | Per Cent. |
|---|---|
| Set screws | 25 |
| Sq. & Hex. Head Cap Screws. | 20 |
| Rd. & Fil. Head Cap Screws | net |
| Flat But. Hd. Cap Screws | plus net |
| Fin. & Semi-fin. nuts up to 1 in. | 25 |
| Fin. & Semi-fin. nuts, over 1 in., up to 1½ in. | 20 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2 in. | plus 10 |
| Studs | net |
| Taper pins | 40 |
| Coupling bolts, plus | 10 |
| Planer head bolts, without fillet, list plus | 10 |
| Planer head bolts, with fillet, list plus 10 and | 10 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | list plus 20 |
| Collar screws | list plus 30, 10 |
| Thumb screws | 20 |
| Thumb nuts | 65 |
| Patch bolts | add 40, 10 |
| Cold pressed nuts to 1½ in. | add $4 50 |
| Cold pressed nuts over 1½ in. | add 7 00 |

### BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $47 50 |
| Open-hearth billets | 47 50 |
| O.H. sheet bars | 51 00 |
| Forging billets | 60 00 |
| Wire rods | 57 00 |

Government prices.

F.O.B. Pittsburgh.

### NAILS AND SPIKES

| | | |
|---|---|---|
| Wire nails | $5 25 | $5 50 |
| Cut nails | 5 70 | 5 65 |
| Miscellaneous wire nails | | 60% |
| Spikes, ⅝ in. and larger | | $7 50 |
| Spikes, ¼ and 5-16 in. | | 8 00 |

### ROPE AND PACKINGS

| | |
|---|---|
| Drilling cables, Manila | 0 41 |
| Plumbers' oakum, per lb. | 8½ |
| Packing, square braided | 0 34 |
| Packing, No. 1 Italian | 0 40 |
| Packing, No. 2 Italian | 0 32 |
| Pure Manila rope | 0 39 |
| British Manila rope | 0 33 |
| New Zealand hemp | 0 33 |
| Transmission rope, Manila | 0 45 |
| Cotton rope, ½ in. and up | .... |

### POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | net |

MISCELLANEOUS

| | |
|---|---|
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | 0 41 |
| [illegible] | 0 16 |
| [illegible] | 3 50 |
| [illegible] | 16 00 |
| [illegible] | [illegible] |
| [illegible] | 14 00 |
| [illegible] bulk | 0 35 |
| [illegible] | 0 33 |
| [illegible] | 0 32 |
| [illegible] | 0 71 |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| Plaster of Paris, per bbl. | 2 50 |
| Sandpaper, B. & A. | list plus 20 |
| Emery cloth | list plus 20 |
| [illegible] | 0 06½ |
| Sulphur, rolls | 0 05 |
| [illegible] | 0 04½ |
| Rosin "D," per lb. | 0 03 |
| Rosin "G," per lb. | 0 03½ |
| Borax crystal and granular | 0 12 |
| [illegible] | 1 80 |
| Whiting, plain, per 100 lbs. | 2 20 |

CARBON DRILLS AND REAMERS

| | Per Cent. |
|---|---|
| S.S. drills, wire sizes up to 52 | 35 |
| S.S. drills, wire sizes, No. 53 to 80 | 40 |
| Standard drills to 1½ in. | 40 |
| Standard drills, over 1½ in. | 40 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 |
| Bit stocks | 40 |
| Ratchet drills | 15 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 40 |
| Sleeves | 40 |
| Taper pin reamers | net |
| Drills and countersinks...list plus | 40 |
| Bridge reamers | 50 |
| Centre reamers | 10 |
| Chucking reamers | net |
| Hand reamers | 10 |
| High speed drills, list plus | 75 |
| High speed cutters, list plus | 40 |

COLD ROLLED SHAFTING

| | |
|---|---|
| At mill | list plus 40% |
| At warehouse | list plus 50% |

**Discounts off new list. Warehouse price at Montreal and Toronto**

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 8 00 | $ 8 00 |
| Sheets, black, No. 10 | 10 00 | 10 00 |
| Canada plates, dull, 52 sheets | 9 00 | 8 65 |
| Can. plates, all bright | 9 50 | 9 50 |
| Apollo brand, 10¾ oz. galvanized | ..... | ..... |
| Queen's Head, 28 B.W.G. | ..... | ..... |
| Fleur-de-Lis, 28 B.W.G. | ..... | ..... |
| Gorbal's Best, No. 28 | ..... | ..... |
| [illegible] Crown, No. 28 | ..... | ..... |
| Premier, No. 28 U.S. | ..... | 9 20 |
| [illegible] | [illegible] | 9 50 |
| [illegible] | 20 00 | 20 00 |

PROOF COIL CHAIN

B

¼ in., $12.35; 5-16 in., $11.85; ⅜ in., $11.50; 7-16 in., $10.90; ½ in., $11.20; ⅝ in., $10.90; ¾ in., $10.65; 1 inch, $10.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $13.00; 3-16 in., $12.50; ¼ in., $11.75; 5-16 in., $11.40; ⅜ in., $11.00; 7-16 in., $10.60; ½ in., $10.40; ⅝ in., $10.00; ¾ in., $9.90

**Prices per 100 lbs.**

FILES AND RASPS.

| | Per cent. |
|---|---|
| [illegible] | 50 |
| [illegible] | 50 |
| P.H. and Imperial | 50 |
| [illegible] | 40 |
| Black Diamond | 40 |
| J. Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 37½ |
| Disston | 50 |
| Whitman & Barnes | 50 |

BOILER TUBES.

| | Screwed | Unwedded |
|---|---|---|
| 1 in. | $36 00 | $..... |
| 1¼ in. | 40 00 | ..... |
| 1½ in. | 43 00 | 36 00 |
| 1¾ in. | 43 00 | 36 00 |
| 2 in. | 50 00 | 36 00 |
| 2¼ in. | 53 00 | 38 00 |
| 2½ in. | 55 00 | 42 00 |
| 3 in. | 64 00 | 50 00 |
| 3¼ in. | ..... | 58 00 |
| 3½ in. | 77 00 | 60 00 |
| 4 in. | 90 00 | 75 00 |

Prices per 100 ft., Montreal and Toronto.

OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | |
| Royalite, per gal., bulk | 18 |
| Palacine | 21 |
| Machine oil, per gal. | 26½ |
| Black oil, per gal. | 15 |
| Cylinder oil, Capital | 49½ |
| Cylinder oil, Acme | 39½ |
| Standard cutting compound, per lb. | 0 06 |
| Lard oil, per gal. | $2 60 |
| Union thread cutting oil antiseptic | 88 |
| Acme cutting oil, antiseptic | 37½ |
| Imperial quenching oil | 39½ |
| Petroleum fuel oil | 13½ |

BELTING—NO. 1 OAK TANNED.

| | |
|---|---|
| Extra heavy, single and double | 30-5% |
| Standard | 40% |
| Cut leather lacing, No. 1 | 1 95 |
| Leather in sides | 1 75 |

TAPES.

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

PLATING SUPPLIES.

| | |
|---|---|
| Polishing wheels, felt | 3 25 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, American | 07 |
| Pumice, ground | 3½ to 05 |
| Emery glue | 28 to 30 |
| Tripoli composition | 06 to 09 |
| Crocus composition | 08 to 10 |
| Emery composition | 08 to 09 |
| Rouge, silver | 35 to 50 |
| Rouge, powder | 30 to 45 |

**Prices Per Lb.**

ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | .08½ |
| Grits, 80 and finer | .06 |

BRASS.

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 38 |
| Brass sheets, 24 gauge and heavier, base | 0 43 |
| Brass tubing, seamless | 0 46 |
| Copper tubing, seamless | 0 48 |

WASTE.

| White. | Cts. per lb. | | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 18½ |
| Peerless | 21 | X Empire | 17¼ |
| Grand | 19¾ | Ideal | 17¼ |
| Superior | 19¾ | X press | 16 |
| X L C R | 18½ | | |

Colored.

| | | | |
|---|---|---|---|
| Lion | 15 | Popular | 12 |
| Standard | 13½ | Keen | 10½ |
| No. 1 | 13½ | | |

Wool Packing.

| | | | |
|---|---|---|---|
| Arrow | 25 | Anvil | 15 |
| Axle | 20 | Anchor | 11 |

Washed Wipers.

| | | | |
|---|---|---|---|
| Select White | 11 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

RUBBER BELTING.

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

ANODES.

| | |
|---|---|
| Nickel | .58 to .65 |
| Copper | .36 to .40 |
| Tin | .70 to .70 |
| Zinc | .23 to .25 |

**Prices Per Lb.**

COPPER PRODUCTS.

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | 42 50 | 43 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 46 00 | 44 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 48 00 | 48 00 |
| Copper sheet, planished, 16 oz. base | 57 00 | 45 00 |
| Braziers,' in sheets, 6x4 base | 45 00 | 44 00 |

LEAD SHEETS.

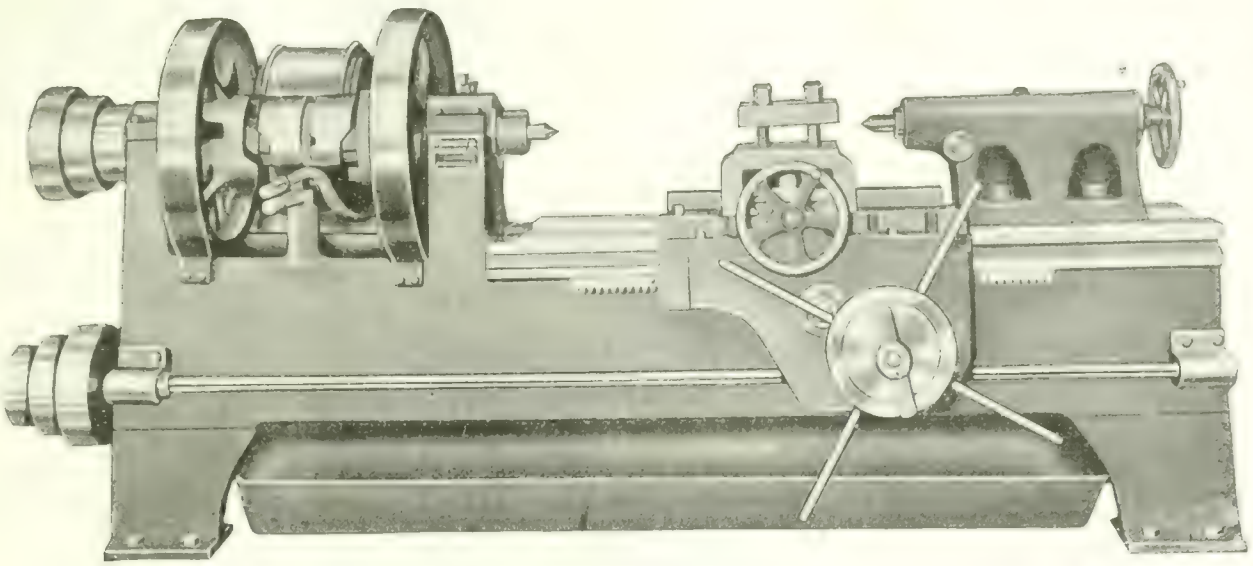
| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $13 25 | $13 25 |
| Sheets, 3½ lbs. sq. ft. | 13 25 | 13 25 |
| Sheets, 4 to 6 lbs. sq. ft. | 12 50 | 12 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

| | |
|---|---|
| Acid, boracic | $ .22 |
| Acid, hydrochloric | off |
| Acid, hydrofluoric | .09½ |
| Acid, nitric | .10 |
| Acid, sulphuric | .03½ |
| Ammonia, aqua | .14¾ |
| Ammonium carbonate | .20 |
| Ammonium, chloride | .40 |
| Ammonium hydrosulphuret | .50 |
| Ammonium sulphate | .30 |
| Arsenic, white | .25 |
| Copper, carbonate, anhy | .45 |
| Copper, sulphate | .17 |
| Cobalt, sulphate | .90 |
| Iron perchloride | .20 |
| Lead acetate | .35 |
| Nickel ammonium sulphate | .25 |
| Nickel carbonate | .65 |
| Nickel sulphate | .35 |
| Potassium carbonate | 1.50 |
| Potassium sulphide (substitute) | .20 |
| Silver chloride (per oz.) | .85 |
| Silver nitrate (per oz.) | .75 |
| Sodium bisulphite | .25 |
| Sodium carbonate crystals | .05 |
| Sodium cyanide, 127-130% | .50 |
| Sodium hydrate | .18 |
| Sodium hyposulphite, per 100 lbs. | 5.00 |
| Sodium phosphate | .18 |
| Tin chloride | .85 |
| Zinc chloride | .90 |
| Zinc sulphate | .18 |

**Prices per lb. unless otherwise stated.**



# *Speed Up Production*

## *with the*

# MONTREAL LATHE

for the economical production of 4.5", 6" and 155 MM. shells. If you are interested in obtaining maximum production at minimum labor expense, investigate the records of the MONTREAL lathe in plants of the largest producers of shells in Canada.

The MONTREAL lathe is wonderfully simple in operation and construction, yet every worth while improvement has been embodied in the design.

A powerful machine—designed to transmit all the power that the cutting tools will stand—with large broad ways, liberal wearing surfaces and unbreakable apron. The MONTREAL lathe comes to you equipped as you need it—with carriage for rough turning —with rigid single bar for boring, or with swivelling bar for inside profiling.

***Write Now for Prices and Delivery.***

## The A. R. Williams Machinery Co.

LIMITED

**64 Front Street West - . - TORONTO**

[illegal] ill for an expenditure [illegal] 000,000. The Bethlehem [illegal] that it will build on the Atlantic coast. [illegal] families can be adequately housed.

Heavy specifications for steel plates, shapes, bars, sheets and wire products [illegal] by the Emergency Fleet Corporation, the War Industries Board and by other Government departments in the last week amounting to [illegal] to 1,000,000 tons. The Carnegie Steel Co., alone has received orders for 250,000 tons of plates for ship and car building. The Newport News Shipbuilding and Drydock Co. will receive sheared plates for the construction of tank ships from the Pittsburg plant. The Carnegie [illegal] has a capacity of 1,500,000 tons of plates a year and its capacity for nearly the whole of 1919 as well as for the whole of 1918 has been taken up. The Quartermaster of the Army has placed a contract for 300,000 kegs of wire nails, calling for an expenditure of $1,-[illegal],000, with American manufacturers for export to France up to February, 1919. The allocation of the order was recommended by the wire committee of the Iron and Steel Institute. This is the largest single export order ever placed for wire nails whether for military or for other purposes.

# BLAMING THE GOVERNMENT IS NOW EASY WAY TO DEAL WITH CUSTOMER

Special to CANADIAN MACHINERY.

PITTSBURGH, June 26.—Additional ship steel fabricating work is being allotted to the Pittsburgh district. The McClintic-Marshall Construction Company is to double the capacity of its fabricating plant, the Government financing the operation, the extension to be devoted entirely to the fabrication of parts for ships. At the outset there was little work of this description given the Pittsburgh district except the large orders that have been going through the American Bridge Company's plant at Ambridge. Recently ship work was allotted to the Pressed Steel Car Company, and this is quite significant in view of the fact that this company is making a great many shells and its facilities are also desired for building cars. It is learned that this ship fabricating work is to take precedence over the building of freight cars which is not to be allowed to interfere. Another evidence of the pressure is that the McClintic-Marshall Company is also engaged to do ship fabricating work at Pottstown, in the eastern part of the State, although that is in the recently established "barred zone" which, on account of transportation limitations, is not to be given additional work except in case of special necessity.

Freight car orders recently placed are to be added to nevertheless, as it is understood that the Railroad Administration is planning to buy 40,000 cars in addition to the 100,000 recently ordered, while General Pershing has cabled additional requirements involving perhaps 10,000 or 20,000 cars.

### Demand Growing

Shipments of finished rolled steel are now at the rate of about 3,000,000 net tons a month, and a considerable part of this tonnage is going for purposes that are strictly essential although they are not the subject of Government orders. In the circumstances it is evident that the volume of direct Government orders on books or about to be placed is growing, for at the recent dinner of the American Iron and Steel Institute the Director of Steel Supplies stated that there were unfilled orders, or orders about to be placed, amounting to 16,-800,000 net tons.

Recent advices have been of about 3,-000,000 tons additional cropping out, and this week's news shows still more tonnage, the rate at which war steel requirements are growing being clearly in excess of the rate at which they are being filled, when that rate is one-half, or somewhat more than half, of 3,000,000 tons a month.

### Delivery Control Working Smoothly

The merchant blast furnaces and the steel mills have now had some experience with the new regulations promulgated by the War Industries Board by its resolutions of June 6. These prescribed a "schedule of purpose entitled to preference treatment," or in other words defined the "more essential" classes of commercial consumption of pig iron and steel products. After priority orders, etc., have been met, material is to be distributed against these purposes, and then if there is anything left, which is rarely the case, it may go to the general trade, although there are some restrictions in that matter also.

The producers report that they have been having little difficulty in interpreting and carrying out these new regulations. Virtually they replace a system of distribution which had been in force for a few weeks by the voluntary act of the producers, though without as clear a definition of the preference cases as is now furnished.

Naturally one thing that appeals strongly to the producers is the fact that when they have occasion to deny a customer any material the responsibility rests not with them but with the Washington authorities. There is a flexibility in the system, moreover, that is pleasing, in that if an issue arises between producer and customer as to whether or not a given lot of material should be furnished, as coming under the preference classification, the adjudication can be left to Washington by the producer referring the customer to the priorities division for a priority certificate. Such a certificate will be given in case the authorities approve of the purpose.

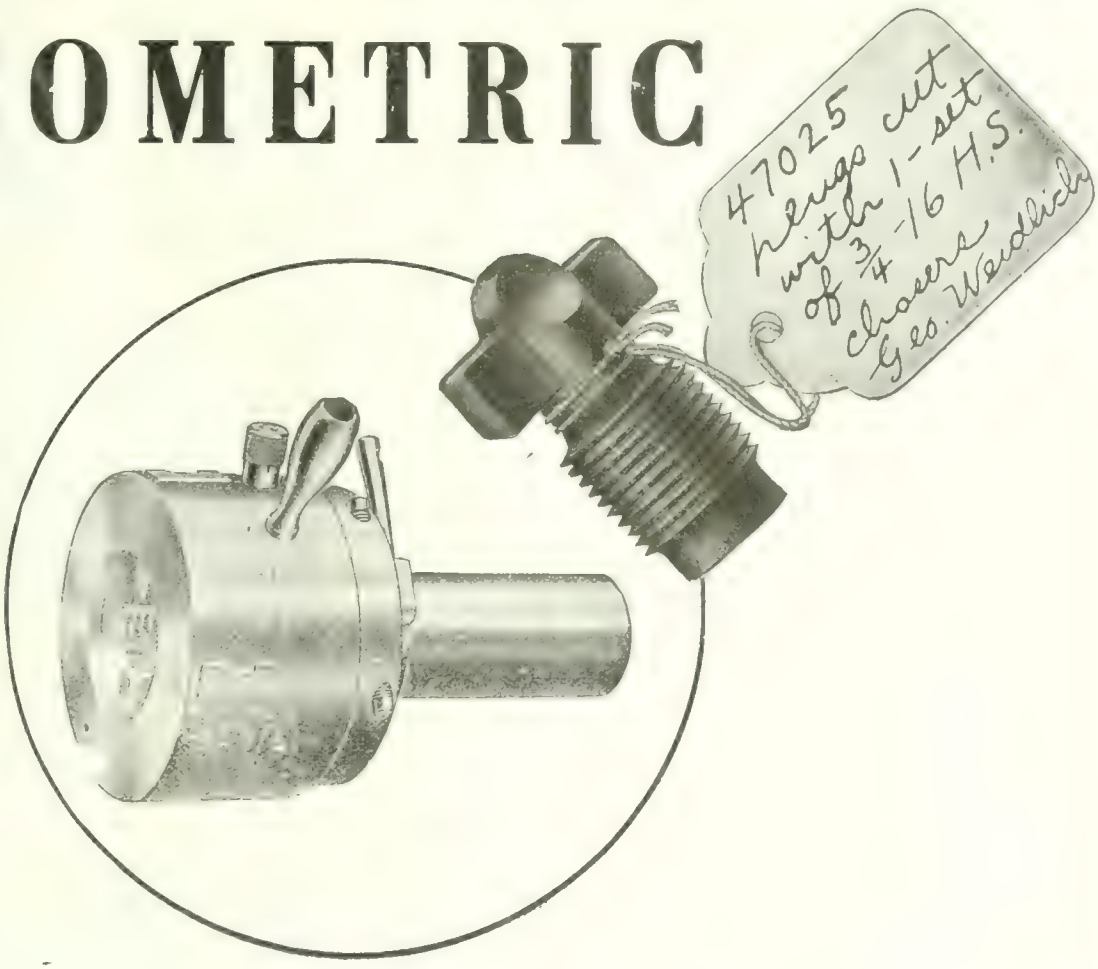
### Production

Production of pig iron and of steel ingots in June is expected to exceed slightly the rate obtaining in May, when there was an increase in pig iron over April, but a slight decrease in steel ingots. Pig iron production may be estimated at about 95 per cent. of capacity and steel ingot production at about 90 per cent., perhaps a shade more. In the case of pig iron the restriction is due chiefly to shortage of coke, though labor shortage exerts a little influence. There is practically no shortage of coke at the furnaces that are operating, but there are a few that would be blown in if coke were available. So far as the physical condition of blast furnaces goes, it has rarely been better as during the period when coke shortage was causing many furnaces to go out of blast there was extensive relining and the furnaces as a whole are in excellent condition physically. As to steel production, the restrictive influences are, in their order, scrap shortage, pig iron shortage and labor shortage. Supplies of scrap are below normal in proportion to the amount of steel being made as the current outcome of scrap is light by reason of the nature of industrial operations now being conducted and also by reason of shortage of labor for gathering and classifying scrap. The yards are receiving but little, and would hardly be able to find labor to take care of more.

Production is likely to decrease somewhat in the next two months, on account of hot weather, though as to that there were spells of weather in May as bad as any that are usually encountered in the midsummer months.

One striking thing that is being brought out is that with all the regulation as to where material is to go, and which is to take precedence of other material, there is after all little pressing demand for pig iron or steel products that is ignored. The "purposes" not named in the preference list would make a formidable showing, for normal times, involving perhaps 25 per cent. of the total consumption, but by reason of war conditions they have of late been gradually effacing themselves so that their requirements, if they were freely permitted expression, would be far below normal. No producer well acquainted with the situation can be found who places the consumption that is perforce denied at more than 10 per cent. and some place it at less. Even as to these limited requirements there may be a modicum of steel, as the months pass, though at present there is practically none.

# GEOMETRIC




## One Set of Chasers in a Geometric Die Head has cut 47,025 of these Plugs

The man who has operated the Geometric Die Head says: "In all my twenty-five years' experience I have never known a die to cut as many threads as this set has cut on cast iron."

A quarter of a century of specializing in one line has brought Geometric Thread Cutting Tools up to the high water mark.

Arrange to do your threading with a Geometric. Let our catalogue tell you about it.

## THE GEOMETRIC TOOL COMPANY

NEW HAVEN, CONN., U.S A.

*Canadian Agents:*

Williams & Wilson, Ltd., Montreal; The A.R.Williams Machinery Co.,Ltd., Toronto, Winnipeg and St.John,N.B.

# INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES

## ENGINEERING

[illegible] ... new stalls ... to the west end of the ... e, making a twenty-stall shop. A ... foot air-driven turntable, to accommodate the larger engines, is to be constructed, and an up-to-date sand drying house and car repairing shops will also be built.

## INCORPORATIONS

Incorporation has been granted to the British Colonies Transportation Co., Ltd., to build, buy, sell, equip and operate steamships, sailing ships, etc. Capital is placed at $750,000. Place of business will be St. John, N.B.

Incorporation has been granted to the Dominion Sheet Metal Corporation, Ltd. Incorporators are J. R. Marshall, H. A. Burbidge, A. B. Turner, G. A. Young, W. Hazell, all of Hamilton. Purposes of the company are to carry on the trades or businesses of rolling, tinning, galvanizing, coating and plating metals and the trade or business of iron masters, iron makers, steel makers, iron and steel converters, steel and iron rollers, colliery proprietors, coke manufacturers, miners, smelters, engineers, tin plate makers, etc., and to acquire and take over as a going concern the undertaking and all or any of the assets and liabilities of Dominion Sheet Metal Company, Limited, or all or any part of the shares or capital stock of the said company. The capital is $500,000, and place of business at Hamilton.

## MARINE

**Sarnia.**—The MacKenzie Milne & Co., Ltd., of Sarnia, have taken up the building of metallic life boats, and are making satisfactory progress in this line.

SANDWICH.—Word of the sinking in Lake Erie of the steamer Jay Gould and the foundering of the barge Commodore was brought here by the crew of the barge, four men and three women, who were picked up by the steamer Mataafa. The Gould's crew, they said, was rescued by an unidentified steamer and taken to Ashtabula, Ohio. The sinkings occurred in heavy weather off south-east shoal. The barge crew, when found by the Mataafa, were in a small boat tied to the water-logged barge.

LUNENBURG, N.S.—Miss Margaret Nicholson and other young ladies who have contracted to assist with the building of small boats, at Beinn Breagh, Baddeck, left Wednesday morning for Baddeck, where they will take up their new work at once. A number of other young ladies are already at Baddeck and others have signified their intention of taking up this work. Miss Nicholson is to remain for the duration of the war, and so are some of the others. Many have, however, contracted for one year the shortest period for which a contract will be signed, and will then renew the contract if they find that the work is congenial and that they can do it.

LONDON.—A fine piece of repair work has just been done by men of the Mercantile Drydock Company at Jarrow. A steamer torpedoed Sunday was brought to the Tyne the following day with a forty-foot rent in her side near the engine-room. Early Tuesday she was placed on the Admiralty pontoon and the men worked day and night until Friday, carrying out temporary repairs to enable her to be towed around to a wharf for completion of the work. This constitutes a record for the River Tyne. Many workmen worked for forty-three hours at a stretch, while others put in four consecutive shifts without a break.

**Halifax.**—That the work of establishing the big steel shipbuilding plant at Halifax will be commenced next week, if the engineers' plans are completed by that time, and that within three months the keels of three 10 000-ton freighters, the largest ever built in Canada, will have been laid on the building berths, was the statement made by J. W. Norcross, president of Halifax Shipyards, Limited. "Our expenditure for the shipbuilding plant," Mr. Norcross said, "will be between $3.750.000 and $4.000.000, and if the engineers have the plans ready we will start spending that money during the latter part of next week, when we will let our contracts."

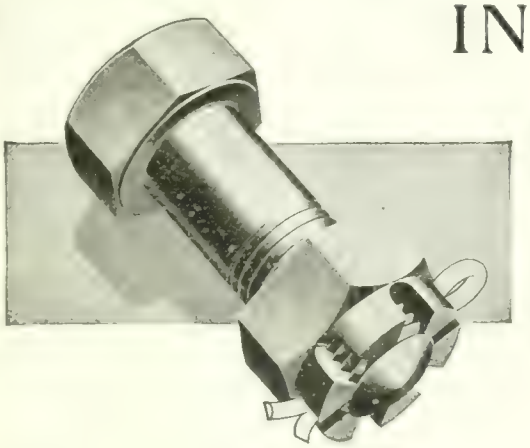
TORONTO.—The car ferry Canora, which was launched at Levis, Que., is the first vessel of its kind to be equipped with a stern gate, the invention of Mr. A. Angstrom, a naval architect of this city. The ferry, which was constructed for the Canadian Northern Railway, will ply in British Columbia waters, operating between Patricia Bay and Port Mann. The stern gate is a segment of a circle. It is a new departure of the rolling type of a shutter and is arranged to completely close the stern opening when the ship is at sea. The contrivance, which closely resembles the roll-top of a desk in design, is operated by a hoisting engine situated on the cabin deck, which will raise or lower it to any distance. When up the shutter closes in on the deck in such a way that it interferes with nothing else.

**Cleveland.**—The steamer Charles R. Van Hise, of the Pittsburg Steamship Company, has been taken over by the United States Shipping Board. The steamer, now on Lake Superior, will be commandeered when she reaches Lake Erie, to be cut in two and reconstructed for salt water service. The Van Hise is the largest lake vessel taken for the coast. The steamer is 446 feet keel, 50 feet beam and 29.5 feet deep. Being too wide to pass through the Welland Canal she will be cut in two sections, which will be rolled over and towed through the canal on their sides. The Van Hise was selected because of her unusual dimensions and power. She is deeper than most lake boats of her length. She has new Scotch boilers and a quadruple expansion enginee. Her capacity is about 7,400 tons, but it is figured she will carry at least 9,000 tons on the coast.

**Montreal.**—Speaking of the Pierce McLouth, a wooden ship made at Marine City, an expert says: "The Pierce McLouth is of unusually heavy build, having six-inch bottom planking, fourteen-inch floor frames, six-inch bilge ceiling and six-inch clamps. The ship is diagonally strapped with steel, has steel straps at the head of her frames, and has two plates of seven-eighths steel, thirty inches wide, on the keelson. She is built entirely of white oak, and has an enclosed pilot house, steam steering gear, electric lights, steam windlass, patent anchors, steel spars, and, in fact, everything that would add to stability and durability. During construction all her timbers were treated with creosote. The vessel is equipped with a powerful driving outfit, having a compound engine with cylinders 24 and 48 inches in diameter and 36-inch stroke. She carries a Scotch boiler, 12 feet in diameter and 14 feet long, allowing 125 pounds of working steam pressure."

# SCREWS AND NUTS

## S.A.E.—V.—U.S.S. STANDARDS IN STOCK



Cap and Set Screws—
Plain and Castellated Nuts—

Special screw machine work from brass, iron and steel made to specifications, in sizes up to 2¼" diameter, 10½" long.

*Catalog or quotations on request.*

## THE NATIONAL ACME COMPANY

De Courcelles and G.T.R.

MONTREAL

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# MAPLE LEAF

STITCHED COTTON DUCK

# BELTING

DOMINION BELTING CO. LTD.

HAMILTON CANADA

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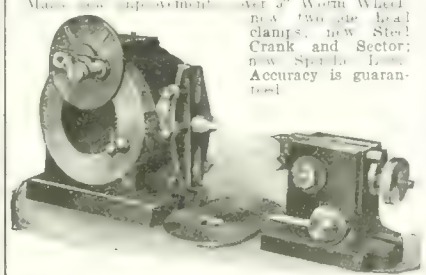
QUICK DELIVERY—GOOD

**Accurate 10-in. Universal Index Centers**

Highest quality of materials and workmanship. Many new improvements over 5" Worm Wheel heavy two-side head clamps, new Steel Crank and Sector; new Spindle Lever. Accuracy is guaranteed.



Get the Original Beware of Imitators

*Sold by all dealers Write to-day for particulars*

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## Prompt Deliveries

on Gauges, Tools, Dies, Jigs and Fixtures

## Special Machinery

CUT GEARS

Contracting and Repairing Machinists

Quotations cheerfully submitted.

**Normac Machine Co.**

55 Vine Street, St. Catharines, Ont.

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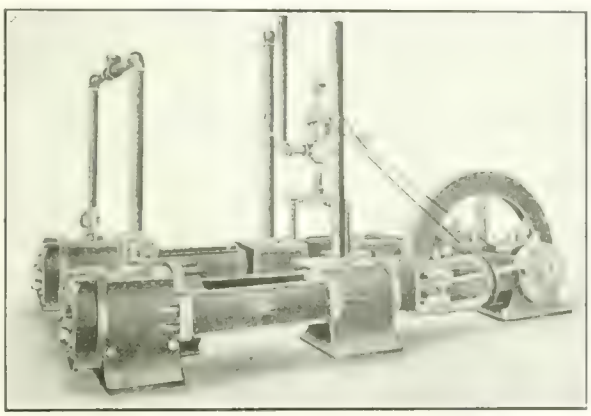

# For Sale at a Bargain

**Rand Class "B-1" Air Compressor**

Duplex Steam, Duplex Air. Steam Pressure, 80 to 100 pounds. Air Pressure, 90 to 100 pounds.

Requires 10 to 16 Steam Horse Power for Full Working Load [illegible] as we now use electric power instead of steam, we have no further use for this machine. Write us for full particulars.

This Compressor cost us $1,700 New before the war. We are now offering it at considerably less than half this price.

**MARSH ENGINEERING WORKS, Limited**

**Established 1846** **BELLEVILLE, Ont.**


*If any advertisement interests you, tear it out now and place with letters to be answered*

GAUGES
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OXY-ACETYLENE WELDING
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Special Machinery
MADE TO ORDER
Mill Machinery, Engine Work
Grey Iron and Brass Castngs
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Vulcan Iron Works OTTAWA, ONT.

BERTRAMS LIMITED
Engineers
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MACHINE TOOLS for IRON WORKERS
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JOHN STIRK & SONS, Limited
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MACHINE TOOLS
Agents—The A. R. Williams Mcy. Co., Ltd.
Toronto, Winnipeg, Vancouver, St. John, N.B.

WM. MUIR & CO., LIMITED
Manchester, England.
Machine Tool Makers
Specialties
Machines.

Keep your name to the front, so that you are in the market for the business that is going and for the new business that is coming. Do not let the world think that you have "gone under."

# MUNICIPAL

WELLAND.—The ratepayers of the city passed the Dillon Consolidated Steel Al... by-law by a vote of 426 to 18. The company will proceed at once with the installation of the necessary plant and early in the autumn will be employing a minimum of fifty hands.

**Montreal.**—The City Commissioners gave orders to seize the plant of Pion and Grothe when the latter declined to complete the contract for Lasalle Bridge and headgates. The city also retains a cheque of $20,000 given as a deposit. The amount of the contract was about $200,000.

**Smith's Falls.**—Speaking of the pumping plant used here, the Smith's Falls "News" says:—"The flume is on a par with the rest of the equipment of the pumping station, as an inspection of the plant proves. There are four pumps, two water-power and two steam, the former supposed to have a capacity of 2,500,000 and 800,000 gallons per day, but not pumping enough water to supply the demands of the town, which cannot be more than 1,000,000 gallons per day. The answer is that like the flume they are obsolete and ready for the scrap heap. With abundance of water power available if properly harnessed to up-to-date pumping machinery, $5,000 worth of coal is consumed in operating the steam plant to help out the other pumps with a rated capacity of over three times the possible demands of the town."

**The Canadian S K F Company, Ltd.,** 47 King Street West, Toronto, has made arrangements with the Hess-Bright Mfg. Co., Philadelphia, to be Canadian distributors for the well-known Hess-Bright ball bearings. A large stock in all sizes will be carried in Toronto and engineering designs and recommendations will be given for all classes of applications. The Hess-Bright Mfg. Co. control the Conrad patents under which other firms manufacture under license. The Conrad Patent is a method of assembly which enables a ball bearing to be made with continuous raceways, eliminating the necessity of filling sloths which rob the bearing of end thrust capacity. The "Monarch" series of bearings, of the deep groove type, are also made by the Hess-Bright Mfg. Co. These bearings are used extensively in work where heavy end thrusts are encountered such as in airplane propellers, etc.

# PERSONAL

**J. A. Burnett,** electrical engineer, Grand Trunk Railway System, has been appointed as technical assistant to the British War Mission, Washington, D.C.

The death occurred at Hamilton on Monday, June 24, of John Howard Kerr, secretary of the Canadian Westinghouse Co. The funeral took place in Pittsburg. Mr. Kerr was well known to the electrical and machinery trade in this country.

**S. A. Armstrong**, deputy minister of the Soldiers' Re-establishment Commission, it is understood, has been offered the position of general manager of the Jones Underfeed Stoker Co., of Chicago. The Chicago position is rated at $25,000 per annum.

**Frank T. Malone,** who has been representing Armstrong, Whitworth Co., of Canada, Limited, in the Hamilton district, has been appointed district representative for Ontario and has been transferred to Toronto, his headquarters in the future.

**J. S. Donal** has been temporarily assigned as manager to the Canadian Bond Hanger and Coupling Company, Alexandria, Ont., from one of the associated companies in the United States. R. J. Rose, who was the former manager, is now with the Newport News Shipbuilding Company, Newport News, Va.

**Alfred C. Roelfson,** vice-president and works manager of the Roelfson Machine Co., Galt, Ont., was married on Saturday, June 15th, to Miss Alberta McBride of Galt, daughter of William McBride, of the safe and vault department of the Goldie & McCulloch Co., Galt. After the ceremony the newly married couple left for New York and Boston.

**J. Walter Wardlaw** has been appointed general manager of the Central Vermont Railroad, with office at St. Albans, Vt. Mr. Wardlaw began his railroad career with the Grand Trunk Railway at Toronto, and is a son of Mr. T. D. Wardlaw, 62 Beaty Avenue, Toronto. Mr. Wardlaw joined the Central Vermont Railroad about 12 years ago as secretary to the general manager. He is about 35 years of age.

The marriage took place on June 14, at St. Andrew's Church, Sharrow, Sheffield, by the Rev. A. Allen, B.D., Captain George Reginald Marshall, Royal Air Force, only son of Mr. and Mrs. George Marshall, of Toronto, late of Sheffield, to Lily, eldest daughter of Mr. and Mrs. A. E. Parton, of Meadow Bank House, Sheffield. Mr. George Marshall, of Toronto, father of the groom, is resident agent for Wm. Atkins & Co., Sheffield.

In the death of Captain Archibald Reid, of Montreal, the shipping fraternity of Montreal loses one of its best known figures. Though born in Liverpool, practically the whole of Capt. Reid's active career has been spent either in Montreal or on sea voyages which had Montreal as their destination or port of departure whenever navigation was open. He was 72 years old. For a quarter of a century he had been port warden at Montreal, and concurrently until last year Lloyd's surveyor as well. Before that he was for many years superintendent on the port for the Dominion Steamship Company, and previous to that again he had commanded the steamship Dominion and other liners of the company which came to Montreal in the summer and to Portland in the winter.

# TENDERS

**Winnipeg.**—Tenders are being asked for the supply of glassware and electrodes for the city street lighting de-

partment. The last date is July 5. Instructions at 54 King street. M. Peterson, Board of Control office, is secretary.

**Toronto.**—Tenders will be received until 12 o'clock noon, on Tuesday, July 2, 1918, for the construction of a military garage at Toronto, Ont. Plans and specification can be seen and forms of tender obtained at the offices of the chief architect, Department of Public Works, Ottawa, and the Clerk of Works, Postal Station "F," Toronto, Ont.

**Kingston.**—Tenders will be received up to June 28 for the construction of a military Isolation Hospital at Kingston. Plans and specification can be seen and forms of tender obtained at the offices of the chief architect, Department of Public Works, Ottawa; Power & Son, architects, Kingston; the clerk of works, Postal Station "F," Toronto, and the overseer of Dominion Buildings, Central Post Office, Montreal, P.Q.

**Winnipeg.**—Tenders will be received until 12 o'clock noon on Wednesday, July 10, 1918, for the construction of a stop log dam, pile bridges and canal for the diversion of the Little Pembina River into Lake Pelican, Souris County, Manitoba. Plans and forms of contract can be seen and specification and forms of tender obtained at this Department at the office of the District Engineer at Winnipeg, Man., and at the Post Office at Ninette, Souris County, Man.

**Winnipeg.**—Tenders, addressed to the Chairman, Board of Control, will be received up to 10 a.m. on Tuesday, July 2nd, 1918, for the supply, delivery and erection in the Winnipeg General Hospital power house of one 200 k.w. motor generator set, together with certain switchboards. Instructions to bidders, together with specifications and forms of tender, may be obtained at the office of the City Light and Power Department, 54 King Street. M. Peterson, secretary, Board of Control office, Winnipeg.

**Windsor.**—Sealed proposals will be received by the Essex Border Utilities Commission at the office of Morris Knowles, Ltd., engineers, 8 Royal Bank Building, Windsor, Ont., until twelve o'clock noon, July 8, 1918, where they will immediately thereafter be publicly opened and read, for the construction of the east sewerage interceptor and appurtenances. The work includes furnishing all the material and doing all the work for about 1,060 feet of 15" vitrified pipe sewer, 1,310 feet of 18" vitrified pipe sewer, 1,530 feet of 20" vitrified pipe sewer, 2,540 feet of 24" vitrified pipe sewer, 1,960 feet of 27" vitrified pipe sewer, 3,640 feet of 33" vitrified pipe sewer, 49 manholes, 2 measuring chambers, 3 regulating chambers.

## TRADE GOSSIP

**Spruce Output Doubled.**—The output of British Columbia spruce for the manufacture of aeroplanes has, as the result of the efforts of the Imperial Munitions Board, been doubled within recent

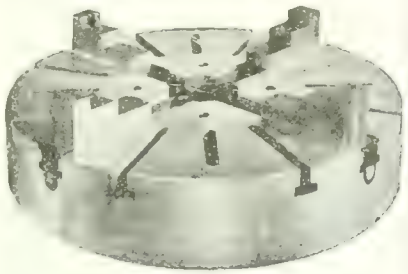

We Know

you are anxious to buy

Canadian Made

goods.

The Imperial



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Brantford, Canada

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EPHILIAN WIPERS & WASTE CO LIMITED TORONTO

BLACK DIAMOND OVENS

OVENS

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FILES

are the only files made absolutely of crucible steel. That is why they

Retain Sharp-cutting Teeth

long after the teeth of a common file would be worn smooth.

On the hardest, toughest metal, Delta Crucible Steel Files work fast.

Delta Files have 50 years of file-making experience to their credit.

Workmen do more with Delta Files. They like to use them. They know them at a glance by this trade-mark on the tang.

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DELTA

DELTA FILE WORKS

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CANADIAN AGENTS

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ALL LEADING JOBBERS.

BOLTS

Machine Bolts,
Nuts and Washers

The Best
Send a trial order

LONDON BOLT & NUT WORKS
London Ontario

'Barnes-Made'
Springs

A trial will convince you that "Barnes-Made" Springs are the best buy.

Established 1857
THE WALLACE BARNES COMPANY
218 South St., Bristol, Ct., U. S. A.
Manfrs of "Barnes-made" Products
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—for every purpose and the best for each use.

Special styles of all kinds to order.

THE CLEVELAND WIRE SPRING COMPANY
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Allatt Machine & Tool Co.
107 Adelaide St. West, Toronto, Ont.
Phone Adel. 908

Cutting off and rough facing machines for 6 inch shell.
Repair parts for Williams type 6-inch cut-off machines.

Kindly Mention this Paper When Writing to Advertisers

[illegible] The output is now approximately [illegible] feet per month.

**Factories Closing.** Two hundred small factories in the Chicago district have been forced to close by reason of the order withholding steel from concerns not engaged in Government work. This statement was given out by the Illinois Manufacturers' Association to-day.

**Short of Power.** The rationing of power had to be resorted to again at Galt on account of there being insufficient Hydro to meet the local demands. One circuit was cut out one day and another the following day. Local officials say the rationing may have to continue for several days.

**Winnipeg.**—The Theodore Kipp Co., Ltd., having purchased the business of the Mechanical Engineering and Manufacturing Co., have been granted letters of patent, changing the name of the company to Kipp, Kelly, Brown, Limited. All business in future passes under that name.

W. H. PLEWES

A member of the firm of Plewes, Ltd., manufacturers' agents, Winnipeg, returned home last week, having been wounded in France. Mr. Plewes joined the Cycle Corps in 1915, and left Canada in 1915 for Europe. He went through several severe engagements, including Passchendale, and was twice sent to hospital for treatment. Mr. Plewes was with the Northern Electric Co. for two years, later with the Canada Metal Co., entering his father's business in 1914, but left the following year for France.

**Surrender Charter.**—Notice appears in the papers that an application will be made to the Lieutenant-Governor of the Province of Ontario for an order accepting the surrender of the charter of Canadian Munitions Corporation, Limited, under the Ontario Companies' Act, Revised Statutes of Ontario, 1914, Chapter 178, and amendments.

**Men Wanted.**—Large advertising space is still used in connection with the attempts of munitions firms to get men enough to carry on their work. There has been a departure from the condensed ad. calling for help. In its place factories are using big display spaces. For instance, the Canada Bridge Co., of Walkerville, Ont., use 24 inches of space in the Wallaceburg "Herald" to try and secure untrained men for munitions work.

**Labor Conditions.** — The following statement was issued by the Labor Department:—"There is an apparent misapprehension as to the extent of labor troubles in Canada. Canada is still, by comparison with other countries, extremely favored in these matters. At the present time, from Cape Breton to Vancouver Island, there are no more than five or six trifling strikes, most of them about a week old, and involving in all something less than 250 men and women. None of them are of more than local interest or importance."

**Change of Address.**—Announcement is made of change in address of the Crane Packing Company's New York office to larger quarters in the Park Row Building, and the appointment of Julian N. Walton, manager. A. W. Payne, connected for some time as manager of this district, has been made sales manager of the United States and Canada, with headquarters at the home office in Chicago. The Pittsburgh offices are located in the May Building, Pittsburgh. The Philadelphia office in the Colonial Trust Building.

**Becoming Scarce.**—A Montreal firm is advising its customers as follows this week: "It is becoming more difficult to secure supplies of citric and tartaric acid, and particularly tartaric, English manufacturers have been and are still unable to offer tartaric for any shipment, and we understand that Italian makers are also refusing to quote. Indications point to a severe shortage and we think it would be well for our friends to look into their requirements without delay and endeavor to pick up anything which might be available from stocks in Canada."

Canadian Hoskins, Limited, Walkerville, manufacturers of electric furnaces and pyrometers, are erecting a concrete and steel factory building on Walker Road, which they hope to occupy within three months. It is an L-shaped structure, 60 x 170 x 220, and will give the company the requisite facilities for the production, not only of their regular lines, such as pyrometers and furnaces, but of nickel chrome castings and wire in which they are specializing. The new factory will call for a much larger working force, and it is worthy of note that the company speedily outgrew the quarters in the Walker industrial building which they occupied about two years ago.

**Russian Rails.**—Much has been said about a quantity of steel lying at Vancouver on order for the Russian Government. An Ottawa explanation is that "the large quantity of Russian rails reported to be rusting on docks in British Columbia have for some time been the subject of negotiations by the Dominion Government looking to their purchase. The Government is quite pre-

pared to buy the rails, but the difficulty arises from the fact that conditions in Russia are so unsettled that they are not able to find any authority with whom there can be conclusive negotiations. There is sufficient steel to span 150 miles. The Government may also buy four thousand box cars consigned to Russia, but as they are extra broad gauge they would be of little use save as scrap to be rebuilt."

**Plants Tied Up.**—Strikes and threats of strikes in factories engaged in the manufacture of important war materials have tied up production in several plants of greater New York. Most of the plants affected have been working on sub-contracts, making parts for the Liberty motor. The factories tied up by strikes are: Scientific Machine and Tool Corporation, 57 Jay street, Brooklyn, making fixtures for Liberty motors. Chatham Machine and Tool Company, 128 Mott street, working on Liberty motor sub-contracts. Premier Snap Fastener Company, 182 Grand street, making Liberty motor and aeroplane parts. Premier Special Machine and Tool Corporation, 421 Canal street. National Indicator Company, 852 Vernon avenue, Long Island City, Liberty motor sub-contractors. Blair Tool and Machine Works, Inc., 521 Greenwich street, making parts for motor trucks awaiting shipment to France.

**Builders in Convention.**—Seventy-five delegates attending the annual convention of the Provincial Builders' and Supplies' Association at Galt were given a civic welcome by Mayor Dakin. The following are the officers:—President, A. Tomlinson, Chatham; first vice-president, Lt.-Col. G. Youngs, Stratford; second vice-president, Robt. Elgie, Toronto; secretary-treasurer, T. R. Wright, London; executive, G. A. Robb, Galt; J. S. Adamson, Ottawa; A. Hannaford, Hamilton; J. Morton, Sarnia; E. Blondie, Chatham; R. Masson, Stratford; F. Nicholson, St. Catharines; S. Willis, London; G. Stocker, Toronto; G. J. Oakley, Toronto; auditors, D. Davidge, Toronto; E. Gerry, London. Robert Elgie, of Toronto, gave an address emphasizing the benefits of patronizing home industry, and it was decided to memorialize the Federal Government to regulate the operations of foreign contractors doing work in Canada. A report was read by G. Gandier, of Toronto, on the benefits of the Workmen's Compensation Act.

## CATALOGUES

**The Canadian S. K. F. Company Ltd.**, 47 King Street West, Toronto, is now carrying a stock of chrome alloy steel balls in all sizes ready for immediate shipment. These balls, which are hardened clear through, are suitable for the highest class of work and heavy service. They are guaranteed round and true to size within one-ten-thousandth of an inch.

**Pocket Catalogue of Young Ovens** is the title of a new catalogue D describing model "G" ovens for japanning, enamel-


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PATENTS

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The old established firm. Patents everywhere. Head office Royal Bank Bldg., Toronto. Ottawa office, 5 Elgin St. Offices throughout Canada.
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PATENTS PROMPTLY SECURED

In all countries. Ask for our Investor's Adviser, which will be sent free.
MARION & MARION 364 University St.
Merchants Bank Building, corner St. Catherine St., MONTREAL, Phone Up. 6474 and Washington, D.C., U.S.A.

The "Dupont" PATENT Power Hammer

The strength, durability, economy of power and simplicity of adjustment of the Dupont Power Hammer make it a decidedly superior tool.

Made carefully from carefully selected, high-class materials.

Positively Guaranteed

Seven sizes.
With rams from 25 to 500 lbs.

Write for full details.

THE PLESSISVILLE FOUNDRY
Plessisville, Que.

Ontario and Western Agents:
The General Supply Co. of Canada, Ltd.
Ottawa Toronto Winnipeg

Scandinavia Belting
Is a Good Belt for Dusty Places

In cement plants and in [illegible] where there is lots of dust this belt is producing results that are very satisfactory for the mill operators.

You know how wearing grit is on a belt, and you want a belt that will not come apart when only partly worn through.

"Scandinavia" is this kind of a belt there are no plies to come apart—it is solid woven. We have seen these belts still giving good service when the thickness was half worn through, and on the pulley side of the belt there were no frayed ends the surface of the belt was smooth.

Mr. Plant Manager, you know what this means. If you require a belt for operating in a dusty place, let us ship you one, [illegible]

Federal Engineering Co., Limited
172 John Street, Toronto

Note—Do not use "bar" or "stick" belt dressing on textile belts.

METAL STAMPINGS

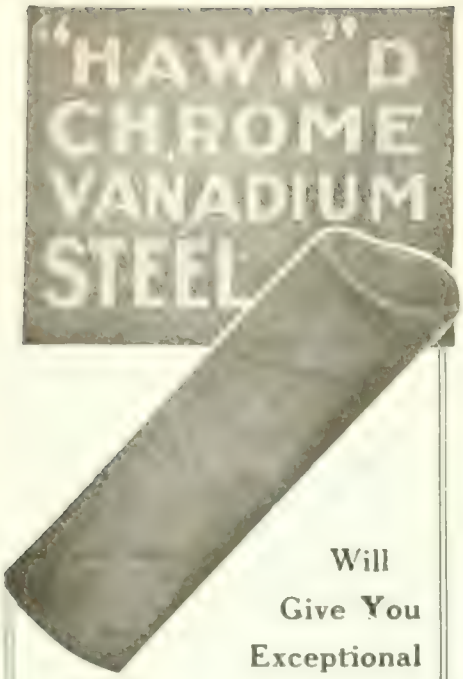
We are manufacturers of stamped parts for other manufacturers.

We do any kind of sheet metal stamping that you require. Our improved presses and plating plant enable us to produce the finest quality of work in a surprisingly short time.

We can finish steel stamping in Nickel, Brass or Copper.

Send us a sample order.

W. H. BANFIELD & SONS
372 Pape Avenue, Toronto, Can.




Will
Give You
Exceptional

**Shell Forging Production**

WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat-treated and ready for use.

It does not stick to the work.

There are many cases where each punch has turned out over 2,000 shells.

It means more shells, per machine per day.

STEEL OF EVERY DESCRIPTION.

**Hawkridge Brothers Company**

303 Congress St., BOSTON, MASS.
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**THE IRON WORKS**
LIMITED
Successors to
Owen Sound Iron Works
Owen Sound, Ont.
Engineers
Boiler-makers
Founders
Machinists

Tank Work
Smoke Stacks,
Grey Iron and
Brass Castings,
Special
Machinery
Made to
Order


(i.e., drying and core baking, etc., made by Young Brothers Co., Detroit, Mich. The catalogue contains brief general information covering the various types of ovens, describing the principal features and illustrating a number of typical installations.

**Electrical Equipment.**—The Ward Leonard Electrical Co., Mount Vernon, N.Y., has issued a pocket size loose leaf bulletin covering an interesting line of electrical equipment such as rheostats, controllers, resistance units, etc. The bulletin contains temporary price and data sheets covering only the apparatus upon which the company can offer reliable delivery dates and assure maintenance of prices. The reason being that the company's facilities are now largely devoted to Government work affecting regular production in the meantime.

**The Present Day Applications of Ball Bearings** is the title of an interesting bulletin being distributed by the Canadian S F K Co., Toronto, principally among colleges and larger educational institutions. This bulletin is gotten up in the form of an illustrated lecture and the company has prepared sets of lantern slides to accompany the lecture for the purpose of creating interest in one of the latest developments in mechanical appliances and showing the latest applications of ball bearings. The lectures and slides are sent out to universities and colleges for the benefit of the students and others who may be interested in mechanical matters. In addition to illustrating and describing the various applications, the bulletin also contains a brief history tracing the development of ball bearings. It deals with the principal features in the design and construction of the S K F ball bearing and describes how ball bearings are manufactured. The applications described cover a large number of industries including automobiles, machine tools, textile, tractors, paper making, milling, wood working, etc. Copies of the bulletin may be had on application by any student, mechanic or engineer interested in the subject. For copies apply to the Canadian S K F Co., 47 King Street West, Toronto.

## BOOK REVIEW

**A Study of the Heat Transmission of Building Materials.**—An investigation to determine the coefficients of heat transmission of standard building materials for exterior walls has been completed by the Engineering Experiment Station of the University of Illinois under the direction of A. C. Willard, Professor of Heating and Ventilation, and L. C. Lichty, Research Fellow. The tests were conducted according to the so-called "hot air box" method, the boxes being built of the material to be tested and of such a size as to insure conditions similar to those found in actual practice. The heating was done electrically so that the input of heat could be controlled and accurately measured. The materials tested included various sizes of tile plastered, magnesia board, cork board, wood, concrete, brick, glass with and without an air space, sheet asbestos and asbestos board. The degree to which the transmission coefficients of the various materials are affected by variations in air velocity, by humidity, and by the use of air spaces in wall is discussed, and the results of the tests are given in detail in Bulletin 102 of the Engineering Experiment Station. The publication is illustrated with diagrams and photographs of the apparatus. Copies of Bulletin 102 may be had gratis by addressing the Engineering Experiment Station, Urbana, Illinois.

**Fuel Economy in the Operation of Hand-Fired Power Plants.**—The scarcity of coal last winter and the recent warnings of the fuel administration regarding the possibility of a shortage next winter emphasize the need for greater economy in the use of fuel. The present high rate of production is still insufficient to supply all needs and there seems to be no possibility of an increase in the output of the mines to meet demands.

There are two possible results of this fuel shortage; either certain industries must close down or more work must be done with the coal available. The Engineering Experiment Station of the University of Illinois has just issued a 90-page booklet printed in four colors which shows that the average small power plant can save fifteen per cent. of its fuel by the exercise of greater care in equipment and operation. This means a saving of 12 or 13 million tons per annum if applied throughout the country.

The purpose of the publication, the title of which is "Fuel Economy in the Operation of Hand-Fired Power Plants," is to present to owners, managers, superintendents, engineers and firemen, certain suggestions which will help them in effecting greater fuel economy, and in determining the properties and characteristics of the coal purchased. Features of installation essential to the proper combustion of fuel are discussed, the practise to be observed in the operation of the plant is outlined.

The publication was prepared by a special committee of the research staff of the Engineering Experiment Station assisted by an advisory committee consisting of Joseph Harrington, advisory engineer on Power Plant Design and Operation, Chicago; Arthur L. Rice, editor "Power Plant Engineering," Chicago; John C. White, chairman educational committee, National Association of Stationary Engineers, Madison, Wis.; O. P. Hood, chief mechanical engineer, Bureau of Mines, Washington, D.C.; D. M. Myers, advisory engineer on fuel conservation, United States Fuel Administration, Washington, D.C., and C. R. Richards, Dean of the College of Engineering and director of the Engineering Experiment Station of the University of Illinois.

Only a limited supply of copies of this publication is available for free distribution. Requests for copies should be directed to the Engineering Experiment Station, Urbana, Illinois, and should specify "Circular No. 7."

# Government May Stop Construction of Eaton's Vast New Mail Order Building

MILLIONS of dollars—$3,500,000 to be exact—is the estimated cost of the huge new mail order building projected by the T. Eaton Company in Toronto. The structure, 400 x 330 feet in foundation area, is to have over a million feet of floor-space, and would be, if constructed according to present plans, the largest single building ever planned in Canada. It has been designed, according to report, solely to enable the T. Eaton Co. to meet the immense mail order competition of the Robert Simpson Company through their big modern mail order building on Mutual Street, Toronto. Or, it may be simply a necessary step due to the immense development of Eaton's own mail order business. Anyway estimates have been called for the structure, and to-day the question is: "Will the Government allow the building to go up?"

## Steel and Labor Seriously Involved

Already the Dominion Bridge Company are preparing to roll the steel for the structure. Steel is a precious munition of war to-day. Labor is looking for employment at the highest possible wage-rate and enterprises both patriotic and profit-earning are looking far and wide for labor. So serious is the farm-labor situation likely to become that the Government instituted National Registration and the Registration Cards lay emphasis on farm-work. Will the Government permit the construction of a building which will use enormous amounts of steel, and tax supplies of labor to a great extent?

## The Financial Post Deals With This Question and With Others

In THE FINANCIAL POST of June 22nd you will find this question very keenly analyzed. You are interested. Every merchant or business man in Canada is interested. THE POST goes incisively into vital matters that concern business in Canada, the business affairs that bring you money. Here are headlines from the issue of June 22nd. Each one of them indicates a business feature of the week, the information on which will be valuable to you, and all the contents of THE POST are not given by any means. Just note these:—

Housing—A Live Subject Throughout Dominion.
Pooling of United States and Canadian War Resources.
Conservation of Coal Needed to Avert Fuel Famine.
Sir Thomas White May Succeed in Getting U. S. Credit.
Fire Insurance Men Criticise the C.M.A. Report.
British Industry Asks Protection From Competition.
Closing Down is no Calamity For Flour Mills.
Senator Nicholls' Trade Corporation Idea.
Supplementing Manufacturers' Balance Sheets For Banks.
Victory Loan Conference on Tuesday.
Over-Favorable Crop Reports Are Unwise.
Bank Profits and Stocks Now, and Before War.
Bank Clearings Again Fall off in West.
Edmonton Getting Back to Equilibrium.
New Westminster Received Bids For Bond Issue.
Thyssen—The German Capitalist Who Was to Own Canada.
Peddlers of U.S. War Orders Getting Middle Profits.

These headlines, and the other important contents of THE POST will indicate to you most important business news matter. To read THE POST on these subjects and on each week's business affairs of note as they arise will provide you with facts to make your opinions in conversation with other business men strong in constructive idea and suggestion force. Careful consideration of THE POST will prove to you its practical value. Secure subscription to-day by signing and mailing this coupon.

Annual Subscription $3.00. .....

THE FINANCIAL POST OF CANADA,
143-153 University Ave., Toronto.

Please enter me as a regular subscriber to THE FINANCIAL POST OF CANADA, commencing with current issue. I enclose (will forward) $3.00 to pay for my subscription for the first year, or you may draw on me for this amount.

Name .....

C.M. 6 D.

Address .....

(Please write plainly)

# CLASSIFIED ADVERTISING SECTION

Rates (payable in advance): Two cents per word first insertion; one cent per word subsequent insertions. Count five words when box number is required. Each figure counts as one word. Minimum order $1.00. Display rates on application.

## FOR SALE

[illegible] CHUCK

[illegible] HEAVY ENGINE

[illegible] ONE 100 K.W. GENERA-

[illegible] (c2m)

## POSITIONS WANTED

[illegible] SUPERINTENDENT HAVING WIDE [illegible] Box 445, Canadian Machinery. (c2m)

POSITION AS TOOLROOM OR MACHINE [illegible] Both American and Canadian experience in manufacturing small and medium interchangeable parts; familiar with latest up-to-date methods; good organizer, energetic, tactful. Open for position after June [illegible] (c2m)

### BUSINESS OPPORTUNITIES.

POUGHKEEPSIE, NEW YORK, HAS NOW vacant several buildings splendidly adapted for machine shop work. Mechanics and machinists available, owing to closing of famous F. I. A. T. factory. City is seventy-two miles from New York City on New York Central and Central [illegible] tion by Hudson River. Electric power in unlimited [illegible] No munitions work in vicinity. Write Chamber of [illegible] (c2m)

## HELP WANTED

PRACTICAL WORKS SUPERINTENDENT with high mechanical and executive ability; competent to handle men to get production in machinery manufacture. State age, give references and wages expected. Steady employment for right man. Apply Box 434, Canadian Machinery. (c27m)

WANTED — DRAFTSMAN, JUNIORS, ON electrical machinery. State age, experience, and salary expected. Apply Box 403, Canadian Machinery. (c3m)

FOREMAN WANTED FOR ROUGH TURNING machine on large shells; state experience; map in Western Ontario. Box 448, Canadian Machinery. (c2m)

GOOD EXECUTIVES FOR SHRAPNEL SHELL plant for point in Ontario required. Reply, stating qualifications and salary to Box 449, Canadian Machinery. (c2m)

WANTED CAPABLE MASTER MECHANIC with good executive ability to take charge of mechanical department of large industrial plant. State salary expected and experience. Applications strictly confidential. Box 447, Canadian Machinery. (c1m)

WANTED HIGHLY QUALIFIED PRODUCTION foreman for six-inch shell shop in English-speaking plant, Sherbrooke, Que. Willing to pay higher salary and offer inducements to qualified man. Reply giving qualifications, etc., to Box 444, Canadian Machinery. (c2m)

SHOP INSPECTORS TWO WANTED, EXperienced on the final end, six-inch shell plant, first-class men only, state your experience and what you want. Box 446, Canadian Machinery. (c2m)

WANTED—FOREMAN MACHINIST FOR MAchine shop of large manufacturing company, one with experience on repairs to hydraulic pumps, steering and heavy machinery. Good position for man of ability. Box 445, Canadian Machinery. (c2m)

## HELP WANTED

EXPERIENCED INSPECTORS REQUIRED FOR shrapnel shell plant for point in Ontario. Apply, giving qualifications, to Box 449, Canadian Machinery. (c2m)

### ROLL TURNERS WANTED.

LARGE STEEL COMPANY IN EASTERN Canada want roll turners with experience in guide and bar mill work. Rate of payment, 51¾c. per hour. Apply Box 443, Canadian Machinery. (c1m)

## WANTED

WANTED SECOND-HAND ALLIGATOR OR Guillotine Shears in good working condition, capacity up to 3" square steel. Address Dillon Crucible Alloys, Limited, Welland, Ont. (c26m)

WANTED QUICK—ONE SCLEROSCOPE, ALSO one Gurney Testing Machine. Give full particulars and price. Albion Machine Co., Ltd., New Glasgow, N.S. (c1m)

WANTED—ONE GOOD SECOND-HAND FROG & Switch Planer with 2 heads on Cross Rail and about 15 ft. bed. J. L. Neilson & Co., Winnipeg, Man. (c26m)

## SPECIAL MACHINERY

H. C. THOMAS, GENERAL MACHINE SHOP, tools, jigs and machine repairs. 301 King St. W., Toronto. Telephone Adelaide 3836. tf

MANUFACTURERS—WE CAN UNDERTAKE work to any specification—munition production equipment or otherwise. Write W. H. Sumbling Machinery Co., 7 St. Mary St., Toronto

## PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (cfm)

## USED MACHINERY FOR SALE IMMEDIATE DELIVERY

[illegible] Planer (1).
No. 70 Heald Internal Grinder (1).

[illegible]

2-2 Special Cutting-off Machine (2).

[illegible]

16" Pratt-Whitney Turrets (2)
24" P. & J. Turrets (1).

**Charles P. Archibald & Co.**

*Machinery and Supplies*

164 St. James St.

Telephone Main 3935 MONTREAL

## We have for immediate sale the following articles:

1—Coils 1.5" wire cable each 310 feet long—crucible steel—used but in good condition.
1—Coil, 1,000 feet 1½" cable, crucible steel—used slightly—equal to new.
1—Coils, 500 to 2,000 ft. each ⅝" high duty steel cable, 7 strands, galvd., new.
1—Pells design punch, steel construction strong and powerful.
1—Pells I beam and angle cutter, will shear up to 24", good as new.
1—20" band saw, tilting table—2 saws perfect condition.
1—6" x 4" x 6" duplex boiler feed pump.
1—Buffalo 4th's post drill, good order.
1—18" pulley lathe (Boston Blower Co.), 4-step drive—4" belt—2 heads—countershaft complete.
1—Large Bull lathe 7 ft. swing—12 ft. bed—complete with countershaft.
1—Swing cut-off saw—will take 18" blade.
1—Ventilating fan, 16" x 18" opening, steel construction.
1—Planer table 14" x 30", bed 18" [illegible] heads, housings 19" x 46".

**WINNIPEG MACHINERY EXCHANGE**
Sutherland and Gladstone Sts.,
Winnipeg, Man.
(c2m)

## USED MACHINE TOOLS

In stock and offered for sale:
Lathes—
1 "New Haven" 32"x14'-0".
1 "Norwood" 22"x7'-0"
1 "Bullard" 20"x12'-0"
1 "Atlas" arbor press No. 26 (new)
1 Hydraulic press 14"x24"
1 Hydraulic press for copper bands 4.5 to 6"

Write for details and prices.

**I. MATHESON & CO., LTD.**
*Manufacturing Engineers*
**New Glasgow, Nova Scotia**
tf

# WILLIAMS' CONDENSED LIST MACHINE TOOLS

ENGINE LATHES

12" x 6' DAVIS, Q.C.G., compound rest
14" x 6' McKENZIE Standard, new
15" x 6' SIDNEY Tapers, taper and form attachments, new.
16" x 8' CISCO D.B.G., Q.C.G., new
18" x 8' LEBLOND D.B.G., Q.C.G., 6" pat. compound rest
19" x 20' LEBLOND quick change gear, new
21" x 8' LEBLOND heavy duty, new
22" x 10' LODGE & SHIPLEY, geared head, Q.C.G., new
22" x 12' DAVENPORT heavy duty, new
24" x 12' C.M.C., D.B.G., Q.C.G., new
28" x 10' CONRADSON geared head, new
30" x 22' BERTRAM compound rest
38" 62" x 25' LONDON Gap Lathe compound rest
26"-48" x 30' McCABE, 2 spindle, motor drive

MILLING MACHINES

No. 2½ BROWN & SHARPE Universal.
No. 12 BROWN & SHARPE, plain
No. 2 CINCINNATI Universal
No. 2B OSTERLEIN, heavy duty, new
No. 3½ LEBLOND Universal, new.
No. 2B HENDEY Universal, new
No. 3 CINCINNATI, plain.
No. 3 HENDEY, plain, geared head, new
No. 4 LEBLOND, plain, heavy duty, new.

SHAPERS.

14" SMITH & MILLS crank, new.
16" McKENZIE Lass geared, crank, new.
16" and 20" KELLY, B.G., crank, new
16", 24" and 28" GOULD & EBERHARDT high duty, new
26" CANADA MCHY CORPN., B.G., crank, new.

PLANERS

52" x 48" x 12' NEW YORK ENGINE CO., three heads
52" x 52" x 12' CANADA TOOL WORKS, one head
46" x 40" x 20' PUTNAM, one head.

42" x 12" x 6' NEW HAVEN, [illegible]
30" x 30" x 8' MacGREGOR-GOURLAY, six head.
40" x 38" x 20' BERTRAM, one head
34" x 30" x 8' BERTRAM, [illegible]

DRILLS.

No. 21 COLBURN heavy duty
CINCINNATI-BICKFORD, heavy duty.
28" and 42" BARNES, sensitive head
30", 22½" 25" BARNES, sensitive head
22½", 28" and 32" SIBLEY, new
15" BARNES, geared
10" and 12" PERFECT & McKENZIE, sensitive
14" LELAND-GIFFORD & AVEY, sensitive.

RADIAL DRILLS

5' REED-PRENTICE, speed box, new
5' LONDON, speed box, motor drive
7½' and 4' POSDICK, speed box and tapper, new
5' and 3½' DRESSER, speed box and tapper, new
4' C.M.C., speed box and tapper, new.

GRINDERS

12" x 52" LANDIS, plain, self-contained
6" x 18" LANDIS, plain, self-contained.
18" x 9" NORTON, plain
No. 1 LEBLOND Universal.
DOMINION Universal
No. 1 CINCINNATI Universal.
WILMARTH & MORMAN, surface.
No. 2 LASALLE surface
WING, hand surface.

CUTTING-OFF MACHINES

6" Williams, new.
6" Globe, new.
4" Davis.
3" Williams.
3" Hollo-Grip

GEAR-CUTTING MACHINES.

No. 2 3" Brown & Sharpe
36" Newes & Philips.
12" S. & S. Gear Hobbing Machine.

**The A. R. Williams Machinery Co., Limited**
64 Front Street W. - TORONTO



# Shell Gauges, Etc., Remaining on Hand June 13th, 1918

[illegible]

**MANITOBA ENGINES LIMITED**
BRANDON, MANITOBA, CANADA



# *RIVERSIDE Machinery Depot*

*We Own Every Tool Offered*

LATHES

[illegible]

TURRET AND SCREW MACHINES

[illegible]

GRINDERS AND MILLING MACHINES

[illegible]

GEAR CUTTERS

[illegible]
2—No. 13 Brown & Sharpe Automatic Spur and Bevel Gear Cutters.

PLANERS, BORING MILLS AND SHAPERS

[illegible]
2—16" Milwaukee Shapers (new).
[illegible] Milwaukee Shapers (new).
[illegible]
1—20" [illegible]
[illegible]
1—18" [illegible]
[illegible]

DRILL PRESSES

[illegible]
1—2-spindle Baker H.D. Drill.
[illegible]
1—12-spindle Pratt & Whitney Drill.
3—20" Buffalo B.G. P.F. Drill Presses (new).
3—20" Buffalo Drill Presses (new).
[illegible]
1—14" Henry & Wright H.S. Drill Press.
[illegible]
2—14" U.S. Plain Drill Presses (new).
2—20" Excelsior Plain Drill Presses (new).

PRESSES AND PLATER

[illegible]
1—No. 2-W Bliss Wiring Press.
[illegible]
1—No. 1 Sidney O.B.I. Press (new).
[illegible]
1—No. 3 Sidney O.B.I. Press (new).
[illegible]
1—No. 2 Williams & White Bull-dozer.

STEAM ENGINES

[illegible] Engine.
1—13 x 15 Erie R.H. 4-valve Automatic Engine.

We also carry in stock Steam Pumps, Elec-

**RIVERSIDE MACHINERY DEPOT**
21 St. Aubin Ave.,
DETROIT, MICH.


*If any advertisement interests you, [illegible]*

## First-class slightly used machines. Immediate shipment

ENGINE LATHES

[illegible]

TURRET LATHES

7—24" W. P. Davis Machine Co.

1—24" Bullard Machine Co.
4—24" Gisholt Co.
2—21" Gisholt Co.

HAMMERS

2—No. 500-lb. Beaudry

MILLING MACHINES

No. 5 Becker Vertical

GRINDERS

No. 3 Landis Universal (Less Internal Att.)
10 x 30 Plain Landis (Universal Headstock).
12 x 66 Plain Landis (Universal Headstock)

GEAR CUTTERS

2—Brown & Sharpe No. 3, 26" Automatic

SHAPERS

2—Back Geared, 18" Stroke

MOTOR

100 h.p., 900 r.p.m., 550 volts, 60 cy., 3 ph., C.G.E.

MISCELLANEOUS EQUIPMENT USED ON 4.5 B.H.E. SHELLS

150 Ton Perrin Hydraulic Press
5 Perrin Triplex Pumps
No. 2 West Tire Band Setter
Hurlburt Rogers Cut-off Machine
Furnace, 7-hole Tate Jones
2 Gray Sand Blasts
Bowser Varnish Tank and Pump
Single Purpose Lathes: 1 Jenckes; 2 Duplex
Internal Shell Grinder (Marsh Henthorn)
Ford-Smith Filing Machine
4 Thread Milling Machines
2 Rivetting Hammers (High Speed Hammer Co.)
2 Shell Washing Tanks
Reseating Machine

**If the machinery you need is not in the above list, let us know. Our stock of both new and used tools is continually changing.**

# Garlock-Walker Machinery Co., Ltd.

**Main 5346** **32-34 Front Street West, Toronto, Ont.**

*"EVERYTHING IN WOOD WORKING AND METAL WORKING MACHINERY"*

# Used Mining Machinery FOR SALE

## First-class Condition

Blake Crushers, Fraser-Chalmers Tube Mill and Motor, Power and Mining Tube Mill and Motor, Hardinge-Ball Mill Air Compressors with motors, Oliver Filters, Aikin Classifiers, Pumps, Tanks, Belting, Pulleys, Boilers, Lighting Generators, Crocker Wheeler Transformers, Copper wire for transmission lines, Steel Drills, Rails, complete Mill. For prices write

## Zenith Coal & Steel Products, Limited

**402 McGill Bldg. - - MONTREAL**

**1410 Royal Bank Building, Toronto**

# GOOD USED EQUIPMENT

TRAVELING CRANES

25-ton Niles, 75' span, 220 or 500 V. DC.
25-ton Case, 28' 1" span, 220 V. DC.
20-ton Shaw, 55' 10" span, 110 V. DC.

PUNCHES AND SHEARS

Double, 15" thts., cap. 1¾ x 1", No. 13 WW.
Double, 12" thts., cap. ⅝ x ⅝", Queen City.
Double, 15" thts., cap. ¾ x ¾", Fischer.
Single, 25" tht., cap. ¾ x ¾", Queen City.
Single, 9" tht., cap. 1 x ¾", Champion (2).
Bar Shear, double, 12" blades, cap. 2" sq.
Bevel Shear, Thompson, rated cap. ½".
Guillotine Shear, cap. 2½" sq., No. 6 Perkins.
Guillotine Shear, No. 0 H. & J., 7" blade.
Guillotine Shear, Fischer, cap. ⅜ x 17".
Squaring Shear, 48" Bertsch Gap, rated cap. 3/16".

PRESSES AND BRAKES

No. 225 Adriance, 2" stroke, geared, 7000-lb.
No. P-5 Ferracute, 1½" stroke, plain, 6500-lb.
No. 4 Stiles, 1½" stroke, plain, 5000-lb.
No. 11 Perkins, straight sided, trimming, 4" stroke, bed 24 x 30", 16,000-lb, side shear.
No. 65 Special Toledo (Cam) 7 and 4" strokes, geared.
13' 6" Garrison Brake or Press, cap. ¼", 118,000-lb.

MISCELLANEOUS

Bolt Cutters, 2½" Morgan, 2" Acme and 1½" Landis.
Bulldozer, No. 7 Ajax, 20" stroke, belted.
Miller, No. 24 Oesterlein Universal, table 9 x 36".
Shapers, 24" Cincinnati and 24" G. & E., crank.

**Prompt Shipments—Partial List**

## McCoy-Brandt Machinery Company

**216-18 Penn Ave. Pittsburgh, Pa.**

# A MAN

was wanted as Tool-room Foreman. He was found by a condensed ad. in

CANADIAN MACHINERY
*Classified Advertising Section*
143-153 University Ave., Toronto

*consult our Buyers' Directory and write advertisers listed under proper heading.*

# *Mr. MacAloney goes us one better!*

IN the June 13th issue we ran an ad on page 71 headed "When you're looking for a job, what do you do?" We suggested that you might wait for a friend to "put you wise" or inquire at different plants, but would probably look over the "Help Wanted" columns of the first paper you picked up and get your job by answering one of the ads.

And we told you why only the good jobs are offered in CANADIAN MACHINERY and why—but that's another advertisement. We started to tell about Mr. H. T. MacAloney, works superintendent of a large Ontario plant. Our ad recalled to him the last time he was looking for a job, on which occasion CANADIAN MACHINERY played a prominent part, so he wrote us about it.

"What you say is all right so far as it goes," he says. "But it doesn't go far enough. When I was looking for a job three years ago, I asked friends, answered ads and inquired at different plants just like you say in your ad. But I went you one better—I advertised for a job, in CANADIAN MACHINERY, and got one—the job I have now.

When a man knows he's a good workman and isn't going ahead, *then* is the time to advertise for something better. Most men don't seem to realize that to a prospective employer this indicates confidence in their ability to make good and shows them to be progressive and up to the minute. It's a pity more don't think of this because many of them are losing opportunities galore to better their positions."

We leave Mr. MacAloney's suggestion with you. And we recommend our Classified Advertising Section if you decide to adopt it. It's the only place your advertisement will be effective. CANADIAN MACHINERY is read in shops all over Canada by the men you will want to interest and the Classified Advertising Section is followed closely by the majority of them.

Our rates are low—two cents a word for first insertion and one cent a word for subsequent insertions, minimum order $1.00. Send us your ad to-day—if you prefer, give us the particulars and we'll be glad to write it for you.

Canadian Machinery, 143 University Ave., Toronto

*Classified Advertising Section*

# PARTIAL LIST OF TOOLS

32" x 24' Fay & Scott Lathe, raising blocks to swing 53".
4 Mueller Single Pulley Drive Radial.
2 20" Rockford High Duty Drills.
New Little Giant Belt Hammer.

**FRANK TOOMEY, INC.**
127-131 North Third St., PHILADELPHIA, PA., U.S.A.

## Is Your Product Used In Power Plants?

THERE is a man in every power plant whose influence is felt when a sale is made. Are you on good terms with that man?

Follow the line of least resistance—follow the example of firms who are successfully doing business in the power plant field, and cultivate the engineers through POWER HOUSE.

...ask the engineers you run across just what they think of *their* paper. Their opinions will guide you to an advertising campaign in POWER HOUSE just as surely as though the publishers had directed you. Ask for application.

**POWER HOUSE**
*Published by The MacLean Publishing Co., Limited*
153 University Ave., Toronto

# Tool Grinding Chart

Showing clearance and rake angles for cutting tools. 17 x 27½ inches, printed in two colors on heavy manilla stock.

A splendid thing for any tool room. One large engineering firm, in acknowledging this chart, stated that they would like two additional copies as they intended adopting it as standard in their tool room.

We would like these charts placed in every shop in the Dominion and if there is not one in YOUR tool room, write for your copy at once. IT'S FREE.

---

CANADIAN MACHINERY,
153 University Avenue, Toronto.

Please send me / us free, one of your tool grinding charts.

Signed.....
Firm Name.....
St. Address.....
City .....
Prov. .....

# MACHINERY FOR SALE

1—ATLAS VERTICAL BORING AND TURNING MILL 12 ft. 2 in. swing, 40 inches under tool blocks. Two adjustable heads, and one central boring head on cross rail with power drive, two back heads. Complete with countershaft

1—SANDERSON STANDARD PIPE THREADER suitable for all sizes of pipe up to 8 inches.

1—GRANT TURRET LATHE 42 in. swing, suitable for heavy chucking work.

3—LANDIS 4-IN. SINGLE HEAD BOLT CUTTERS. Standard lead screw attachment, pump, countershaft. Left hand stud and pinion, full left hand gauge and wrench equipment.

1—DUNDAS 62 x 62 x 29 0 PLANER. Two heads on rail, complete with countershaft—in first-class condition.

*For further information apply to*

**CANADIAN INGERSOLL-RAND COMPANY, LIMITED**
SHERBROOKE, QUE

# We Buy For Cash

## Used Machinery, Metals of all kinds, Shafting, and Electrical Equipment

We gather together the various materials and products that have served their purpose in the economic machine and start them over again in new forms through this machine.

**Forward us a list of what you have and obtain our prices**

*Because we Buy for Cash we can Sell at Attractive Prices*

Motors, Generators, Transformers, Electrical Equipment, Water Wheels, Shafting, Pulleys, Hangers, Rails, Locomotives, Boilers, Cars, Engines.

WE INVITE YOU TO TEST OUR SERVICE AND PRICES

**DOMINION IRON & WRECKING CO., LTD.**
General Offices: Transportation Building, MONTREAL

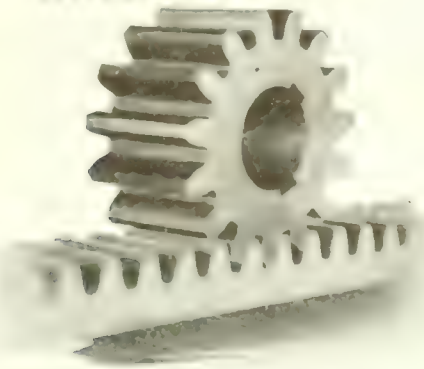
# SPECIAL MACHINERY

Special Machinery, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Forgings, Etc.

# CONTRACT WORK

RACKS and PINIONS

LARGE SIZES OR SMALL



CUT GEARS

GET OUR QUOTATIONS

HAMILTON GEAR AND MACHINE COMPANY
VAN HORNE STREET, TORONTO

## We Do Contract Work

Grey Iron Castings, Bench and Floor Molding, also any class of machine shop work.

**Canadian Rumely Company, Limited**
48 Abell Street, Toronto

## COMPLETE MACHINES AND PARTS MANUFACTURED

Send us your sample or blueprint of work and get our estimate.

**CANADIAN BARKER CO., LTD., Sault Ste. Marie, Ont.**

## Elliott and Whitehall Machine and Tool Co.

*Manufacturers* GALT, ONT.

Shell Tools and Gauges
Special Machines

Jigs and Fixtures, and
General Machine Work

Shell Machines Overhauled and Tooled Up

*PROMPT ATTENTION TO ALL WORK.*

*SATISFACTION GUARANTEED.*

## SHAFTING

We have supplied both new and used iron and steel shafting in sizes up to 24" diameter. Whether large or small, communicate with

B. ENUSHEVSKY & SON
TORONTO - - - CANADA

Kindly mention CANADIAN MACHINERY when writing to advertisers

# CUT GEARS

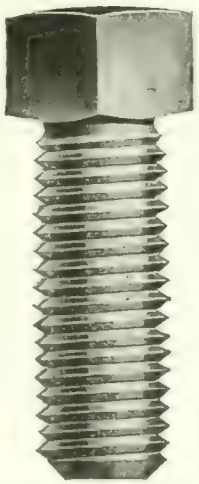
*Theoretically Correct*

PROMPT SERVICE

**ROBERT GARDNER & SON**
LIMITED
52 NAZARETH ST., MONTREAL, P. Q.

RAWHIDE OR METAL

# ACCURACY

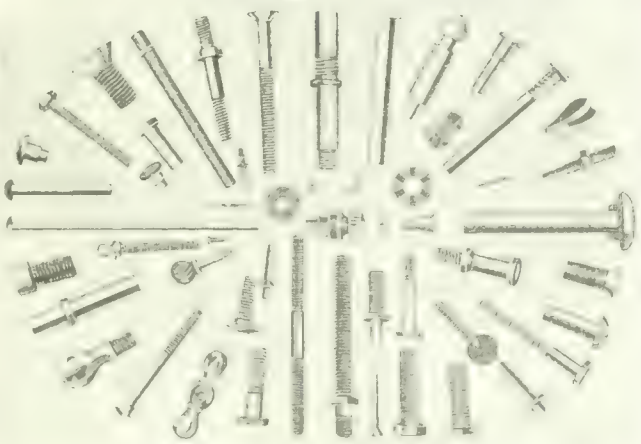


The discriminating buyer is the one we like to meet—the one who insists on accurate product. He will eventually buy "GALT" Cap and Set Screws because they measure up to his standard

Your rush orders for S. F. Hex. nuts taken prompt care of. Better finished nuts—try a sample.

THE
**GALT MACHINE SCREW CO., LIMITED**
**GALT, ONTARIO**

Eastern Representatives: The Canadian B. K. Morton Company Limited, 49 Common St., Montreal, Que.



## Automatic Screw Machine Products

ACCURACY QUALITY

Our Mechanical Engineers are at the service of our Clients.

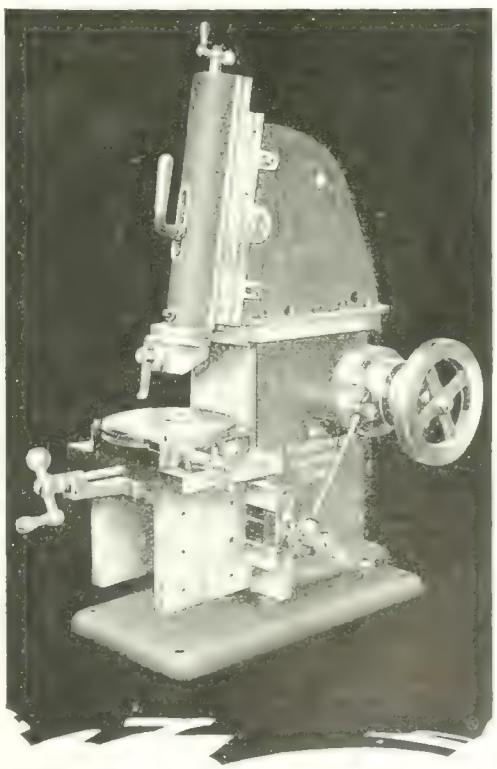
**United Brass & Lead, Limited**
St. Helen's Avenue, - Toronto

W. L. TOBIAS, *Superintendent*
Formerly Superintendent National Cash Register Co.

MORE WORK AT REDUCTION IN COST

*Rhodes Combined*
## Shaper and Slotter

Light-running, easy to handle—far more efficient than heavier and complicated tools. Lead in every way for light and thorough accurate work. They're saving production costs in all parts of the world.



Maximum efficiency at minimum cost is the Rhodes slogan—and it's true. Illustration shows $3\frac{1}{2}$ in. bench type vertical crank shaper. Let us tell you fully of all various types.

THE RHODES MFG. COMPANY
*Owned and Operated by the Jacobs Mfg. Co*
HARTFORD, CONN., U.S.A.

# Lowering the Cost of Getting Orders

THEY were talking about the high cost of getting orders—were Brown and Jones. They were agreed on some things: train service was interfering with ability of salesmen to call on as many as formerly; hotel bills were adding heavily to the weekly expenses of salesmen; congested freight and express service was interfering with quick deliveries; salaries of men were going up; labor of all sorts, as well as materials, was becoming higher-priced.

Then Brown said: "I am giving a good deal of thought to the training of my salesmen. I am endeavoring to save them needless waste of time—to sell more goods, and to reduce the number of futile calls. I notice that they are giving much attention to this subject in the United States, and that in Canada some firms are paying serious attention to this matter of better salesmanship."

"What are you doing?" said Jones.

"Well, I haven't got far as yet, for I am in the initial stages of my studies. But one thing I have learned: it is that my men haven't been analyzing the causes of their failures to make sales. I can't blame them, for I myself haven't troubled myself to dig into this phase of the selling game. Now I [illegible] Why the failure to get the order?

"I have discovered a good deal. One thing is that my men haven't known enough about the goods they took out to demonstrate them convincingly. This is largely our fault. So we are using time and printed matter to make our men know exactly what they have to offer.

"Another thing we have had impressed on us is that our men haven't been approaching their prospects always in the best way. They have been too keen to sell rather than to serve.

"I saw a thing the other day that is good—by a man named Casson. He said the average salesman's method was 'Talk—Argue—Compel.' As against this, he recommended: Listen—Argue—[illegible]

"What he means is that the salesman must get on the side of the buyer if he is to have best results. And so I am doing something to get my men trained to acquire the point of view of the man they canvass—this first. When a salesman postpones his sales talk until he has won the interest and attention of the prospect, he is in a much more favorable position to put across his proposal.

"I read recently an advertisement of the FINANCIAL POST in which it told of Frank Mutton, President of the International Business Machines Company, in which he said that he has subscribed to THE POST for each of his salesmen in order that they may be well informed about business conditions and affairs in Canada—this as an aid in making sales. The idea, I infer, is to make his men quick to get the point of view of the men they are to canvass—to become possessed of a kind and amount of information which will enable them to make themselves interesting to prospective buyers of time-recording machines.

"Now, I have known Mutton for many years—known him to be a super-salesman. In subscribing to THE POST for his salesmen, I saw one of his methods—secrets, if you like. So I got THE POST myself to see how my men could make use of it for the same objects.

"I have subscribed to THE POST for 4 months at the cost of a dollar per salesman, and I have been having my men report to me in writing just how they are finding THE POST useful to them. They read THE POST with one question uppermost: What item or article in this issue can be used by me to help me make sales?

"I want to tell you, Jones, that I am delighted with the experiment. The minds of my men have been stimulated. They are 'cashing in' on what they read. They relate certain items or articles to certain prospects, and they are approaching their customers with greater confidence, greater art, and with more persistency, born of a surer knowledge of how our product is worth the other man's consideration and purchase.

"My men are bringing in more business, and this offsets the increasing costs of going after business."

* * * *

A VERY suggestive conversation, is it not? The point of its reproduction here: If you think the idea put into operation by Brown (and Mutton who is paying for 50 subscriptions for men in his employ) is worth your consideration, then investigate THE POST for yourself. Instruct us to send THE POST to you that you may investigate it from the angle—What is there in this paper that my men can use to help them "get next" their prospects with a view to making more sales and in quicker time?

So we suggest to you that you sign the coupon below.

Just what does THE FINANCIAL POST aim to do? The answer is: It gives business men information about every important happening in every part of Canada as this happening relates to Business. It follows the various listed and unlisted securities, and gives each week clear and accurate and up-to-the-minute information about them. It tells about the movements and influences affecting such groups of investment interests as Iron and Steel, Textiles, Milling, Pulp and Paper, Transportation, and so on. It has numerous contributed articles of first-class interest and importance. It contains much personal matter—notes and sketches about men of influence or position in the public eye whose doings or sayings have relation to Business. What's more, THE POST is extremely readable. It is edited and prepared by trained journalists—the highest-priced staff of men on any publication in Canada. All this makes THE POST a "different" paper, and a good one. The subscription price is $3.00 (52 issues — Saturdays); or 4 months for one dollar.

---

The MacLean Publishing Company, Ltd.,
143-153 University Avenue, Toronto.

Send me THE FINANCIAL POST (weekly, every Saturday). Subscription price of $3 will be remitted on receipt of invoice in the usual way. Have it addressed to

.....

.....

# Flint Shotting Saves Machining Cost

In **two** ways:

1. By Flint Shotting CASTINGS or FORGINGS, so much of the fins and unevennesses can be removed **by wholesale** that the subsequent machining is reduced to the minimum.

2. By Flint Shotting Hot Rolled Stock or Heat-treated Forgings the mill scale and furnace scale—both ruinous to tools—are removed, and the life of breaking-down tools, milling cutters, etc., multiplied. At the same time the **output** per man per day is increased—even doubled.

Flint Shotting has been called "sand blasting with a college education"—because Flint Shot is a precise, accurate, uniform, scientifically-produced form of sand blast "sand."

Note the "quotes" around the word "sand"—because Flint Shot is really not sand at all, but a **manufactured** product, secured by disintegrating St. Peter's Rock and segregating, washing, drying and screening the pearl-like nodules of **pure flint** contained in the rock.

The fact that one car of Flint Shot lasts as long and does as much sand blasting work as two or three cars of natural sand is of peculiar interest just now, no matter how far you may be from our big plants at Ottawa, Illinois.

We can load your car immediately.

Envelope sample and quotation will echo your telegram, instanter.

## United States Silica Company

**Sole Producers of Flint Shot** **430 Peoples Gas Bldg., Chicago**

# The Cost of Labour and Material

makes it more than ever necessary to get value for costs.

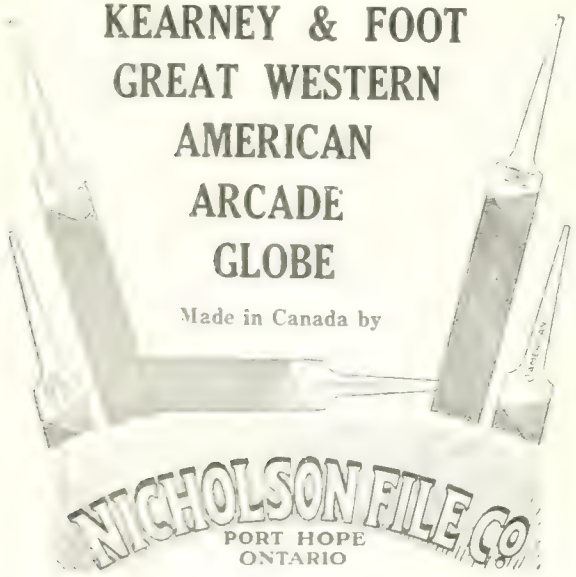
You will find, for instance, that it is more economical to have a mechanic turn in a file that has passed its "efficient" point, than have him use double the time on a job because of a dull file.

Also, remember, when buying files, to specify "Famous Five." They are well balanced and stay hard and sharp because they are accurately cut and properly hardened.

They are:

KEARNEY & FOOT
GREAT WESTERN
AMERICAN
ARCADE
GLOBE

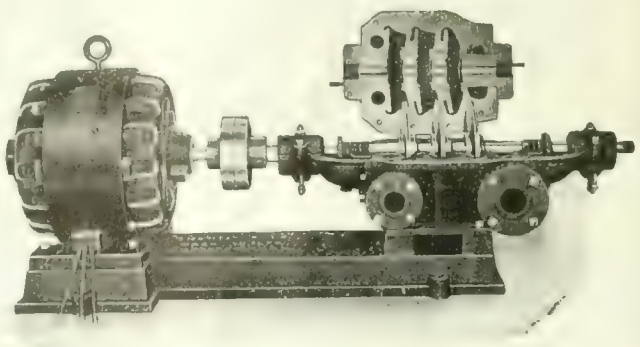
Made in Canada by




We will appreciate an opportunity of figuring on your requirements in

## Pumping Machinery

Steam and Power
Vertical and Horizontal



The Smart-Turner Machine Co., Ltd.
HAMILTON, CANADA

## BIG ORDERS AND REPEAT ORDERS

are proof of the efficiency of the

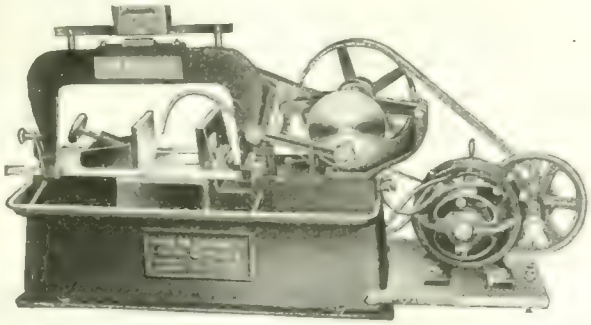
### M. E. C. Air-Operated Expanding Mandrels

The M. E. C. Mandrel shown herewith is particularly adapted for rough and finish turning—compensation Mandrel is furnished for cutting rough shell forgings to length and for centering. Used in large numbers by shell manufacturers.

Write for catalog on all M.E.C. Labor-Saving devices.

Manufacturers Equipment Co.
171 North Jefferson St., Chicago, Ill., U.S.A.

*Canadian Agents:*
J. R. STONE TOOL & SUPPLY CO.
Detroit, Mich.



Standard the World over

## The "RACINE" High Speed Metal Cutting Machine

Combination vise holds the stock close to the blade, enabling the operator to cut short pieces at any angle.

Cuts Angles, Channels, I-beams, Die Blocks, Pipe Tubing, etc.

This is the machine for the shop that studies economy.

# Built for Speed!

## *And the "Racine" is as Accurate as it is Speedy*

In the **Racine High Speed Metal Cutting Machine** you get a tool with extraordinary productive power, and second to none in accuracy. It is compact, strong and rigid.

Saw frame guide of heavy semi-steel that will not spring. It holds the saw frame rigid, insuring accurate cuts.

All bearings long, heavy and adjustable, so that you can take up any wear that may occur from time to time.

We ship "Racines" on a trial basis. Get our proposition.

**Racine Tool & Machine Co.**

**15 Melbourne Avenue** **RACINE, Wis.**

# "ECLIPSE" SUD AND LUBRICATING PUMP

**BRITISH MADE BY BRITISH LABOUR.**

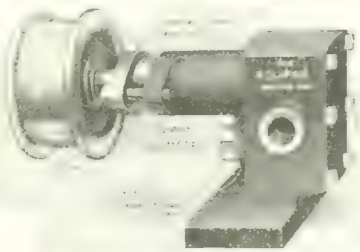
Made in 3 sizes:

½ ¾ 1

20 -($4.86) 27/-($6.56) 34'-($8.26)

Cash; Ex-Works.

All with Relief Valves.



Unquestionably a high grade Pump at a **low price.**

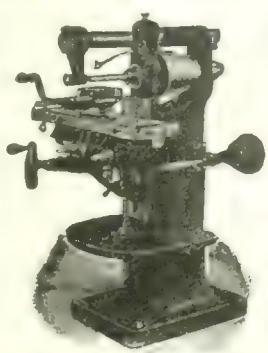
Fitted with **Gunmetal Wheels, Bush and Glands** at the price of Steel Wheels and C.I. Glands.

**Will prove superior to any Pump with Steel Wheels and C.I. Glands, &c.**

*AGENTS WANTED*

**FRY'S (London) LIMITED,** HEAD OFFICE: 46, UPPER THAMES STREET, LONDON, E.C. 4.
WORKS: GREENWICH, S.E. 10

# Increased Production Means Increased Profits



Large Millers for large work —STEPTOE MILLERS for small work

Large Planers for large work —STEPTOE SHAPERS for small work.

**Will result in increased production; less money invested in machinery, and increased profits.**

**THE JOHN STEPTOE COMPANY**
**CUMMINSVILLE, CINCINNATI, OHIO, U.S.A**
Canadian Representatives: Garlock-Walker Machinery Co., Toronto, Ont.

# Fearless and Entertaining

This is the most momentous time in history, and you want your reading to keep you abreast of what is happening in the world. You want articles that are timely, vital, fearless. Here's what is offered in June MACLEAN'S:

**Must the British Empire Cease to Exist?** Must all nations as strong as Britain's collapse or exist? Read what is said on this subject by - - - - - - **H. G. Wells**

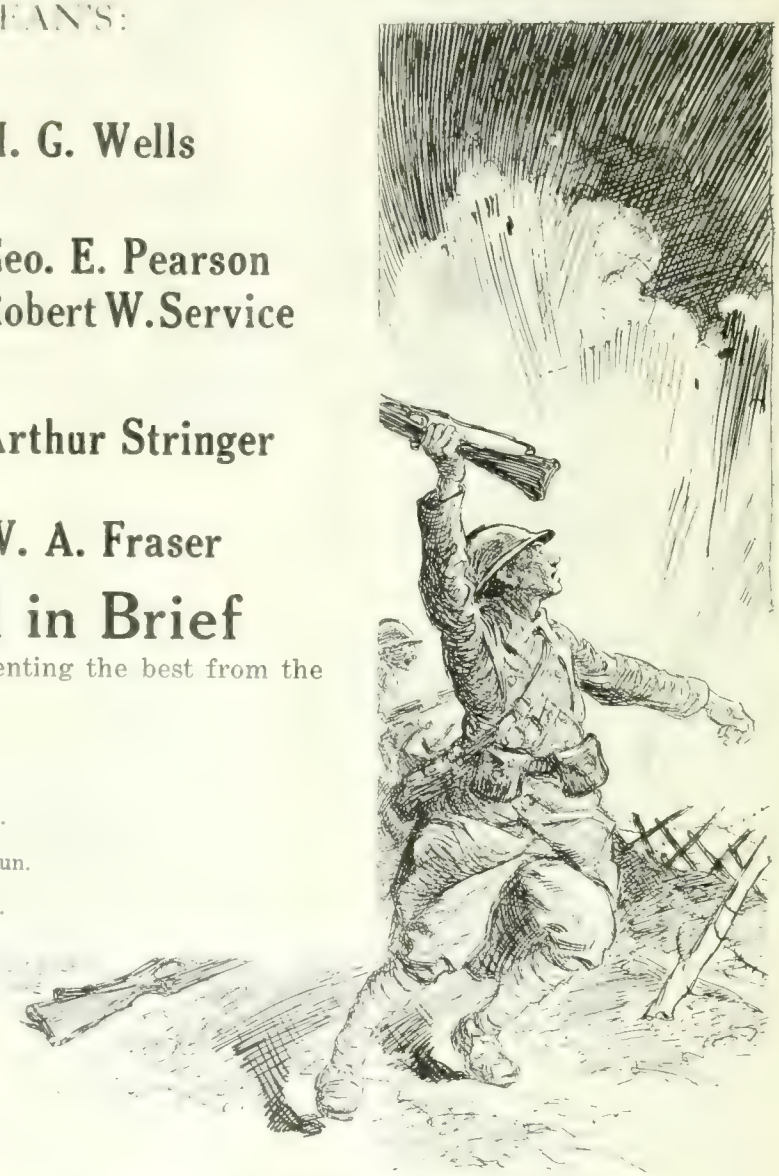
**When a thousand guns play on a single trench,** what happens in that trench? A powerful description by one who lived through it by - - - - - - **Geo. E. Pearson**

A soul-stirring ballad of the trenches by **Robert W. Service**

**Galvanizing the Government at Ottawa.** An article on the work of the Ginger Group.

A gripping mystery story by - - - **Arthur Stringer**

**The Three Sapphires**—A new serial story combining Hindu mystery and war intrigue by a great Canadian novelist. **W. A. Fraser**



## News of the World in Brief

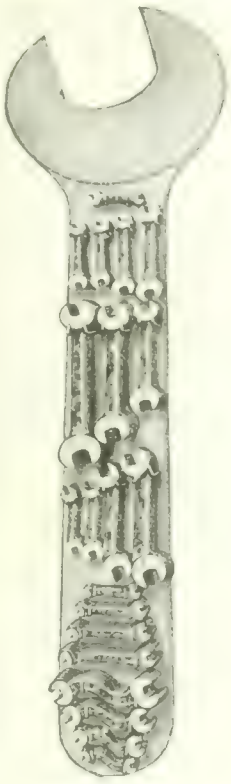
The following articles are reprinted as representing the best from the best magazines the world over:

Is This Germany's Plan?
Is Japan Seeking a New Ally?
How Allied Victory Was Lost.
Is Foch Another Napoleon?
How Germany Annexed Turkey.
The Death of General Maude.
That Mysterious Long Range Gun.
How Bolo Pasha Was Caught.
The World is Growing Warmer.
Super-Kaiser or Little Willie?

# JUNE MACLEAN'S

"Canada's National Magazine"

At All News Stands - 20c.



Display Board

## This is No Free Offer of

# Williams' Superior Drop-Forged Wrenches

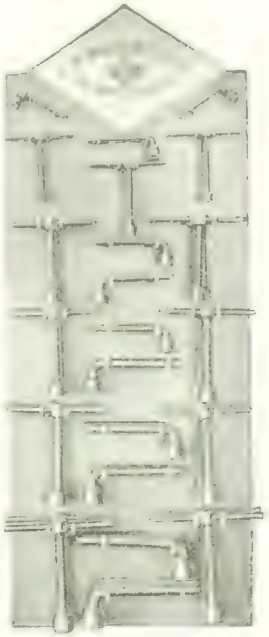
It is but another evidence of J. H. Williams & Co.'s policy to make your display and sale of Williams' Wrenches attractive and profitable. We shall be well paid for the board in the increased business we acquire through your use of it, and in the added satisfaction it affords you and your trade.

### You Buy the Wrenches

a carefully selected assortment that provides the widest range of usefulness. Their finish and physical qualities are unexcelled; and they enjoy a larger consumer demand among mechanics than all others combined.

We have additional Display Boards fully described in our "Silent Salesman" Booklet; it's free, with your imprint, if desired.

**Western Office and Warehouse:**
**45 South Clinton Street, Chicago**



Socket Wrench
3 Wrenches each size



# There's a man

advertising on page 70 for a position.

Have you a position open that he could profitably fill? If you have, write him. If you have the position and don't think he can fill it, advertise for one who can.

**Canadian Machinery**

*Classified Advertising Section*

143 University Avenue, Toronto



# Let them know it's there

In commenting upon the results secured from their advertisement in the classified section, one advertiser said:

> "Of course we would not have sold it without letting people know it was here, that is obvious, and thanks are due you for letting the people know it was for sale."

If you have any old or used equipment for sale, let people know it's there. Your message in Canadian Machinery will be placed before the probable buyers of such equipment.

**Canadian Machinery**

*Classified Advertising Section*

**143 University Ave., TORONTO**

# HINTS TO BUYERS


## BRISTOL'S ELECTRIC PYROMETERS FOR EVERY SERVICE

Recording Pyrometer furnished with patented frictionless movement, complete with indicating scale for process requiring exact heat treatment.

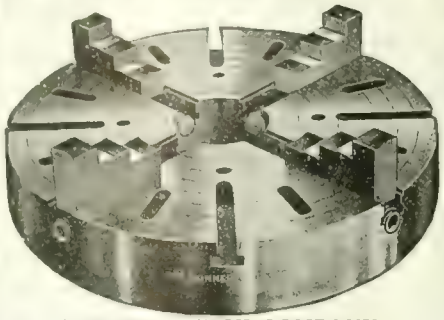
Simplicity of construction and ruggedness make them ideal shop pyrometers. The ONLY pyrometer guaranteed with Western multi-voltage instrument.

Write for Bulletin 1-205.

THE BRISTOL CO.
WATERBURY, CONN., U.S.A

## Skinner Independent Chucks

FOR HIGH SPEED WORK
IRON OR STEEL BODY



The last word in chuck construction.

Wide jaws: hardened steel thrust bearings; adjusting screws of large diameter, threaded full length; jaws ground after hardening, etc.

Write us to-day for prices.

THE SKINNER CHUCK COMPANY, New Britain, Conn.
New York Office: 94 Reade St. N.Y.
Factory and Main Office: New Britain, Conn.
London Office: 149 Queen Victoria Street
San Francisco Office: Rialto Building

## SHAFTING

Cold Drawn, Turned and Polished Steel, Rounds, Squares, Hexagons and Flats, Steel Piston Rods, Pump Rods.

Special facilities for Keyseating up to 6 in. diameter.

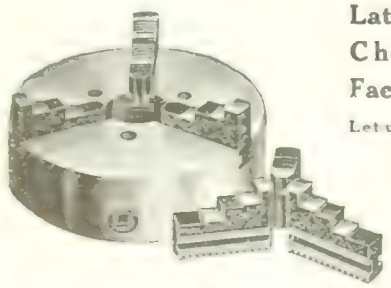
THE Canadian Drawn Steel Co. LIMITED
HAMILTON CANADA

## STEEL CASTINGS

We are well equipped to make all kinds of steel castings, 100 lbs. to 50,000 lbs.

Dominion Steel Foundry Co. LIMITED
Hamilton Ontario

## Cushman Chucks

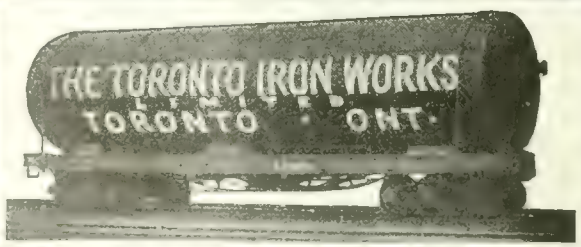


Lathe Chucks, Drill Chucks, Portable Face Plate Jaws.

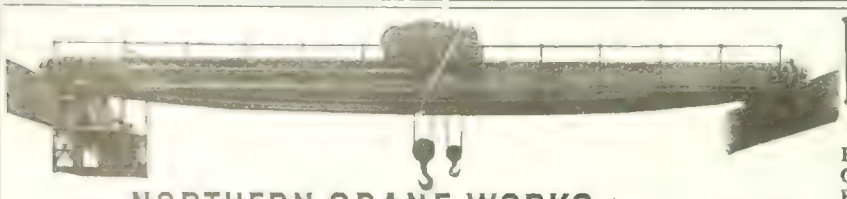
Let us send you our catalog.

The Cushman Chuck Co.
Hartford, Conn., U.S.A.

## RIVETED STEEL TANKS FOR EVERY PURPOSE




OIL STORAGE - GASOLINE TANKS - AIR RECEIVERS
PNEUMATIC WATER SUPPLY TANKS - SMOKE STACKS
BOILER BREECHING - RIVETED STEEL PIPE - BINS & HOPPERS



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*"MADE IN CANADA"*

Electric Traveling Cranes, Hand Cranes, Electric Hoists, Air Hoists Foundry Equipment, Cupolos, Ladles, Etc., Etc.

NORTHERN CRANE WORKS LIMITED
WALKERVILLE, ONTARIO

# DIAMOND POINTED TOOLS

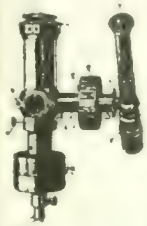
Our line comprises Diamond Pointed Tools for every industrial purpose. We are also equipped to furnish promptly special Diamond Pointed Tools of every variety. Quality products.

ORDER FROM ST. CATHARINES if more convenient. Complete stock — quick service. Goods submitted on memorandum to responsible firms.

**Wheel Trueing Tool Company, 88 West Pitt Street, Windsor, Ontario**

John W. Gordon, Manager, 7 St. James St., St. Catharines.

## For Hardness Testing



in shop and laboratory use the

**Standard Scleroscope**

Universally adopted, direct reading, inexpensive, and the only instrument that agrees with others of its kind in all parts of the world, thus solving problems of ordering materials to specification.

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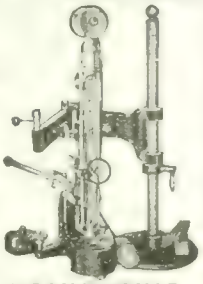


THE SCLEROSCOPE (Set)

## Heat Indication

THE PYROSCOPE

by optical means is fast becoming the correct thing. The PYROSCOPE has solved the problem. Perfect constancy, inexpensive, no electricity used. Built to stand rough usage and upon common-sense lines. Used by the Government and best firms.

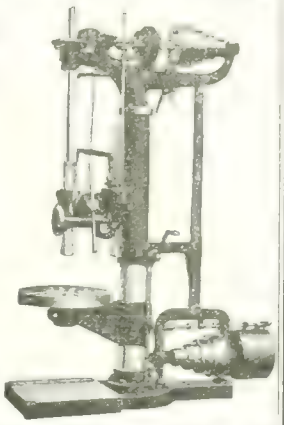
**Shore Instrument & Mfg. Co. 555-7 W. 22nd St. New York**

Agents for Canada: A. R. Williams Machy. Co., Ltd., Toronto, Can.

## For 40 Years Silver's Drills

have been favorably known in both the States and Canada.

With Silver's new 25" Upright Drilling Machine six positive geared feeds are instantly obtained while machine is running. Write to-day for complete specifications.



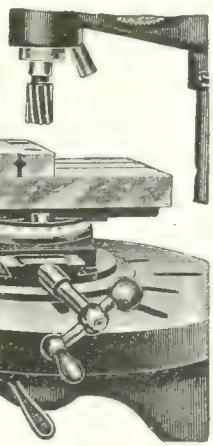
**The Silver Manufacturing Co.**

290 Broadway Salem, Ohio

## THE DAVIS MILLING ATTACHMENT

*and Compound Table*

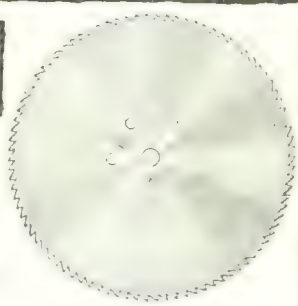
For the Die Maker, Repair Shop, Pattern Maker or Garage; will perform more than 90% of the jobs that come up.



For any Drill Press 14" to 42" swing. Big Economy — Big Convenience — Small Price. It relieves your large millers, comes in handy spotting castings, milling ends of bosses, and many other odd jobs. Cuts all kinds of keyseats perfectly; mills deep grooves, slots and cams. We also make cylinder reamers for reboring Ford car, and a reliable air compressor—all at special factory prices. Write for circulars to-day.

**Hinckley Machine Works,** HINCKLEY ILLINOIS

## HUNTER



**Circular Metal Cutting Saw Blades**

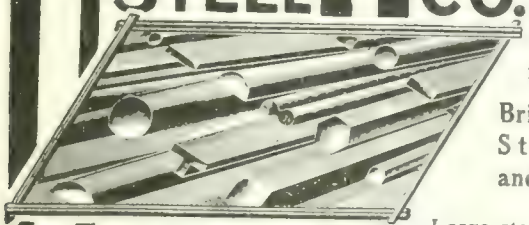
*For Any Type of Machine*

Unequalled for cutting Ingots, Bars, Forgings, Castings, Rails, Structural Shapes etc. Sizes from 10" to 84" diameter.

Hot Saws, Friction Discs, Solid Blades made from Vanadium, Tungsten and Chrome Alloy Steels. Saw Sharpening Machines, Inserted Tooth Grinders, Hardened Steel Specialties, etc. Write for prices.

**Hunter Saw & Machine Co., Pittsburgh, Pa**

## UNION DRAWN STEEL CO. LTD.



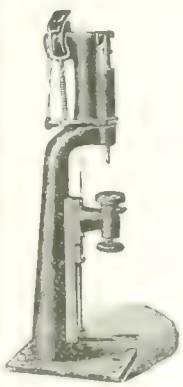
Manufacturers of

**Bright Finished Steel Shafting and Shapes.**

Large stock of all sizes.

***Send for Price List***

**HAMILTON, ONTARIO**



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Our Elastic Rotary Base Riveting Machine does profitable work, because one machine will do the work of several hand riveters, and do it better.

Every head is perfect, formed any shape, round, flat, oval, rectangular, etc.

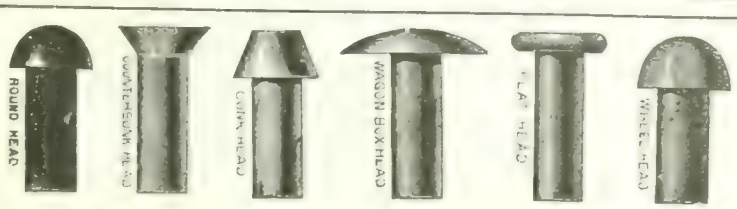
Catalogue C tells more about it.

**The F. B. SHUSTER COMPANY**

**New Haven, Conn.**

Formerly John Adt & Son. Established 1866.

Manufacturers of Wire Working and Cutting, Cotter Pin Machines, etc.




**WE MANUFACTURE RIVETS of every description, ½ inch. dia. and smaller**

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# J.C.McLAREN BELTING

Will Save You Money
In Every Day of Service

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Limited
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# PATTERN MAKERS' TOOL CHEST

STYLE J—
PATTERNMAKERS' SPECIAL

Leatherette covered. Solid mahogany fronts. Extension drawer slides. Tool lined throughout. A real tool chest to meet your particular requirements. Guaranteed.

Eighteen other styles and sizes quartered and plain oak and leatherette covered. Perfectly designed. Guaranteed.

BUY THIS "UNION" TOOL CHEST

... top for the protection of best tools. Has a place for every tool, keeps it safe and ready, free from knocks and moisture; you know immediately if one is missing or borrowed. Write for our Catalog and Prices. If we have no dealer near you, get our special offer.

UNION TOOL CHEST CO. 28 Railroad Street, Rochester, N.Y.

# PRESSES—ALL TYPES

BAIRD

Press Attachments. Automatic.
Metal and Wire Forming Machines.
Tumblers—Large Line.
Burnishing Machines. Grinders.
Special Machines.

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THE ULTIMATE
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IT IS GUARANTEED

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## HEAVY DUTY LATHES

Engine Lathes—26 and larger swing. Manufacturing Lathes, Axle Lathes, Journal Truing Lathes and Bevel Gear Turning Lathes. Gun Turning and Boring Lathes, and Rifling Machines.

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Manufacturers of Heavy Duty Lathes for More than Twenty Years

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Trade Mark Reg. U.S. Pat. Office

A universal grinder. A grinder with all attachments. A grinder that will handle ... as well as cylindrical, internal and surface grinding. An all-around machine for your tool-room.

Catalog No. 6.

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GEARS AND GEAR CUTTING
SPROCKETS AND CHAINS

In stock and to order, any size from one-quarter inch to six-foot in diameter, any material. Estimates and gear advice cheerfully furnished.

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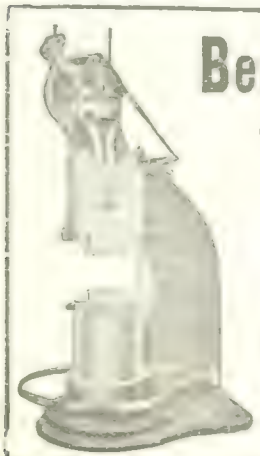

# Beaudry Hammers
FOR GENERAL FORGING

Save Fuel, Time and Labor. Cut Forging Costs in two.

BELT OR MOTOR DRIVEN

BEAUDRY & COMPANY, Inc.
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Agents: Hepburn, Ltd., Coventry, England; Boston, Paris, Calcutta, Yokohama.

# STEEL CASTINGS

1 to 5,000 pounds

Highest Quality
PROMPT AND RELIABLE SERVICE

We make a specialty of Carbonizing Boxes and Cyanide and Lead Bath Pots

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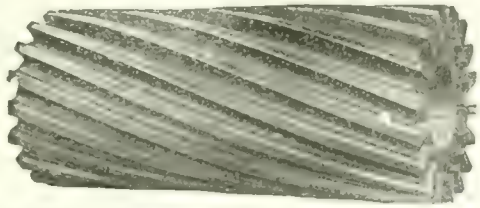
OF CANADA, Ltd., Windsor, Ont.

## Taylor-Newbold Milling Cutters

Fast Cutting Powerful



Inverted Helical Blades of High Speed Steel

THE HEIGHT OF EFFICIENCY, MADE IN 4-in. DIAMETER FOR GENERAL MACHINE SHOP USE

Write for Bulletin R-P

THE TABOR MANUFACTURING COMPANY
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CUTTING COMPOUND

Saves Oil. Increases Speed. Insures Better Finish. Lengthens Life of Tool. Remains a Permanent Emulsion. Write for Details.

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LANDIS MACHINE CO., INC.
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Manufacturers of BOLT and PIPE THREADING MACHINERY

Exclusive Canadian Agents:
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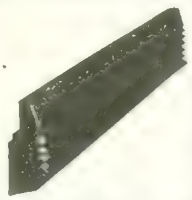

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Combined Jaw and Friction. Friction only. Gas Engine Clutches. Jaw Clutches.
*Write for interesting printed matter.*

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MONTREAL Factory: Aurora, Ont. TORONTO

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TORONTO HAMILTON WINNIPEG

IRON AND STEEL
HEAVY HARDWARE
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WE SHIP PROMPTLY

## Socket Head Cap Screws

Clean cut socket holes, free from chips. Accurately threaded to standard gauges. Test them where great strength is desirable.

THE ALLEN MFG. COMPANY
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FOR ALL KINDS OF HEAVY LIFTING

Send for complete catalogue showing 50 styles 10 to 100 tons capacity.

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## A "fitting" case for your high-grade tools

"EMBREE" TOOL CASES
(17 Styles and Sizes)

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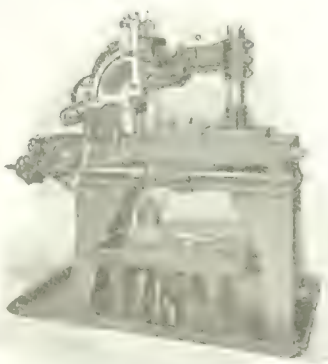

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AUTOMATIC
Gear Cutting
Machine

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The D. E. Whiton Machine Co.
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**Electric Travelling Cranes**
(Direct or Alternating Current)

**Steam and Electric Derricks**
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Up-to-date design. Built for fast, continuous service.
ACCESSIBILITY—DURABILITY.

**Dominion Bridge Company, Limited**
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**HYDROLITE**
**CUTTING COMPOUND**

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Brass, Gunmetal, Manganese Bronze, Delta Metal, Nickel Alloys, Aluminum, etc.

MARINE AND LOCOMOTIVE ENGINE BEARINGS. MACHINE WORK AND ELECTRO PLATING. METAL PATTERN MAKING.

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SAFETY AND FIRST AID EQUIPMENT

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Adjustable and Reversible

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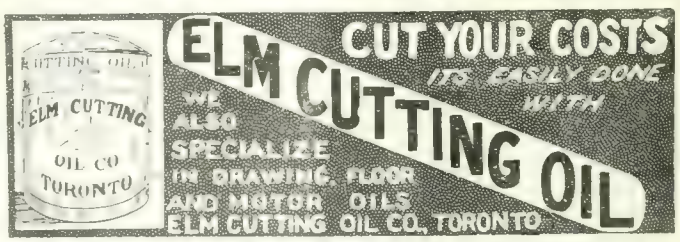


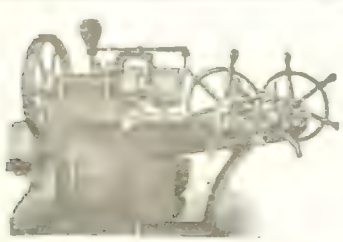

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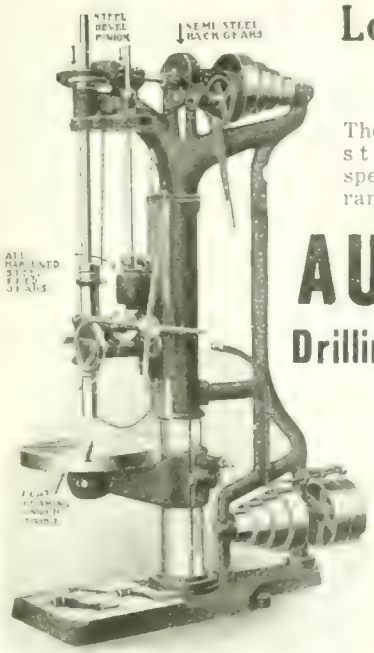

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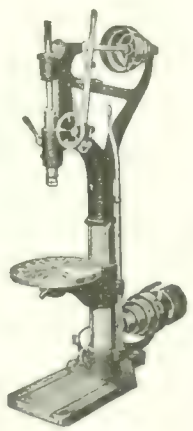

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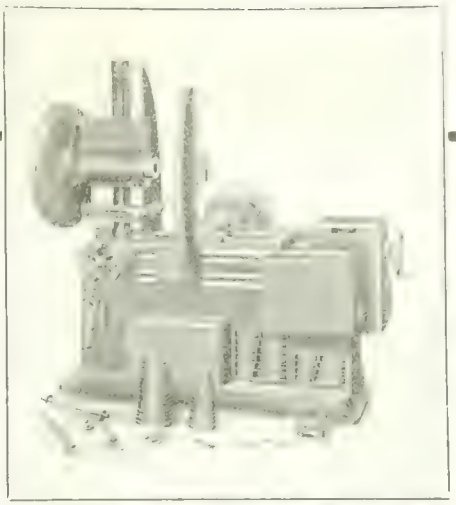

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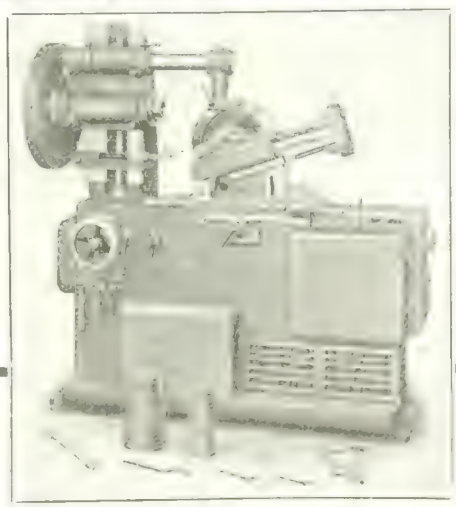
SPUR AND BEVEL GEAR CUTTING MACHINE

No. 13 B & S



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CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS

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CUTTING AND WELDING PLANTS

[illegible] Montreal, Que.

[illegible] Inc. Toronto, Ont.

[illegible] Que.

DERRICKS

Aikenhead Hardware Co., Toronto, Ont.

[illegible] Co., Montreal.

[illegible] Ont.

[illegible] & [illegible]

DIAMOND TOOLS

[illegible] Tool Co. Windsor, Ont.

DIAMONDS, BLACK AND ROUGH

[illegible] New York.

[illegible] Tool Co. Windsor, Ont.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING

Matthews, Jas. H., & Co., Pittsburgh, Pa.

[illegible] Stamp Co., Pittsburg, Pa.

DIES AND DIE STOCKS

Aikenhead Hardware Co., Toronto, Ont.

Bamfield, W. H., & Son, Toronto.

[illegible] Que.

Butterfield & Co., Rock Island, Que.

Brown, Boggs Co., Hamilton, Ont.

Canadian Fairbanks-Morse Co., Montreal.

[illegible] & Supply Co., Montreal

Gardner Robt., & Son, Montreal.

A. B. Jardine & Co., Hespeler, Ont.

Landis Machine Co., Waynesboro, Pa.

Modern Tool Co., Erie, Pa.

Morse Twist Drill & Mch. Co., New Bedford, Mass.

[illegible]

[illegible] Montreal Que.

Pratt & Whitney Co., Dundas, Ont.

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Standard Machy. & Supplies Ltd., Montreal.

Wells Brothers of Canada, Galt, Ont.

DIES, FOR BIT BRACE USE

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[illegible] Ont.

Wells Brothers Co. of Canada, Galt, Ont.

DIES, NOSING

[illegible]

DIES, PIPE THREADING

[illegible] Ont.

[illegible]

[illegible] Pa

DIE SINKERS

Geiger Milling Machine Co., Boston, Mass.

Garvin Machine Co., New York.

[illegible] Montreal Que.

[illegible] Ont.

DIES, P.B. MACHINES

Aikenhead Hardware Co., Toronto, Ont.

[illegible] Rock Island, Que.

[illegible]

[illegible] Pa

[illegible] Galt, Ont.

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Jennings Tool Co., New Haven.

Landis Machine Co., Waynesboro, Pa.

Modern Tool Co., Erie, Pa.

Murchey Machine & Tool Co., Detroit, Mich.

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DIE FORGINGS

[illegible] N.Y.

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Armstrong, Whitworth of Canada, Montreal, Que.

[illegible] Que.

Mayer Bros. Machine Co., Utica.

DIES FOR SCREW PLATES

Wells Brothers Co. of Canada, Galt, Ont.

DIES, SHEET METAL WORKING

[illegible] Co., Brooklyn, N.Y.

Brown, Boggs & Co., Hamilton, Canada.

[illegible] Tool Works, Chicago, Ill.

Curtis Machine Co., Hamilton, Ont.

[illegible] Machine Co., St. Catharines, Ont.

[illegible] & Tool Co., Windsor, Ont.

Worth Engineering Co., Toronto, Ont.

DIES, SCREW AND THREAD

[illegible] & Co., Rock Island, Que.

[illegible] & Co., Ltd., Hespeler, Ont.

Landis Machine Co., Waynesboro, Pa.

Modern Tool Co., Erie, Pa.

Murchey Machine & Tool Co., Detroit, Mich.

National Acme Co., Cleveland, Ohio.

Pratt & Whitney Co., Dundas, Ont.

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Graton & Knight Mfg. Co., Worcester, Mass.

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Butterfield & Co., Rock Island, Que.

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[illegible] Ltd., Oshawa, Ont.

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Ford-Smith Mach. Co., Hamilton, Ont.

Wheel Truing Tool Co., Windsor, Ont.

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W. F. & John Barnes Co., Rockford.

Can. Blower & Forge Co., Kitchener, Ont.

Canada Machinery Corp., Galt, Ont.

The Geo. F. Foss Mchy. & Supply Co., Montreal.

Garlock-Walker Machinery Co., Toronto, Ont.

Garvin Machine Co., New York.

A. B. Jardine & Co., Ltd., Hespeler, Ont.

Niles-Bement-Pond Co., New York.

Petrie, Ltd., H. W., Toronto, Ont.

Petrie of Montreal, Ltd., H. W., Montreal, Que.

Riverside Machinery Depot, Detroit, Mich.

Standard Machy. & Supplies, Ltd., Montreal.

Stow Mfg. Co., Binghampton, N.Y.

United States Mach. Tool Co., Cincinnati, O.

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Canada Machinery Corp., Galt, Ont.

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Garlock-Walker Machinery Co., Toronto, Ont.

Henry & Wright Mfg. Co., Hartford, Conn.

D. McKenzie Machinery Co., Guelph, Ont.

Niles-Rement-Pond Co., New York.

Pratt & Whitney Co., Dundas, Ont.

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Cincinnati Electrical Tool Co., Cincinnati, Ohio.

Cleveland Twist Drill Co., Cleveland.

Garlock-Walker Machinery Co., Toronto, Ont.

A. B. Jardine & Co., Hespeler, Ont.

Millers Falls Co., Millers Falls, Mass.

Morse Twist Drill & Mch. Co., New Bedford, Mass.

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Petrie of Montreal, Ltd., H. W., Montreal, Que.

Pratt & Whitney Co., Dundas, Ont.

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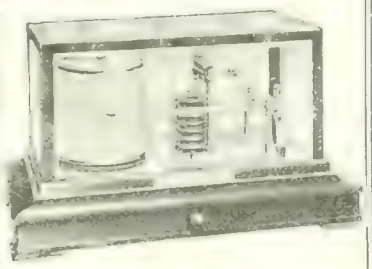

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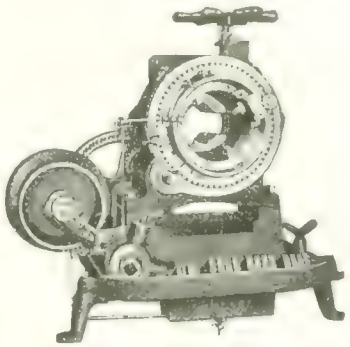

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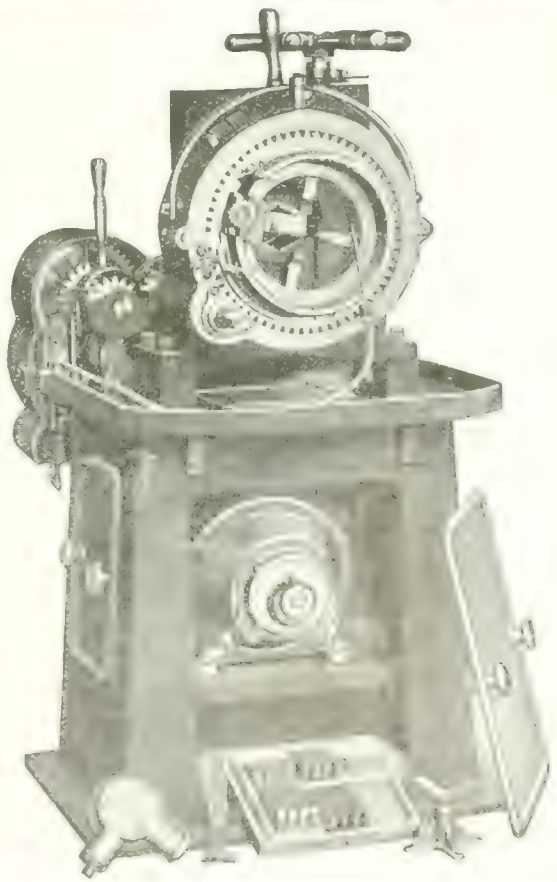
FOR VERY DIRTY PLACES





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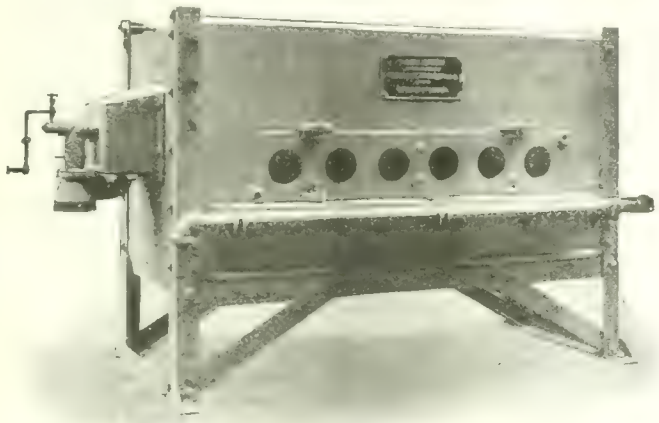
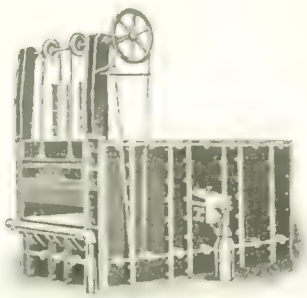
If it is—





*At half the first cost of a coal-burning furnace,* own any one of the

# "Mecol" Oil-burning Furnaces

and experience all the advantages they possess.

Mecol Furnaces are used in several of the largest plants in Canada—in many small plants, too.

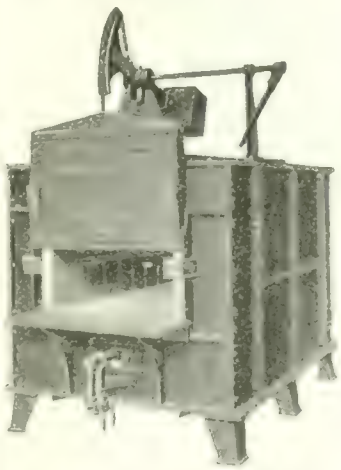
**Ask us to send you Service Facts.**

## Mechanical Engineering Co., Limited

55 COTE ST., MONTREAL, QUE., CANADA

# STANDARD FURNACES OIL or GAS

*Immediate delivery on all tool room types.*



LARGE OVEN FURNACE

*Write for catalogue or special prints on shell and munition furnaces.*

**1646 Woodward Ave.**

For

Annealing
Carbonizing
Hardening
High Speed Steel
Lead and Salt
Oil Tempering
Forging
Riveting
Shell Types

STANDARD FUEL ENGINEERING CO. DETROIT, MICH.

# A Niagara of Coolant

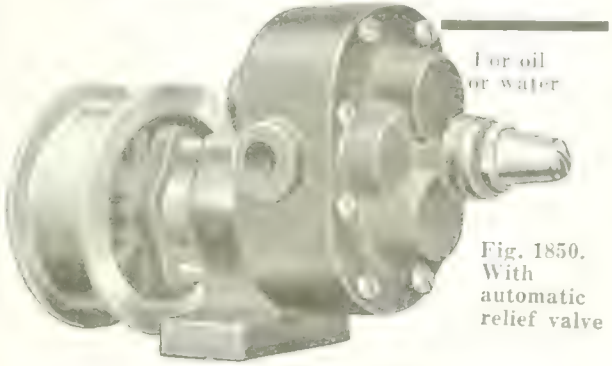
if you wish it, or just enough to cool the tool—whichever you prefer. That is the way TRAHERN ROTARY GEARED PUMPS deliver the lubricant. Don't delay another day—write at once.

## Trahern Pump Company

ROCKFORD, ILLINOIS

*Canadian Agents:*

**A. R. Williams Machinery Co., Toronto**



For oil or water

Fig. 1850. With automatic relief valve

LATHES, TURRET AND HAND

LEAD BURNING

LEATHER STRAPPING

LIFTS, PNEUMATIC

LINK BELTING

LINOLEUM MILL MACHINERY

LIQUID AIR

LOADERS, WAGON AND TRUCK
Can. Link Belt Co., Toronto, Ont.

LOCKERS, STEEL WARDROBE AND STEEL MATERIAL

LUBRICANTS

LUBRICATORS

MACHINERY DEALERS
Can. Fairbanks-Morse Co., Montreal

MACHINERY GUARDS (SEE GUARDS)

MACHINERY REPAIRS

MACHINISTS' SCALES, SMALL TOOLS AND SUPPLIES
Marten Machine Co., Hamilton, Ont.

MANDRELS
Manufacturers Equip. Co., Chicago, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

MARKING DEVICES

MARKING MACHINERY
Perrin, Wm. R., Toronto.

MEASURING MACHINES

MEASURING TAPES AND RULES

METALLURGISTS

METERS, METAL TESTING

METALS
Toronto, Ont.
Can. B. K. Morton, Toronto, Montreal.

METERS, OIL, WATER

MICROMETERS

MILL MACHINERY

MILLING MACHINES, AUTOMATIC

MILLING ATTACHMENTS
Becker Milling Machine Co., Boston, Mass.
John Bertram & Sons Co., Dundas.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Cleveland Milling Mach. Co., Cleveland, Ohio.
Ford Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Mach. Co., Torrington, Conn.
Hinckley Machine Works, Hinckley, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Whitney Mfg. Co., Hartford, Conn.

MILLING MACHINES, HAND
Hardinge Bros., Inc., Chicago, Ill.
United States Mach. Tool Co., Cincinnati, Ohio
Pratt & Whitney Co., Dundas, Ont.
Whitney Mfg. Co., Hartford, Conn.

MILLING MACHINES, HORIZONTAL AND VERTICAL
Becker Milling Machine Co., Boston, Mass.
Brown & Sharpe Mfg. Co., Providence.
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Riverside Machinery Depot, Detroit, Mich.
United States Mach. Tool Co., Cincinnati, Ohio
Whitney Mfg. Co., Hartford, Conn.

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL
Becker Milling Machine Co., Boston, Mass.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Ford Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Garlock Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington.
Kempsmith Mfg. Co., Milwaukee, Wis.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio
Niles-Bement-Pond Co., New York
Pratt & Whitney Co., Dundas, Ont.
Sterling, The John Co., Cincinnati, Ohio

MILLING MACHINES, PROFILE
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks Morse Co., Montreal.
Garlock Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Riverside Machinery Depot, Detroit, Mich.

MILLING TOOLS
Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice, Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.

MINE CARS
Can. Fairbanks-Morse Co., Montreal.
Dominion Bridge Co., Montreal, Quebec.
MacKinnon, Holmes Co., Sherbrooke.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.

MINING MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Jenckes Mach. Co., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

MODEL WORK
Windsor Mach. & Tool Co., Windsor, Ont.

MORTISING MACHINES
Canada Machinery Corp., Galt, Ont.
Garlock Walker Machinery Co., Toronto, Ont.
New Britain Mach. Co., New Britain, Conn.

MOTORS, ELECTRIC
Can. Fairbanks-Morse Co., Montreal.
Elm Cutting Oil Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

MOTORS, PNEUMATIC
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock Walker Machinery Co., Toronto, Ont.

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York.

MUNTZ METAL
Brown Copper & Brass Roller Mills, New Toronto, Ont.

NAIL MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews, Jas. H., & Co., Pittsburgh, Pa.
Pritchard-Andrews Co., Ottawa, Can.

NICKEL
Baker & Co., Inc., H., Montreal, Que.

NICKEL SILVER
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

NIPPLE HOLDERS
Curtis & Curtis Co., Bridgeport, Conn.

NIPPLE THREADING MACHINES
John H. Hall & Sons, Ltd., Brantford, Ont.
Landis Machine Co., Waynesboro, Pa.

NITROGEN
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.

NUTS, SEMI-FINISH AND FINISHED
Canadian B. K. Morton, Toronto, Montreal.
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton, Ont.

NUT BURRING MACHINES
National Machy. Co., Tiffin, O.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

NUT MACHINES (HOT)
National Machy. Co., Tiffin, O.
Petrie of Montreal, Ltd., H. W. Montreal, Que.

NUT FACING AND BOLT SHAVING MACHINES
Garvin Machine Co., New York.
National Machy. Co., Tiffin, O.
Victor Tool Co., Waynesboro, Pa.

NUT TAPPERS
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hall, J. H., & Son, Brantford, Ont.
A. B. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machy. Co., Tiffin, O.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

DRAWING
Elm Cutting Oil Co., Toronto, Ont.

OIL SEPARATORS
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Smart-Turner Machine Co., The, Hamilton.

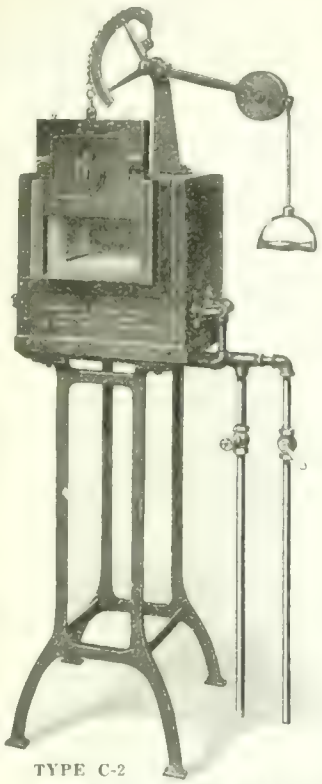
OIL STONES
Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice, Lewis & Son, Toronto, Ont.

OIL STORAGE SYSTEMS
Bowser & Co., Inc., S. F., Toronto, Ont.

OPTICAL SUPPLIES
Toronto, Ont.

OSCILLATING VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto

OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING
Brantford Oven & Rack Co., Brantford, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.



TYPE C-2

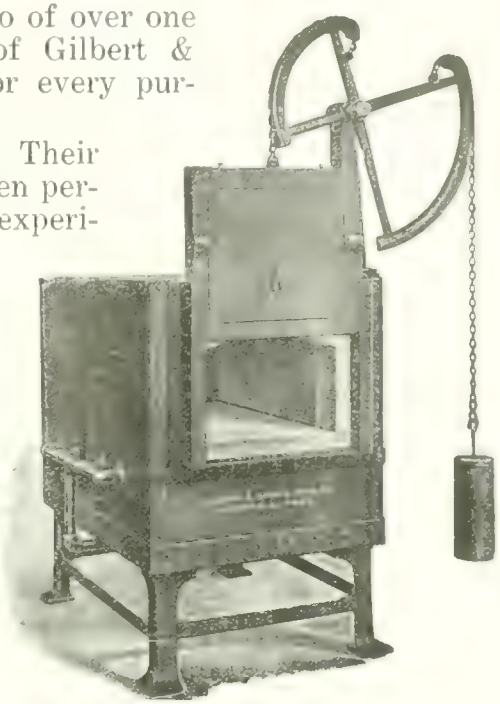
# The Right Furnace For Every Purpose

THE types shown are only two of over one hundred types and sizes of Gilbert & Barker Furnaces—a furnace for every purpose.

G. & B. Furnaces are built right. Their construction and design have been perfected by our half century of experience.

We offer you the benefit of this experience and thorough knowledge of modern heat-treating methods through our engineering department. The service is free. Put your problems up to us.

Just now we are making prompt delivery of these two types and many others. Send for Stock List 24.



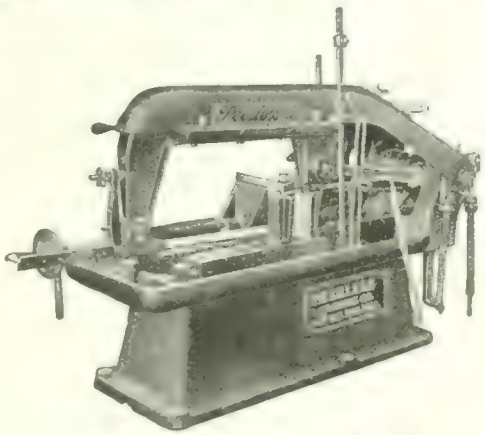
TYPE C-15

**Gilbert & Barker Mfg. Co.** West Springfield Mass.

Canadian Agents:
James DeVon, 227 Davenport Road, Toronto, Ont. Williams & Wilson, Montreal, Que.

# Peerless HIGH SPEED

The saw which has revolutionized metal cutting and created a new standard by increasing production all to 100 per cent.



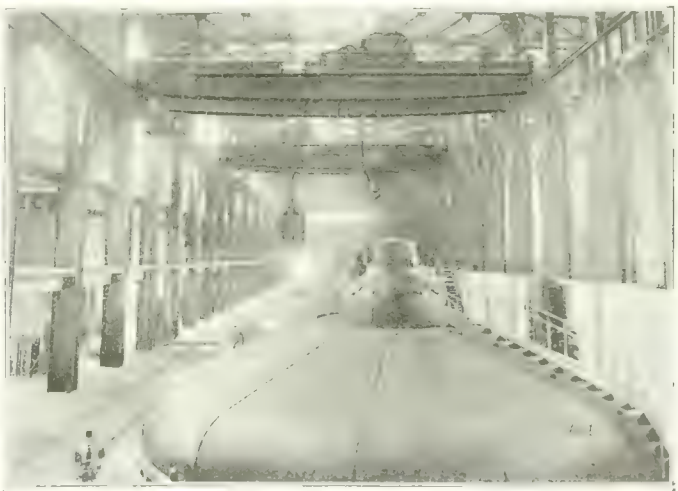
Here's an example of how it works out

ability to improve upon their so-called standard equipment.

consented to install one "Peerless," but in that short time several repeat orders have already run up their total to sixteen of our 6-

largest user of "Peerless" High-Speed Saws. But it illustrates how quickly the new standard supplants the old wherever and whenever it is given the opportunity.

**PEERLESS MACHINE CO.**
1607 RACINE STREET RACINE, WISCONSIN



Two 150-ton Whiting Electric Travelling Cranes, Cedar Rapids Mfg. and Power Co., Cedars, P.Q.

# Power Plant Cranes

SEND FOR CATALOGUE No. 130

Complete Foundry Equipments

WHITING FOUNDRY EQUIPMENT CO. HARVEY-ILL. U.S.A. CHICAGO SUBURB

Cranes of All Kinds

OVEN TRUCKS, STEEL
Dominion Iron & Steel Co., Brantford, Ont.
[illegible]

OVENS FOR DRYING, TEMPER AND UNDER TRUCKS
Dominion Iron & Steel Co., Brantford, Ont.

OXY-ACETYLENE WELDING AND CUTTING
[illegible]

OXY-ACETYLENE WELDING AND CUTTING PLANT
[illegible]

OXYGEN, SEE ACETYLENE

PACKINGS, ASBESTOS
[illegible]
Cleveland Metallic Packing Co., Cleveland
New Britain Machine Co., New Britain, Conn.

PACKINGS, LEATHER, HYDRAULICS, ETC.
[illegible]
Graton & Knight Mfg. Co., Worcester, Mass.
William R. Perrin, Ltd., Toronto.
[illegible]

PAPER MILL CONVEYORS AND DRIVES
[illegible] Toronto, Ont.

PAPER MILL MACHINERY
[illegible] Edinburgh, Scotland.
[illegible] Montreal, Que.
MacKinnon, Holmes & Co., Sherbrooke, Que.

PATTERN SHOP EQUIPMENT
Canada Machinery Corp., Galt, Ont.
Fay Machine Co., Jackson, Mich.
Gardner Machinery Co., Toronto, Ont.

PATENT SOLICITORS
Bowlby, Lambert & A., Montreal.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.

PATTERNS
[illegible] Toronto, Ont.
Marion Machine Co., Hamilton, Ont.

PEAK CARRIERS FOR POWER PLANTS
[illegible] Toronto, Ont.

PERFORATED METALS AND ORNAMENTAL IRON GOODS
Canada Wire & Iron Goods Co., Hamilton.

PIG IRON
Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada Ltd., Hamilton, Ont.

PIPE FITTINGS, MALLEABLE AND CAST IRON
[illegible]

PIPE CUTTING AND THREADING MACHINES
Bertsdorf & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Fay Machine Co., Jackson, Mich.
Gardner Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
R. Medingall Co., Galt.
[illegible] Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
A. R. Williams Machy. Co., Toronto.

PHOSTOTATS
Commercial Photo Co., Providence, R.I.

PIPE RIVETED STEEL
Toronto Iron Works Ltd., Toronto.

PIPE CUTTERS, ROLLING
Curtis & Curtis Co., Bridgeport, Conn.
John H. Hall & Sons Ltd., Brantford, Ont.
Peirce & Montreal Ltd., H. W., Montreal, Que.
Wells Bros. Co. of Canada, Galt, Ont.

PISTON AND PISTON RING MACHINES
[illegible]

PLANER JACKS
Armstrong Bros. Tool Co., Chicago.

PLANERS, STANDARD AND ROTARY
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
The [illegible] & Supply Co., Montreal.
Gardner Mach. & Son, Montreal.
Gardner Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Morton Mfg. Co., Muskegon Heights, Mich.
Niles-Bement-Pond Co., New York.
[illegible] Toronto, Ont.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.

PLANING MILL WORKS
[illegible] Toronto, Ont.

PLANING AND SHAPING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
The [illegible] & Supply Co., Montreal.
Gardner Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
[illegible] Toronto, Ont.
Pedrick & Ayer, Philadelphia, Pa.
Perkins Machine Tool Depot, Detroit, Mich.
Standard Machy. Co., Cincinnati, Ohio.
A. R. Williams Machy. Co., Toronto.

PLATING MATERIALS
[illegible] Toronto, Ont.

PLANING MILL EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons Ltd., Galt, Ont.
Niles-Bement-Pond Co., New York.

PLIERS
Ashcohead Hardware Co., Toronto.
Canadian Billings & Spencer, Ltd., Welland.
[illegible] & Wilcox Co., Southington, Conn.
[illegible] & Co., Toronto, Ont.

POLISHING CLOTHS
[illegible] W. Market St., Toronto.

POWER HOUSE CONVEYORS
Can. Link Belt Co., Toronto, Ont.
[illegible] & Hess Co., Herbert, Niagara Falls, Ont.

PRESSES, ARBOR
Atlas Press Co., Kalamazoo, Mich.
Hannifin Mfg. Co., Chicago, Ill.
Metalwood Mfg. Co., Detroit, Mich.

PRESSES, BROACHING, FORGING AND FLANGING
Atlas Press Co., Kalamazoo, Mich.
F. W. Bliss Co., Brooklyn, N.Y.
Ferracute Machine Co., Bridgeton, N.J.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES FOR SHELLS
Atlas Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Machine Co., Bridgeton, N.J.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Garlock-Walker Machinery Co., Toronto, Ont.
Hydraulic Machy. Co., Ltd., Montreal, Que.
Metalwood Mfg. Co., Detroit, Mich.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
West Tire Setter Co., Rochester, N.Y.

PRESSES, FILTER
William R. Perrin, Ltd., Toronto.

PRESSES, DROP AND FORGING
W. H. Banfield & Son, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Charles F. Elmes Eng. Works, Chicago.
Can. Fairbanks-Morse Co., Montreal.
Erie Foundry Co., Erie, Pa.
Hydraulic Machy. Co., Ltd., Montreal, Que.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Toledo Machine & Tool Co., Toledo.

PRESSES, HYDRAULIC
John Bertram & Sons Co., Dundas.
Charles F. Elmes Eng. Works, Chicago.
Hydraulic Machy. Co., Ltd., Montreal, Que.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Toledo Machine & Tool Co., Toledo.
West Tire Setter Co., Rochester, N.Y.
A. R. Williams Machy. Co., Toronto.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Machine Co., Bridgeton, N.J.
Garlock-Walker Machinery Co., Toronto, Ont.
Hydraulic Machy. Co., Ltd., Montreal, Que.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
Toledo Machine & Tool Co., Toledo.
A. R. Williams Machy. Co., Toronto.

PRESSES, BALING
William R. Perrin, Ltd., Toronto.

PRESSES, PNEUMATIC
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, SCREW
Barnes, W. F. & John Co., Rockford, Ill.
Bliss Co., E. W., Brooklyn, N.Y.
Ferracute Mach. Co., Bridgeton, N.J.
William R. Perrin, Ltd., Toronto.

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Erie Foundry Co., Erie, Pa.
Ferracute Mach. Co., Bridgeton, N.J.

PRODUCTION WORK
Windsor Mach. & Tool Co., Windsor, Ont.

PROPELLERS
Kennedy & Sons, Wm., Owen Sound, Ont.

PULLEYS
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Bond Hanger & Colg. Co., Alexandria, Ont.
Can. Fairbanks-Morse Co., Montreal.
Dominion Machy. Co., Toronto, Ont.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Positive Clutch & Pulley Works, Ltd., Toronto.
Standard Machy. & Supplies, Ltd., Montreal, Que.
The Smart-Turner Mach. Co., Hamilton.
A. R. Williams Machy. Co., Toronto.

PULLEYS, FRICTION CLUTCH
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Que.
Can. Link Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Positive Clutch & Pulley Works, Ltd., Toronto.
Jones & Glassco, Montreal.
Johnson, Carlyle, Mach. Co., Manchester, Conn.

PULP MILL MACHINERY
Can. Barker Co., Sault Ste. Marie, Ont.
Hydraulic Machy. Co., Ltd., Montreal, Que.
MacKinnon, Holmes & Co., Sherbrooke, Que.

PUMPS, AIR
Smart-Turner Mach. Co., Hamilton.

PUMPS, CENTRIFUGAL
Bowser & Co., Inc., S. F., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.
Smart-Turner Mach. Co., Hamilton.

PUMPS, FUEL OIL
Bowser & Co., Inc., S. F., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

PUMPS, HIGH PRESSURE
Charles F. Elmes Eng. Works, Chicago.
Hydraulic Machy. Co., Ltd., Montreal, Que.
William R. Perrin, Ltd., Toronto.
Smart-Turner Mach. Co., Hamilton.

PUMPS, ALL KINDS
Charles F. Elmes Eng. Works, Chicago.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Smart-Turner Mach. Co., Hamilton.
A. R. Williams Machy. Co., Toronto.

PUMPS, HYDRAULIC
Charles F. Elmes Eng. Works, Chicago.
Hydraulic Machy. Co., Ltd., Montreal, Que.
Metalwood Mfg. Co., Detroit, Mich.
Smart-Turner Mach. Co., Hamilton.
William R. Perrin, Ltd., Toronto.

PUMPS, LUBRICANT, OIL
Bellevue Industrial Furnace Co., Detroit, Mich.
Bowser & Co., Inc., S. F., Toronto, Ont.
Fry's (London), Ltd., London, England.
Fulflo Pump Co., Cincinnati, Ohio
Trahern Pump Co., Rockford, Ill.

PUMPS, ROTARY, POWER DRIVEN
Bowser & Co., Inc., S. F., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

PUMPS, SUD
Fry's (London), Ltd., London, England.

PUMP LEATHERS
Can. B. K. Morton, Toronto, Montreal.
Graton & Knight Mfg. Co., Worcester, Mass.

PUNCHES AND DIES
W. H. Banfield & Sons, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Baker & Co., Inc., H., Montreal, Que.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Blower & Forge Co., Kitchener, Ont.
Ferracute Mach. Co., Bridgeton, N.J.
Can. Fairbanks-Morse Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Marten Machine Co., Hamilton, Ont.
Mulliner-Enlund Tool Co., Syracuse, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Toledo Machine & Tool Co., Toledo, O.

PUNCHES, POWER
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Brown, Boggs Co., Ltd., Hamilton, Canada.
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Consolidated Press Co., Hastings, Mich.
Ferracute Mach. Co., Bridgeton, N.J.
A. B. Jardine & Co., Limited, Hespeler, Ont.
Niles-Bement-Pond Co., New York.

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Hammond Steel Co., Inc., Syracuse, N.Y.

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John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Niles-Bement-Pond Co., New York.
W. A. Whitney Mfg. Co., Rockford, Ill.

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Bristol Co., Waterbury, Conn., U.S.A.
Can. Hoskins, Ltd., Walkerville, Ont.
Holz, Herman A., 1 Madison Ave., New York.
Shore Instrument & Mfg. Co., New York City.
Taylor Instrument Co., Rochester, N.Y.
Thwing Instrument Co., Philadelphia, Pa.

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John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

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Can. Welding Works, Montreal, Que.
United Brass & Lead, Ltd., Toronto, Ont.

RAIL BENDERS
Niles-Bement-Pond Co., New York.

RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.

RAIL OVERHEAD
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

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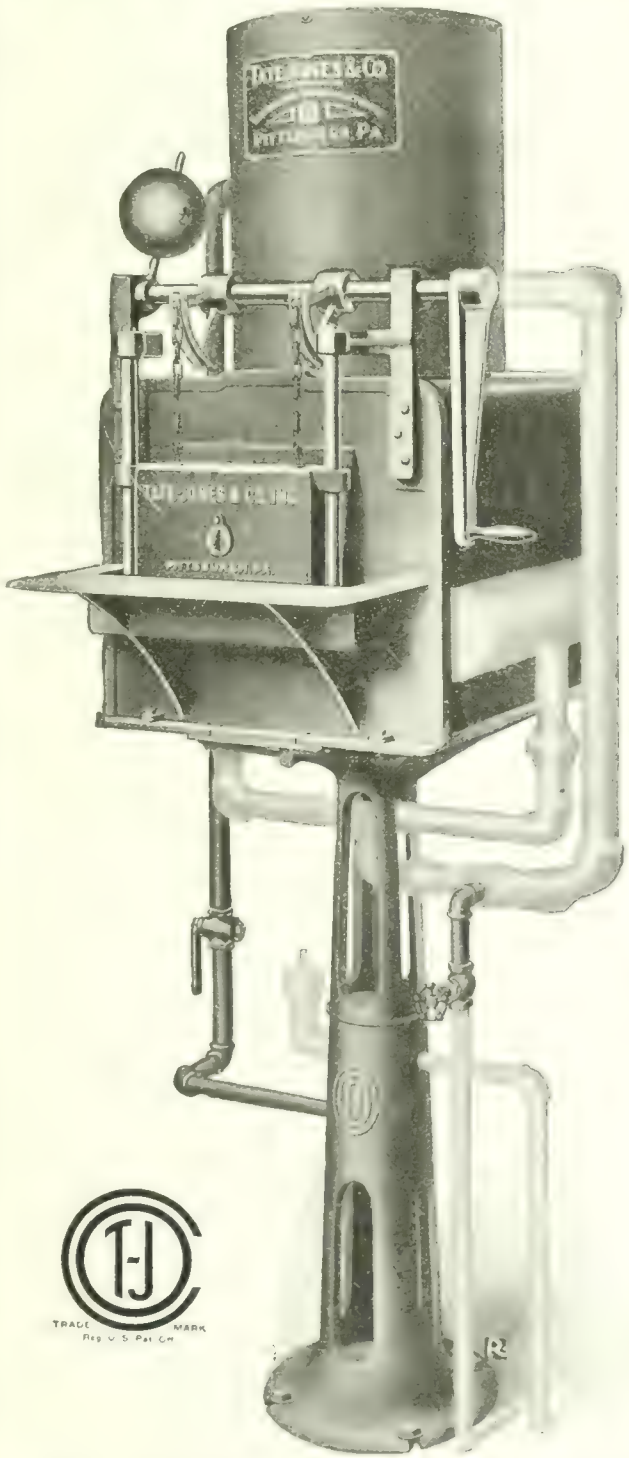

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Saw Works, Springfield, Mass
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SAWS, INSERTED TOOTH
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Saw Works, Springfield, Mass.
Mfg. Co., Philadelphia, Pa.

SAWS, BAND AND COPING
Springfield, Mass.

SAWS, SLITTING

SCLEROSCOPES
& Mfg. Co., New York City

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Ont.

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Co., Cleveland, O.

SCREW MACHINE PARTS
Co., Cadiz, Manchester, Conn.

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Machine Screw Corp., New Haven, Conn.

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Brown & Sharpe Mfg. Co., Providence, R.I.
Fairbanks Morse Co., Montreal.
Machine Co., Elkhart, Ind.
Garlock Walker Machy. Co., Ltd., Toronto, Ont.
Gisholt Machine Co., New York
A. B. Jardine & Co., Hespeler
Millholland Mach. Co., W. K., Indianapolis, Ind.
Que.
New Britain Machine Co., New Britain, Conn.
Ont.
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Pratt & Whitney Co., Dundas, Ont.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto

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National-Acme Co., Cleveland, Ohio
Rice, Lewis & Son, Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Wilkinson & Kompass, Hamilton, Ont.

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A. B. Jardine & Co., Hespeler
Morse Twist Drill & Mch. Co., New Bedford, Mass
Rice, Lewis & Son, Toronto, Ont.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Wilkinson & Kompass, Hamilton, Ont

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Garvin Machine Co., New York
Que.
Pratt & Whitney Co., Dundas, Ont.

SCRAP METAL
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The Geo. E. Fess Mchy. & Supply Co., Montreal
Peters, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Strelinger Co., Chas. A., Detroit, Mich.
Wachs, Chicago, Ill.

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Aikenhead Hardware Co., Toronto, Ont.
Allen Mfg. Co., Hartford, Conn.
Wilkinson & Kompass, Hamilton, Ont.

SHANKS, STRAIGHT AND TAPER
Jacobs Mfg. Co., Hartford, Conn.

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Can. Fairbanks-Morse Co., Montreal
Canada Machinery Corp., Galt, Ont.
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Hendey Machine Co., Torrington, Conn.
Hamilton Mach. Tool Co., Hamilton, Que.
McKinnon Machy. Co., D., Guelph, Ont.
Peters, Ltd., H. W., Toronto, Ont.
Rhodes Mfg. Co., Hartford, Conn.
John, Cincinnati, Ohio

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Can. Drawn Steel Co., Hamilton, Ont.
Garlock Walker Machy. Co., Ltd., Toronto, Ont.
& Glasco, Montreal
Niles-Bement-Pond Co., New York
Peters, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Rice, Lewis & Son, Toronto, Ont.
Strelinger Co., Chas. A., Detroit, Mich.
A. R. Williams Machy. Co., Toronto
& Kompass, Hamilton, Ont.

SHAFTS, FLEXIBLE
Stow Mfg. Co., Binghamton, N.Y.

SHARPENING STONES
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice, Lewis & Son, Toronto, Ont.

SHEARING MACHINES, ANGLE IRON, BAR AND GATE
John Bertram & Sons Co., Dundas
Bertrams, Ltd., Edinburgh, Scotland
Canada Machinery Corp., Galt, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York
Toledo Machine & Tool Co., Toledo

SHEARS, POWER
John Bertram & Sons Co., Dundas
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Ferracute Machine Co., Bridgeton, N.J.
A. B. Jardine & Co., Limited, Hespeler, Ont.
National Machy. Co., Tiffin, Ohio.
Niles Bement Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que
Toledo Machine & Tool Co., Toledo

SHEARS, PNEUMATIC
Machine & Tool Co., Toledo, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Canada

SHEETS, CORRUGATED
Pedlar People, Ltd., Ottawa, Ont.

SHEET METAL WORK
Can. Rumely Co., Toronto, Ont.

SHEET METAL WORKING TOOLS
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Peck Stow & Wilcox, Southington, Conn.
Steel Bending Brake Works, Ltd., Chatham, Ont.

SHEET METAL STAMPINGS
Dominion Forge & Stpg. Co., Walkerville, Ont
Pedlar People, Ltd., Oshawa, Ont.

SHELVING, STEEL
Dennis Wire & Iron Works, London, Ontario.

SHELL BANDING MACHINES, HYDRAULIC
Blashill Wire Machy. Co., Montreal, Que.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., W. R., Toronto, Ont.
West Tire Setter Co., Rochester, N.Y.

SHELL GRINDING CONES, BLOCKS AND WHEELS FOR INSIDE SHELL OPERATIONS
Prescott Emery Wheel Co., Prescott, Ont.

SHELL PAINTING MACHINES
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.

SHELL RIVETERS
Grant Mfg. & Machine Co., Bridgeport, Conn.
High Speed Hammer Co., Rochester, N.Y.

SHINGLES, METAL
Pedlar People, Ltd., Oshawa, Ont.

SHELL TOOLS
Armstrong, Whitworth of Canada, Montreal, Que.
Blashill Wire Machy. Co., Montreal, Que.
Marsh Engineering Works, Belleville, Ont.

SHOP FURNITURE
Dennis Wire & Iron Works, London, Ontario.
New Britain Mach. Co., New Britain, Conn.

SIDE TOOLS
Armstrong Bros. Tool Co., Chicago.
Can. B. K. Morton, Toronto, Montreal.

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Strong, Kennard & Nutt Co., Cleveland, Ohio.

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Can. Link-Belt Co., Toronto, Ont.
Jones & Glasco, Montreal.

SILVER SOLDER
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SKYLIGHTS
Pedlar People, Ltd., Oshawa, Ont.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Rice, Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilkinson & Kompass, Hamilton, Ont.

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Crane & Hoist Co., Herbert, Niagara Falls, Ont.

SLOTTERS
Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York
Rhodes Mfg. Co., Hartford, Conn.

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Canadian Welding Works, Montreal, Que.
MacKinnon, Holmes Co., Sherbrooke, Que
Marsh Engineering Works, Belleville, Ont.

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Brown & Sharpe Mfg. Co., Providence.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass
Rice, Lewis & Son, Toronto, Ont.
J. H. Williams & Co., Brooklyn, N.Y.

SOCKET HEAD CAP SCREWS
Allen Mfg. Co., Hartford, Conn.

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Aikenhead Hardware Co., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Canada
Prest-O-Lite Co., Inc., Toronto, Ont.
Rice, Lewis & Son, Toronto, Ont.
United Brass & Lead, Ltd., Toronto

SOLDER
Aikenhead Hardware Co., Toronto, Ont.
Rice, Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.
United Brass & Lead, Ltd., Toronto

SPEED REDUCING GEARS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glasco, Montreal

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Can. Steel Foundries, Ltd., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
Jas. Steele, Ltd., Guelph, Ont.

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Banfield, W. H., & Sons, Toronto.
Bertram, John, & Sons Co. Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Bogge & Co., Hamilton, Canada
Brown Engineering Corp., Toronto, Ont.
Can. Barker Co., Sault Ste. Marie, Ont.
Can. Ry. Co., Toronto, Ont.
Charles F. Elmes Eng. Works, Chicago.
Elliott & Whitcomb Mfg. & Tool Co., Ltd., Ont.
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Garvin Machine Co. New York.
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National Acme Co., Cleveland, Ohio.
D. McKenzie Machinery Co., Guelph, Ont.
Mulliner & Ellund Tool Co., Syracuse, N.Y.
Marion Machine Co., Hamilton, Ont.
Sleeper & Hartley, Inc., Worcester, Mass.
Smart Turner Machine Co., Hamilton, Ont.
Victoria Foundry Co., Ottawa, Ont.
Wood, [illegible] & Machine Co., Welland, Ont.
William R. Perrin, Ltd., Toronto.
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Garvin Machine Co., New York.
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Sleeper & Hartley, Inc., Worcester, Mass.

**SPIRAL CONVEYORS**
[illegible]
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**SPROCKETS, CHAIN**
[illegible]
Grant Gear Works, Boston, Mass.
[illegible]
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.

**SPROCKET WHEELS, CAST**
[illegible]
Perrin, W. R., Toronto.

**STAIRS, IRON**
[illegible]
Canada [illegible] & Iron Goods Co., Hamilton, Ont.

**STAMPINGS**
Dom. Eyelet & Stamping Co., Waterville, Ont.
Homer & Wilson, Hamilton, Ont.

**STAMPING, SHEET METAL**
[illegible]

**STAMPING MACHINERY**
Bliss, E. W. Co., N.Y.
Brown, Bogge & Co., Hamilton, Canada
Canada Machinery Corp., Ltd., Ont.
Ferracute Mach. Co., Bridgton, N.J.
Noble & Westbrook Mfg. Co., Hartford, Conn.

**STAMPS, STEEL ALPHABET, FIGURES**
Matthews, Jas. H. & Co., Hartford, Conn.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Pritchard-Andrews Co., Ottawa, Can.

**STAPLE MACHINES**
[illegible], Worcester, Mass.

**STEAM SEPARATORS AND TRAPS**
Can. Fairbanks-Morse Co., Montreal.
Can. Morehead Mfg. Co., Woodstock, Ont.
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Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.

**STEEL, ALLOY, SEE ALLOY STEEL)**

**STENCILS, STEEL**
[illegible], Pittsburg, Pa.

**STEEL, CRUCIBLE TOOL**
[illegible], N.Y.

**STEEL, CARBON, FERRO-TUNGSTEN**
[illegible]
Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
[illegible]
Latrobe Electric Steel Co., Latrobe, Pa.
[illegible], Montreal, Que.
[illegible], Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.
Zenith Coal & Steel Products, Montreal, Que.

**STEEL, CASTINGS**
[illegible]

**STEEL, DRILL ROLLED**
[illegible], Hamilton, Ont.
[illegible]
Union Drawn Steel Co., Hamilton, Ont.

**STEEL, DRUMS**
[illegible], Hamilton, Ont.

**STEEL, FORGED BLOWERS**
[illegible], Kitchener, Ont.
Can. [illegible], Montreal.
Sheldons, Ltd., Galt, Ont.

**STEEL, NICKEL**
[illegible], Montreal, Que.
[illegible]

**STEEL, HIGH SPEED**
[illegible], Ltd., Montreal.
[illegible]
[illegible]
Can. Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Century Steel Co. of America, New York.
Colonial Steel Co., Pittsburgh, Pa.
H. A. Drury Co., Ltd., Montreal.
Fairley Davidson Steel Co., New York, N.Y.
[illegible]
Firth & Sons, Trent, Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Latrobe Electric Steel Co., Latrobe, Pa.
Ostorn Canada Steel Co., Ltd., Montreal, Que.
[illegible]
[illegible]
[illegible]
Standard Alloys Steel Co., Pittsburgh, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.
[illegible], Montreal, Que.
Zenith Coal & Steel Products, Montreal, Que.

**STEEL, GRIT**
[illegible], Pittsburgh, Pa.

**STEEL, CHROME AND MANGANESE**
[illegible]

**STEEL, CRUSHED**
[illegible], Pittsburgh, Pa.

**STEEL, ROCK DRILL**
Armstrong, Whitworth of Canada, Montreal, Que.

**STEEL, SPECIAL ELECTRIC ALLOY**
[illegible]

**STEELS, HIGH STRENGTH, HOT WORKING, DIE, MAGNET**
[illegible], New York, N.Y.

**STEEL, VANADIUM**
[illegible], Montreal, Que.
[illegible], Montreal, Que.
Standard Alloys Co., Pittsburgh, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

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Deloro Smelting & Refining Co., Toronto, Ont.

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[illegible], Niagara Falls, Ont.
New Britain Machine Co., New Britain, Conn.

**STOCKS, PIPE**
Bertram & [illegible], Dundas, Ont.
A. B. [illegible], Hespeler, Ont.
[illegible], Ont.
Wells Bros. Co., Greenfield, Mass.

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New Britain Machine Co., New Britain, Conn.

**STRAIGHTENING MACHINERY**
Baird Machine Co., Bridgeport, Conn.
[illegible], Scotland.

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[illegible], Ont.

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[illegible], Montreal, Que.
Dominion Bridge Co., Montreal, Quebec.
Dominion Bridge & Stamping Co., Waterville, Ont.
[illegible], Sherbrooke, Que.
[illegible], Montreal, Que.

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Can. [illegible] & Iron Works Co., Toronto, Ont.
Can. Welding Works, Montreal, Que.
Dominion Bridge Co., Montreal, Quebec.
MacKinnon, Holmes Co., Sherbrooke.
[illegible], Montreal, Que.
[illegible]

**TANK WAGONS**
[illegible], Montreal, Que.
MacKinnon, Holmes Co., Sherbrooke.
[illegible], Montreal, Que.
[illegible], Toronto.

**TAPES, MEASURING**
[illegible], Sheffield, Eng.
[illegible]

**TAPPING MACHINES, PNEUMATIC**
[illegible]

**TAPPING MACHINES AND ATTACHMENTS**
[illegible]
[illegible]
[illegible]
[illegible]
A. B. Jardine & Co., Hespeler, Ont.
[illegible]
Manufacturers Equipment Co., Chicago, Ill.
[illegible]
[illegible], Detroit.
[illegible]
Petrie, Ltd., H. W., Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
L. S. Starrett Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.

**TAPS, ADJUSTABLE**
Baxter Co., Ltd., J. R., Montreal, Que.
Boker & Co., Inc., H., Montreal, Que.
[illegible]
[illegible]
Manufacturers Equipment Co., Chicago, Ill.
[illegible], Detroit.
[illegible]
Osborn (Canada), Ltd., Sam'l, Montreal, Que.

**TAPS, COLLAPSIBLE**
[illegible], Montreal, Que.
[illegible], New Haven.
[illegible], Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Victor Tool Co., Waynesboro, Pa.

**TAPS, DIES AND WRENCHES**
Butterfield & Co., Rock Island, Que.
Can. [illegible], Montreal.
[illegible]
[illegible], Montreal.
[illegible]
A. B. [illegible], Ont.
Landis Machine Co., Waynesboro, Pa.
[illegible], Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Rice, Lewis & Son, Toronto, Ont.
[illegible], Ont.
[illegible], Ont.

**TAP EXTENSIONS**
Allen Mfg. Co., Hartford, Conn.

**TAP EXTRACTORS**
[illegible]

**TELEPHONE SYSTEMS, RECORDING**
[illegible], N.Y.

**TESTING, INSTRUMENTS METALLURGICAL**
[illegible], New York.
[illegible], New York, N.Y.

**TESTING LABORATORIES**
[illegible], Montreal, Que.
[illegible]

**THREAD CUTTING MACHINES**
[illegible]
Curtis & Curtis Co., Bridgeport, Conn.
[illegible], Toronto, Ont.
[illegible]
A. B. Jardine & Co., Limited, Hespeler, Ont.
[illegible], Pa.
[illegible]
[illegible]
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., Greenfield, Mass.

**THREADING TOOLS**
Landis [illegible], Pa.
Pratt & Whitney Co., Dundas, Ont.

**THREAD MILLING MACHINES**
Holden-Morgan Co., Toronto, Ont.
[illegible]

**THRESHING MACHINES**
[illegible]

**THUMB SCREWS AND NUTS**
[illegible], Ont.
[illegible]

**TINSMITHS' TOOLS**
[illegible], Hamilton, Can.
[illegible], Conn.

**TIRE BENDERS**
A. B. Jardine & Co., Limited, Hespeler, Ont.

**TIRE SETTING MACHINES, HYDRAULIC**
[illegible], N.Y.

**TOOL HOLDERS**
[illegible], Toronto, Ont.
[illegible]
[illegible], Montreal.
[illegible], Toronto, Ont.
[illegible], Ont.
Pratt & Whitney Co., Ont.
[illegible], N.Y.
[illegible]

**TOOL CASES**
[illegible], Ont.
[illegible], N.Y.

**TOOL POSTS, LATHE**
[illegible]

**TOOL [illegible]**
[illegible], Ont.

**TOOL STEEL, CARBON**
[illegible], Que.

**TOOL STEEL**
[illegible], Montreal.
[illegible]
Boker & Co., Inc., H., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal.
[illegible]
[illegible], Ont.
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
[illegible]
[illegible], Que.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**TOOLS, BLACKSMITHS'**
[illegible], Ont.
[illegible]

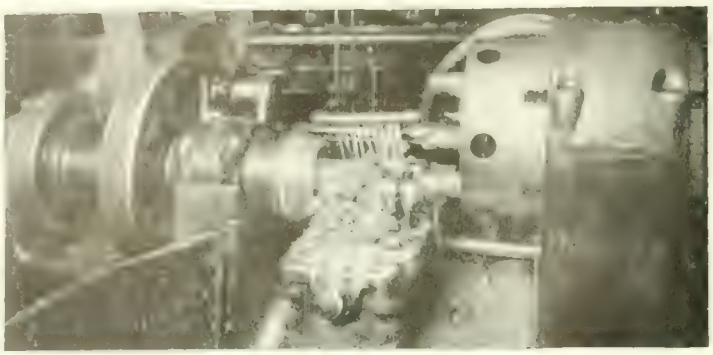
**TOOLS, ELECTRIC**
Independent Pneumatic Tool Co., Chicago, Ill.
Stow Mfg. Co., Binghamton, N.Y.
A. R. Williams Machinery Co., Toronto.
United States Elec. Tool Co., Cincinnati, O.

**TOOLS, PNEUMATIC**
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
[illegible], Mass.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

# CATARACT

Cutting Compounds

Drawing Compounds



Cutting Oils

Quenching Oils

## ACME---MYSTIC---SPECIAL

We have the proper lubricant for every purpose. Greater production and a reduction in costs always results from their use.

Our salesmen are practical mechanics and will be pleased to give you a personal demonstration. Get in touch with us. Circular upon request.

## Cataract Refining Company, Limited

TORONTO, ONTARIO LONDON, ENGLAND


**TOOLS, LATHE, PLANER, SLOTTER**
Armstrong Bros. Tool Co., Chicago.
[illegible] N.Y.

**TOOLS, SCREW MACHINE**
Foster Machine Tool Co., Elkhart, Ind.

**TORCHES, STEEL**
Armstrong, Whitworth of Canada Ltd., Montreal
[illegible] Toronto, Ont.

**TRACK, PORTABLE STEEL**
[illegible] & Engr. Wks., Hamilton, Ont.
[illegible] & [illegible] Co., Herbert, Niagara [illegible]

**TRACK SYSTEMS**
[illegible] & Hoist Co., Herbert, Niagara [illegible]
Northern Crane Works, Walkerville.
[illegible] Equipment Co., Harvey, Ill.

**TRACTORS, OIL AND PETROL**
[illegible]

**TRANSMISSION MACHINERY**
[illegible], Philadelphia, Pa.
A. R. Williams Machinery Co., Toronto.
[illegible] Alexandria, Ont.
Can. [illegible] Co., Montreal.
[illegible] Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto.
[illegible] Ont.
Morse Chain Co., Ithaca, N.Y.
[illegible] Hamilton

**TRANSMISSION ROPE**
[illegible]

**TRANSMISSION TOWERS**
[illegible] Co., St. Louis, Mo.
[illegible] Co., Montreal, Quebec
Northern Crane Works, Walkerville.
Toronto Bridge & Metal Co., Hamilton

**TROLLEYS**
Wright Mfg. Co., Lisbon, Ohio.

**TRUCKS, FACTORY, FREIGHT, ETC.**
Canada Machinery Corp., Galt, Ont.
[illegible] Co., Toronto
[illegible] Toronto, Ont.
[illegible] Co., Harvey, Ill.

**TRUCKS, LUMBER AND KILN**
[illegible] Galt, Ont.
Northern Crane Works, Walkerville.

**TUBING, SEAMLESS, BRASS & COPPER**
[illegible] & Brass Co., Woodstock, Ont.

**TUBING COILERS, FLEXIBLE METAL**
[illegible] E. R. Ashburnham, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.

**TUNGSTEN FILAMENT COILING MACHINERY**
Sleeper & Hartley, Inc., Worcester, Mass.

**TURRET MACHINES**
Brown & Sharpe Mfg. Co., Providence
Garlock-Walker Machinery Co., Toronto, Ont.
Milholland Mach. Co., Indianapolis, Ind.
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney, Hartford, Conn.
Riverside Machinery Depot, Detroit, Mich.
Warner & Swasey, Cleveland, O.
Garvin Machine Co., New York

**TURNBUCKLES**
Canada Foundries & Forgings, Ltd., Welland, Ont.
Rice, Lewis & Son, Toronto, Ont.

**TURNTABLES**
Can. Link-Belt Co., Toronto, Ont.
Hammant Steel Car & Engr. Wks., Hamilton, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

**UPSETTING AND BENDING MACHINERY**
John Bertram & Sons Co., Dundas
Brown, Boggs Co., Ltd., Hamilton, Canada.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, O.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

**VALVE LEATHERS**
Can. B. K. Morton, Toronto, Montreal.
Graton & Knight Mfg. Co., Montreal.

**VALVE GRINDERS (PNEUMATIC)**
Cleveland Pneumatic Tool Co. of Canada, Toronto

**VALVES, FOOT**
Smart-Turner Machine Co., Hamilton, Ont.

**VALVES, HYDRAULIC**
Charles F. Elmes Eng. Works, Chicago, Ill.
Metalwood Mfg. Co., Detroit, Mich.

**VENTILATING APPARATUS**
Brantford Oven & Rack Co., Brantford, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Gurney Foundry Co., Toronto, Ont.
Sheldons, Limited, Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.

**VISES, AIR OPERATED**
Hannifin Mfg. Co., Chicago, Ill.

**VISE STANDS, PORTABLE**
New Britain Machine Co., New Britain, Conn.
Williams & Co., J. H., Brooklyn, N.Y.

**VISES, BENCH**
Aikenhead Hardware Co., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass.
Cleveland Milling Machine Co.
The Geo. F. Foss Mchy. & Supply Co., Montreal
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

**VISES, PIPE**
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Wells Bros. Co. of Canada, Galt, Ont.
J. H. Williams & Co., Brooklyn, N.Y.

**VISES, PLANER AND SHAPER**
Aikenhead Hardware Co., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.

**VISES, TILTING**
Globe Engineering Co., Hamilton, Ont.

**WASHER MACHINES**
National Machy. Co., Tiffin, Ohio.

**WASHERS**
Barnes, Wallace, Co., Bristol, Conn.
Dillon Mfg. Co., Oshawa, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
United Brass & Lead Ltd., Toronto.
Wilkinson & Kompass, Hamilton, Ont.

**WASTE**
Pullan, E., Toronto, Ont.

**WATER-INTAKE SCREENS**
Can. Link-Belt Co., Toronto, Ont.

**WATER CINDER MILLS**
Whiting Foundry Equipment Co., Harvey, Ill.

**WATER JACKETS**
Can. Welding Works, Montreal, Que.

**WATER TOWERS**
Toronto Iron Works, Ltd., Toronto.

**WATER WHEELS**
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Sleeper & Hartley, Inc., Worcester, Mass.

**WELDING, ELECTRIC, SPOT, BUTT, ETC.**
St. Lawrence Welding Co., Montreal, Que.

**WELDING MASKS**
Strong, Kennard & Nutt Co., Cleveland, Ohio.

**WELDERS, ELECTRIC, SPOT, BUTT, ETC.**
Tabor Mfg. Co., Philadelphia, Pa.
Winfield Electric Welding Mach. Co., Warren, Ohio.

**WELDING, WORK AND SUPPLIES (Autogenous and Oxy-Acetylene) see OXY-ACETYLENE**

**WHEELS, SPROCKET AND TRACTION**
Can. Link-Belt Co., Toronto, Ont.

**WHEEL TRUEING TOOLS**
Wheel Trueing Tool Co., Windsor, Ont.